

Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AB1-089

Byron Wayne 345kV

July 2016

Network Impacts

The Queue Project AB1-089 was evaluated as a 575.0 MW (Capacity 550.0 MW) injection tapping the Byron-Wayne 345kV line in the COMED area. Project AB1-089 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB1-089 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2019

Generator Deliverability

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

1. (CE - CE) The BYRON ; B-CHERRY VA; B 345 kV line (from bus 270678 to bus 270694 ckt 1) loads from 78.96% to 83.0% (**DC power flow**) of its emergency rating (1441 MVA) for the single line contingency outage of '345-L0622__R-R'. This project contributes approximately 58.13 MW to the thermal violation.

CONTINGENCY '345-L0622__R-R'
TRIP BRANCH FROM BUS 270679 TO BUS 270695 CKT 1 / BYRON; R 345 CHERR; R 345
END

2. (CE - CE) The BYRON ; R-CHERRY VA; R 345 kV line (from bus 270679 to bus 270695 ckt 1) loads from 80.86% to 84.98% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0621__B-R'. This project contributes approximately 60.89 MW to the thermal violation.

CONTINGENCY '345-L0621__B-R'
TRIP BRANCH FROM BUS 270678 TO BUS 270694 CKT 1 / BYRON; B 345 CHERR; B 345
END

3. (CE - CE) The BYRON ; R-CHERRY VA; R 345 kV line (from bus 270679 to bus 270695 ckt 1) loads from 69.4% to 77.35% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 117.55 MW to the thermal violation.

CONTINGENCY '345-L0626__B-R_B'
TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345
END

4. (CE - CE) The CHERRY VA; R-GARDEN PR; R 345 kV line (from bus 270695 to bus 270759 ckt 1) loads from 79.13% to 88.72% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 142.16 MW to the thermal violation.

CONTINGENCY '345-L0626__B-R_B'
TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345
END

5. (CE - CE) The CHERRY VA; R-GARDEN PR; R 345 kV line (from bus 270695 to bus 270759 ckt 1) loads from 70.88% to 72.39% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 40.01 MW to the thermal violation.

6. (CE - CE) The GARDEN PR; R-SILVER LK; R 345 kV line (from bus 270759 to bus 270883 ckt 1) loads from 76.68% to 81.01% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 142.16 MW to the thermal violation.

CONTINGENCY '345-L0626__B-R_B'
TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345
END

7. (CE - CE) The WAYNE ; B-TOLLWAY ; B 345 kV line (from bus 270916 to bus 270900 ckt 1) loads from 56.9% to 71.77% (**DC power flow**) of its emergency rating (1201 MVA) for the single line contingency outage of '345-L11126_B-N'. This project contributes approximately 178.68 MW to the thermal violation.

CONTINGENCY '345-L11126_B-N'
TRIP BRANCH FROM BUS 270730 TO BUS 270916 CKT 1 / ELEC JUNC; B 345 WAYNE ; B 345
TRIP BRANCH FROM BUS 270916 TO BUS 270917 CKT 1 / WAYNE ; B 345 WAYNE ; R 345
END

8. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 58.25% to 77.37% (**DC power flow**) of its normal rating (1679 MVA) for non-contingency condition. This project contributes approximately 321.06 MW to the thermal violation.

9. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 60.34% to 76.52% (**DC power flow**) of its emergency rating (2058 MVA) for the single line contingency outage of '345-L15616__-R'. This project contributes approximately 333.42 MW to the thermal violation.

CONTINGENCY '345-L15616__-R'
TRIP BRANCH FROM BUS 270695 TO BUS 270759 CKT 1 / CHERR; R 345 U3-021 GARDEN PRAIRIE
END

10. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 60.1% to 76.3% (**DC power flow**) of its emergency rating (2058 MVA) for the single line contingency outage of '345-L97116__-R'. This project contributes approximately 333.42 MW to the thermal violation.

CONTINGENCY '345-L97116__-R'
TRIP BRANCH FROM BUS 270759 TO BUS 270883 CKT 1 / U3-021 SILVE; 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. (AEP - AEP) The 05OLIVE-X2-052 TAP 345 kV line (from bus 243229 to bus 909144 ckt 2) loads from 90.57% to 91.96% (**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 44.19 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 907040 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 - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 92.76% to 94.94% (**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 52.88 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 907040 X1-020 TAP 765 1

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1
END

/ 243206 05DUMONT 765 270644 WILTON ; 765 1

3. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 91.96% to 94.16% (**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 53.29 MW to the thermal violation.

CONTINGENCY '112-65-BT4-5__'

TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1
TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1
TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1
TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1
END

/ WILTO; 765 05DUMONT 765
/ WILTO;4M 345 WILTO; 765
/ WILTO;4M 345 WILTO; R 345
/ WILTO;4M 345 WILTO;4C 33

4. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 91.92% to 94.12% (**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 53.28 MW to the thermal violation.

CONTINGENCY '112-65-BT3-4__'

TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1
TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1
TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1
TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1
END

/ WILTO; 765 05DUMONT 765
/ WILTO;3M 345 WILTO; 765
/ WILTO;3M 345 WILTO; B 345
/ WILTO;3M 345 WILTO;3C 33

5. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 99.56% to 102.15% (**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 68.93 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1
END

/ 243206 05DUMONT 765 907040 X1-020 TAP 765 1
/ 243206 05DUMONT 765 270644 WILTON ; 765 1

6. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 99.47% to 102.07% (**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 68.87 MW to the thermal violation.

CONTINGENCY '023-65-BT2-3__'

TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1
TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1
END

/ WILTO; 765 05DUMONT 765
/ COLLI; 765 PLANO; 765

7. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 98.95% to 101.56% (**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 69.28 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 CHERRY VA; R-GARDEN PR; R 345 kV line (from bus 270695 to bus 270759 ckt 1) loads from 75.59% to 83.82% (**DC power flow**) of its emergency rating (1768 MVA) for the line fault with failed breaker contingency outage of '144-45-BT4-7__'. This project contributes approximately 146.15 MW to the thermal violation.

CONTINGENCY '144-45-BT4-7__'

TRIP BRANCH FROM BUS 270730 TO BUS 270916 CKT 1	/ ELEC JUNC; B 345 WAYNE ; B 345
TRIP BRANCH FROM BUS 270916 TO BUS 270917 CKT 1	/ WAYNE ; B 345 WAYNE ; R 345
TRIP BRANCH FROM BUS 270916 TO BUS 270900 CKT 1	/ WAYNE ; B 345 TOLLWAY ; B 345
TRIP BRANCH FROM BUS 275228 TO BUS 270916 CKT 1	/ WAYNE ;1M 138 WAYNE ; B 345
TRIP BRANCH FROM BUS 275228 TO BUS 272740 CKT 1	/ WAYNE ;1M 138 WAYNE ; B 138
TRIP BRANCH FROM BUS 275228 TO BUS 275328 CKT 1	/ WAYNE ;1M 138 WAYNE ;1C 34.5

END

9. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 90.71% to 92.94% (**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 48.09 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1	/ 243206 05DUMONT 765 907040 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1	/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

10. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 83.43% to 85.68% (**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 48.57 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

11. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 83.43% to 85.68% (**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 48.57 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

12. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 92.76% to 94.94% (**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 52.88 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'
 OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 907040 X1-020 TAP 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
 END

13. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 91.96% to 94.16% (**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 53.29 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

14. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 91.92% to 94.12% (**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 53.28 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

15. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 65.23% to 80.7% (**DC power flow**) of its emergency rating (2280 MVA) for the

tower line contingency outage of '345-L0621__B-R+_345-L0622__R-R'. This project contributes approximately 356.16 MW to the thermal violation.

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CONTINGENCY '345-L0621__B-R+_345-L0622__R-R'
TRIP BRANCH FROM BUS 270678 TO BUS 270694 CKT 1 / BYRON; B 345 CHERR; B 345
TRIP BRANCH FROM BUS 270679 TO BUS 270695 CKT 1 / BYRON; R 345 CHERR; R 345
TRIP BRANCH FROM BUS 270694 TO BUS 270695 CKT 1 / CHERR; B 345 CHERR; R 345
END
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16. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 63.65% to 79.04% (**DC power flow**) of its emergency rating (2280 MVA) for the tower line contingency outage of '345-L15616__R+_138-L15627_R-R'. This project contributes approximately 351.56 MW to the thermal violation.

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CONTINGENCY '345-L15616__R+_138-L15627_R-R'
TRIP BRANCH FROM BUS 270695 TO BUS 270759 CKT 1 / U3-021 SILVE; R 345
TRIP BRANCH FROM BUS 271193 TO BUS 271581 CKT 1 / CHERR; R 138 B200 ; R 138
TRIP BRANCH FROM BUS 271558 TO BUS 272730 CKT 1 / GLIDD; B 138 WATER;3B 138
TRIP BRANCH FROM BUS 271581 TO BUS 272757 CKT 1 / B200 ; R 138 W DEK;7T 138
TRIP BRANCH FROM BUS 272757 TO BUS 271558 CKT 1 / W DEK;7T 138 GLIDD; B 138
TRIP BRANCH FROM BUS 272757 TO BUS 272761 CKT 1 / W DEK;7T 138 W DEK;7R 138
MOVE 100 PERCENT LOAD FROM BUS 272761 TO BUS 272759 / W DEK;7R 138 W DEK;4R 138
END
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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 17HIPLE-05COLNGW 345 kV line (from bus 255105 to bus 243214 ckt 1) loads from 103.32% to 103.45% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '7444_C2_05DUMONT 765-A2'. This project contributes approximately 40.43 MW to the thermal violation.

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CONTINGENCY '7444_C2_05DUMONT 765-A2'
OPEN BRANCH FROM BUS 243206 TO BUS 246999 CKT 1 / 243206 05DUMONT 765 246999 05SORENS 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 243219 CKT 2 / 243206 05DUMONT 765 243219 05DUMONT 345 2
OPEN BRANCH FROM BUS 243219 TO BUS 909144 CKT 2 / 243219 05DUMONT 345 909144 X2-052 TAP 345 2
END
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2. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 121.24% to 123.93% (**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 83.93 MW to the thermal violation.

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CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 907040 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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3. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 111.08% to 113.82% (**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 85.73 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

4. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 110.99% to 113.74% (**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 85.84 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

5. (CE - AEP) The WILTON ; -05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 108.85% to 110.78% (**DC power flow**) of its emergency rating (4444 MVA) for the tower line contingency outage of '345-L94507_B-S+_345-L97008_R-S'. This project contributes approximately 190.16 MW to the thermal violation.

CONTINGENCY '345-L94507_B-S+_345-L97008_R-S'
 TRIP BRANCH FROM BUS 274750 TO BUS 255112 CKT 1 / CRETE;BP 345 17STJOHN 345
 TRIP BRANCH FROM BUS 274804 TO BUS 243229 CKT 1 / UPNOR;RP 345 05OLIVE 345
 END

6. (CE - AEP) The WILTON ; -05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 107.33% to 109.26% (**DC power flow**) of its emergency rating (4444 MVA) for the tower line contingency outage of '345-L6607__B-S+_345-L97008_R-S'. This project contributes approximately 190.41 MW to the thermal violation.

CONTINGENCY '345-L6607__B-S+_345-L97008_R-S'
 TRIP BRANCH FROM BUS 270728 TO BUS 274750 CKT 1 / E FRA; B 345 CRETE;BP 345
 TRIP BRANCH FROM BUS 274804 TO BUS 243229 CKT 1 / UPNOR;RP 345 05OLIVE 345
 END

7. (CE - MISO NIPS) The BURNHAM ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 106.64% to 108.98% (**DC power flow**) of its emergency rating (1069

MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 55.79 MW to the thermal violation.

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CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1      / 243206 05DUMONT 765 907040 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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8. (CE - MISO NIPS) The BURNHAM ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 106.36% to 108.7% (**DC power flow**) of its emergency rating (1069 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 55.79 MW to the thermal violation.

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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
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9. (CE - MISO NIPS) The BURNHAM ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 105.96% to 108.31% (**DC power flow**) of its emergency rating (1069 MVA) for the line fault with failed breaker contingency outage of '023-65-BT4-5__'. This project contributes approximately 56.11 MW to the thermal violation.

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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
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10. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 117.14% to 119.48% (**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 83.36 MW to the thermal violation.

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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
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11. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 120.37% to 122.77% (**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 85.12 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

12. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 121.75% to 124.16% (**DC power flow**) of its emergency rating (1390 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 74.3 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

13. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 121.85% to 124.25% (**DC power flow**) of its emergency rating (1390 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 73.81 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1	/ 243206 05DUMONT 765 907040 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1	/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

14. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 121.69% to 124.1% (**DC power flow**) of its emergency rating (1390 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 74.28 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

15. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 114.72% to 117.41% (**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 57.96 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1	/ 243206 05DUMONT 765 907040 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1	/ 243206 05DUMONT 765 270644 WILTON ; 765 1
END	

16. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 113.32% to 116.03% (**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 58.43 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	

17. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 113.29% to 116.0% (**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 58.43 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	

18. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 106.72% to 109.06% (**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 83.36 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	

19. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 108.92% to 111.32% (**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 85.12 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	

20. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 111.2% to 112.78% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '286_B2_TOR1687'. This project contributes approximately 46.47 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
OPEN BRANCH FROM BUS 348885 TO BUS 348887 CKT 1	/ 348885 7BUNSONVILLE 345 348887 7SIDNEY 345 1
OPEN BRANCH FROM BUS 348885 TO BUS 348886 CKT 1	/ 348885 7BUNSONVILLE 345 348886 4BUNSONVILLE 138 1
END	

21. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 111.4% to 112.89% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '1363_B2'. This project contributes approximately 44.07 MW to the thermal violation.

CONTINGENCY '1363_B2'	
OPEN BRANCH FROM BUS 348885 TO BUS 348887 CKT 1	/ 348885 7BUNSONVILLE 345 348887 7SIDNEY 345 1
END	

22. (MISO AMIL - AEP) The 7BUNSONVILLE-05EUGENE 345 kV line (from bus 348885 to bus 243221 ckt 1) loads from 106.26% to 108.46% (**DC power flow**) of its normal rating (822 MVA) for the single line contingency outage of '685_B2_TOR1686'. This project contributes approximately 40.06 MW to the thermal violation.

CONTINGENCY '685_B2_TOR1686'	
OPEN BRANCH FROM BUS 243213 TO BUS 346809 CKT 1	/ 243213 05BREED 345 346809 7CASEY 345 1
END	

23. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 909144 to bus 243219 ckt 2) loads from 113.91% to 115.32% (**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 44.19 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'	
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1	/ 243206 05DUMONT 765 907040 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1	/ 243206 05DUMONT 765 270644 WILTON ; 765 1
END	

24. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 909144 to bus 243219 ckt 2) loads from 103.37% to 104.88% (**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 47.26 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	

25. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 909144 to bus 243219 ckt 2) loads from 103.36% to 104.87% (**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 47.26 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	

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 violations identified.

Affected System Analysis & Mitigation

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 05DUMONT-05SORENS 765 kV line (from bus 243206 to bus 246999 ckt 1) loads from 100.67% to 100.8% (**DC power flow**) of its normal rating (4257 MVA) for the

single line contingency outage of '709_B2_TOR546'. This project contributes approximately 130.58 MW to the thermal violation.

CONTINGENCY '709_B2_TOR546'
OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1
END

2. (MISO NIPS - AEP) The 17HIPLE-05COLNGW 345 kV line (from bus 255105 to bus 243214 ckt 1) loads from 102.14% to 102.25% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '7442_B2_TOR200545'. This project contributes approximately 40.1 MW to the thermal violation.

CONTINGENCY '7442_B2_TOR200545'
OPEN BRANCH FROM BUS 243206 TO BUS 246999 CKT 1 / 243206 05DUMONT 765 246999 05SORENS 765 1
END

3. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 91.49% to 93.69% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 53.19 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. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 110.76% to 113.5% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 85.84 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 - CE) The COLLINS ;-WILTON ; 765 kV line (from bus 270607 to bus 270644 ckt 1) loads from 96.39% to 97.75% (**DC power flow**) of its normal rating (4142 MVA) for non-contingency condition. This project contributes approximately 124.91 MW to the thermal violation.

6. (CE - CE) The COLLINS ;-WILTON ; 765 kV line (from bus 270607 to bus 270644 ckt 1) loads from 94.29% to 95.4% (**DC power flow**) of its emergency rating (4460 MVA) for the single line contingency outage of '345-L16703_R-S'. This project contributes approximately 109.77 MW to the thermal violation.

CONTINGENCY '345-L16703_R-S'
TRIP BRANCH FROM BUS 270846 TO BUS 270847 CKT 1 / PLANO ; B 345 PLANO ; R 345
TRIP BRANCH FROM BUS 270847 TO BUS 270733 CKT 1 / PLANO ; R 345 ELEC JUNC;3R 345

END

7. (CE - AEP) The WILTON ; -05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 111.27% to 113.26% (**DC power flow**) of its normal rating (4047 MVA) for the single line contingency outage of '238_B3'. This project contributes approximately 178.51 MW to the thermal violation.

CONTINGENCY '238_B3'

OPEN BRANCH FROM BUS 243219 TO BUS 255113 CKT 1 / 243219 05DUMONT 345 255113 17STILLWELL 345 1
OPEN BRANCH FROM BUS 255100 TO BUS 255113 CKT 1 / 255100 17BABCOCK 345 255113 17STILLWELL 345 1
OPEN BRANCH FROM BUS 255113 TO BUS 255180 CKT 1 / 255113 17STILLWELL 345 255180 17STILLWELL 138 1
END

8. (CE - MISO NIPS) The BURNHAM ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 105.12% to 107.48% (**DC power flow**) of its emergency rating (1069 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 56.12 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 98.07% to 100.68% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 69.3 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 - CE) The BYRON ; B-CHERRY VA; B 345 kV line (from bus 270678 to bus 270694 ckt 1) loads from 80.67% to 84.78% (**DC power flow**) of its emergency rating (1441 MVA) for the single line contingency outage of '345-L0622__R-R'. This project contributes approximately 60.77 MW to the thermal violation.

CONTINGENCY '345-L0622__R-R'

TRIP BRANCH FROM BUS 270679 TO BUS 270695 CKT 1 / BYRON; R 345 CHERR; R 345
END

11. (CE - CE) The BYRON ; R-CHERRY VA; R 345 kV line (from bus 270679 to bus 270695 ckt 1) loads from 82.6% to 86.8% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0621__B-R'. This project contributes approximately 63.66 MW to the thermal violation.

CONTINGENCY '345-L0621__B-R'

TRIP BRANCH FROM BUS 270678 TO BUS 270694 CKT 1 / BYRON; B 345 CHERR; B 345
END

12. (CE - CE) The CHERRY VA; R-GARDEN PR; R 345 kV line (from bus 270695 to bus 270759 ckt 1) loads from 89.37% to 99.38% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 148.62 MW to the thermal violation.

CONTINGENCY '345-L0626__B-R_B'
TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345
END

13. (CE - CE) The GARDEN PR; R-SILVER LK; R 345 kV line (from bus 270759 to bus 270883 ckt 1) loads from 88.07% to 92.6% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 148.62 MW to the thermal violation.

CONTINGENCY '345-L0626__B-R_B'
TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345
END

14. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 83.37% to 85.62% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 48.56 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

15. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 91.49% to 93.69% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 53.19 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

16. (CE - CE) The WAYNE ; B-TOLLWAY ; B 345 kV line (from bus 270916 to bus 270900 ckt 1) loads from 61.34% to 76.89% (**DC power flow**) of its emergency rating (1201 MVA) for the single line contingency outage of '345-L11126_B-N'. This project contributes approximately 186.8 MW to the thermal violation.

CONTINGENCY '345-L11126_B-N'
TRIP BRANCH FROM BUS 270730 TO BUS 270916 CKT 1 / ELEC JUNC; B 345 WAYNE ; B 345
TRIP BRANCH FROM BUS 270916 TO BUS 270917 CKT 1 / WAYNE ; B 345 WAYNE ; R 345
END

17. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 120.95% to 123.35% (**DC power flow**) of its emergency rating (1390 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 74.08 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 LEE CO EC;BP-NELSON ; B 345 kV line (from bus 274768 to bus 270828 ckt 1) loads from 34.71% to 48.23% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 211.7 MW to the thermal violation.

CONTINGENCY '345-L0626__B-R_B'

TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345
END

19. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 112.85% to 115.55% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 58.33 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

20. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 157.55% to 159.19% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '286_B2_TOR1687'. This project contributes approximately 48.59 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
OPEN BRANCH FROM BUS 348885 TO BUS 348887 CKT 1 / 348885 7BUNSONVILLE 345 348887 7SIDNEY 345 1
OPEN BRANCH FROM BUS 348885 TO BUS 348886 CKT 1 / 348885 7BUNSONVILLE 345 348886 4BUNSONVILLE 138 1
END

21. (MISO AMIL - AEP) The 7BUNSONVILLE-05EUGENE 345 kV line (from bus 348885 to bus 243221 ckt 1) loads from 171.9% to 174.2% (**DC power flow**) of its normal rating (822 MVA) for the single line contingency outage of '685_B2_TOR1686'. This project contributes approximately 41.88 MW to the thermal violation.

CONTINGENCY '685_B2_TOR1686'

OPEN BRANCH FROM BUS 243213 TO BUS 346809 CKT 1 / 243213 05BREED 345 346809 7CASEY 345 1
END

22. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 909144 to bus 243219 ckt 2) loads from 103.21% to 104.72% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 47.22 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

23. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 65.5% to 85.37% (**DC power flow**) of its normal rating (1679 MVA) for non-contingency condition. This project contributes approximately 335.65 MW to the thermal violation.

24. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 68.66% to 85.59% (**DC power flow**) of its emergency rating (2058 MVA) for the single line contingency outage of '345-L97116__-R'. This project contributes approximately 348.58 MW to the thermal violation.

CONTINGENCY '345-L97116__-R'
TRIP BRANCH FROM BUS 270759 TO BUS 270883 CKT 1 / U3-021 SILVE; R 345
END

Light Load Analysis - 2019

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 - CE) The BYRON ; B-CHERRY VA; B 345 kV line (from bus 270678 to bus 270694 ckt 1) loads from 78.96% to 83.0% (**DC power flow**) of its emergency rating (1441 MVA) for the single line contingency outage of '345-L0622__R-R'. This project contributes approximately 58.13 MW to the thermal violation.

Reinforcement: ComEd 345kV L0621 SSTE rating is 1568 MVA. The post contingency flow exceeds the rating. Upgrades are required. At Cherry Valley upgrade the 345kV BT 4-13 CB current transformers. Sag mitigation on L0621. The new ratings will be 1334/1726/2084 MVA, SN/SE/SLD.

Cost: \$18.3M

Time: 24-30 months.

2. (CE - CE) The BYRON ; R-CHERRY VA; R 345 kV line (from bus 270679 to bus 270695 ckt 1) loads from 80.86% to 84.98% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0621__B-R'. This project contributes approximately 60.89 MW to the thermal violation.

Reinforcement: ComEd 345kV L0622 SSTE rating is 1568 MVA. The post contingency flow exceeds the rating. Upgrades are required. At Cherry Valley upgrade the 345kV BT 4-13 CB current transformers. Sag mitigation on L0622. The new ratings will be 1334/1726/2084 MVA, SN/SE/SLD.

Cost: \$18.3M

Time: 24-30 months.

3. (CE - CE) The BYRON ; R-CHERRY VA; R 345 kV line (from bus 270679 to bus 270695 ckt 1) loads from 69.4% to 77.35% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 117.55 MW to the thermal violation.

CONTINGENCY '345-L0626__B-R_B'

TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345
WAYNE ; B 345
END

4. (CE - CE) The CHERRY VA; R-GARDEN PR; R 345 kV line (from bus 270695 to bus 270759 ckt 1) loads from 79.13% to 88.72% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 142.16 MW to the thermal violation.

Reinforcement: ComEd 345kV L15616 SSTE is 1568 MVA. Upgrade L15616 line conductor and line terminal conductor at TSS 138 Silver Lakes and TSS 156 Cherry Valley. Relay review at TSS 156 for L15616 with possibility of new relays (to be determined by ComEd Relay & Protective Services), new 345kV BT 3-4 CB at TSS 156 as well as associated disconnect switches and upgrade 345kV L15616 motor operated disconnect switch. Upon completion of this upgrade the new ratings will be 1478/1863/1975/2232 MVA SN/SE/SSTE/SLD.

Cost: \$47.5 M

Time: 24-30 months.

5. (CE - CE) The CHERRY VA; R-GARDEN PR; R 345 kV line (from bus 270695 to bus 270759 ckt 1) loads from 70.88% to 72.39% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 40.01 MW to the thermal violation.

Reinforcement: ComEd 345kV L15616 SN rating is 1201 MVA. Upgrades include re-conductor of L15616 and L15616 station conductor upgrades at both station terminals. Upon completion of upgrade, the ratings will be 1448/1863/2232 MVA, SN/SE/SLD.

Cost: \$45.2M

Time: 24-30 months.

6. (CE - CE) The GARDEN PR; R-SILVER LK; R 345 kV line (from bus 270759 to bus 270883 ckt 1) loads from 76.68% to 81.01% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L0626__B-R_B'. This project contributes approximately 142.16 MW to the thermal violation.

Reinforcement: ComEd 345kV L15616 SSTE rating is 1568 MVA. Upgrades include re-conductor of L15616 and L15616 station conductor upgrades at both station terminals..

Upon completion of upgrade, the ratings will be 1448/1863/2232 MVA, SN/SE/SLD.

Cost: \$45.2M

Time: 24-30 months

7. (CE - CE) The WAYNE ; B-TOLLWAY ; B 345 kV line (from bus 270916 to bus 270900 ckt 1) loads from 56.9% to 71.77% (**DC power flow**) of its emergency rating (1201 MVA) for the single line contingency outage of '345-L11126_B-N'. This project contributes approximately 178.68 MW to the thermal violation.

Reinforcement: ComEd 345kV L14402 SSTE rating is 1251 MVA. Upgrade will be to mitigate sag limitation on L14402. New SSTE rating limit upon completion will be 1523 MVA.

Cost: \$2.3 M

Time: 20-24 months.

8. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 58.25% to 77.37% (**DC power flow**) of its normal rating (1679 MVA) for non-contingency condition. This project contributes approximately 321.06 MW to the thermal violation.

Reinforcement: ComEd 345kV L0626 SN rating is 1679 MVA. Upgrade will be to re-conductor L0626. Upon field completion of the upgrade the new ratings will be 2888/3062/3358 MVA, SN/SE/SLD.

Cost: \$26M

Time: 24-36 months

9. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 60.34% to 76.52% (**DC power flow**) of its emergency rating (2058 MVA) for the single line contingency outage of '345-L15616__-R'. This project contributes approximately 333.42 MW to the thermal violation.

Same as Generator Deliverability #8

10. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 60.1% to 76.3% (**DC power flow**) of its emergency rating (2058 MVA) for the single line contingency outage of '345-L97116__-R'. This project contributes approximately 333.42 MW to the thermal violation.

Same as Generator Deliverability #8

Multiple Facility Contingency

1. (AEP - AEP) The 05OLIVE-X2-052 TAP 345 kV line (from bus 243229 to bus 909144 ckt 2) loads from 90.57% to 91.96% (**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 44.19 MW to the thermal violation.

AEP

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. If deemed necessary to rebuild section of line

Cost: \$56,000-Sag study. \$28,000,000-Line rebuild

Time: 6 to 12 months-sag study. 24 to 36 months-sag study

2. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 92.76% to 94.94% (**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 52.88 MW to the thermal violation.

ComEd

No upgrade required.

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

3. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 91.96% to 94.16% (**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 53.29 MW to the thermal violation.

Same as Multiple Facility #2

4. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 91.92% to 94.12% (**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 53.28 MW to the thermal violation.

Same as Multiple Facility #2

5. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 99.56% to 102.15% (**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 68.93 MW to the thermal violation.

ComEd

ComEd 345kV L17703 ALDR rating is 2279 MVA. No upgrade required.

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

6. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 99.47% to 102.07% (**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 68.87 MW to the thermal violation.

Same as Multiple Facility #5

7. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 98.95% to 101.56% (**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 69.28 MW to the thermal violation.

Same as Multiple Facility #5

8. (CE - CE) The CHERRY VA; R-GARDEN PR; R 345 kV line (from bus 270695 to bus 270759 ckt 1) loads from 75.59% to 83.82% (**DC power flow**) of its emergency rating (1768 MVA) for the line fault with failed breaker contingency outage of '144-45-BT4-7__'. This project contributes approximately 146.15 MW to the thermal violation.

Reinforcement: ComEd 345kV L15616 ALDR is 2033 MVA. The post-contingency flow exceeds the ALDR therefore a portion of L15616 will need to be re-conducted.

Cost: \$45M

Time: 24-36 months

9. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 90.71% to 92.94% (**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 48.09 MW to the thermal violation.

ComEd

ComEd SLD rating of 1237 MVA (ALDR is 1423 MVA). No upgrade required.

AEP

Reinforcement: Olive - Green Acres 345 kV line is a sag derated tie line and thus a sag check will be required for the entire 40.64 miles of ACSR/PE ~ 1414 ~ 62/19 Conductor section 1 to determine if the line can be operated above its emergency rating 971 MVA. If deemed necessary to rebuild the entire 40.64 miles of the section of the line.

Cost: \$162,560-sag study. \$81,280,000 line rebuild

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

10. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 83.43% to 85.68% (**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 48.57 MW to the thermal violation.

Same as Multiple Facility #9

11. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 83.43% to 85.68% (**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 48.57 MW to the thermal violation.

Same as Multiple Facility #9

12. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 92.76% to 94.94% (**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 52.88 MW to the thermal violation.

Comed

Reinforcement: ComEd 345kV L6617 sag mitigation.

Cost: \$3M

Time: 18-24 months

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

13. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 91.96% to 94.16% (**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 53.29 MW to the thermal violation.

Same as Multiple Facility #12

14. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 91.92% to 94.12% (**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 53.28 MW to the thermal violation.

Same as Multiple Facility #12

15. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 65.23% to 80.7% (**DC power flow**) of its emergency rating (2280 MVA) for the tower line contingency outage of '345-L0621__B-R+_345-L0622__R-R'. This project contributes approximately 356.16 MW to the thermal violation.

Reinforcement: ComEd 345kV L0626 SLD rating per ComEd Project Diagram and the ALDR is 2622 MVA. The post contingency flow exceeds the ALDR therefore the upgrade will be a new 345kV line to run parallel to L0626.

Cost: \$126M

Time: 24-36 months

16. (CE - CE) The AB1-089 TAP-WAYNE ; B 345 kV line (from bus 930480 to bus 270916 ckt 1) loads from 63.65% to 79.04% (**DC power flow**) of its emergency rating (2280 MVA) for the tower line contingency outage of '345-L15616__R+_138-L15627_R-R'. This project contributes approximately 351.56 MW to the thermal violation.

Same as Multiple Facility #15

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 17HIPLE-05COLNGW 345 kV line (from bus 255105 to bus 243214 ckt 1) loads from 103.32% to 103.45% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '7444_C2_05DUMONT 765-A2'. This project contributes approximately 40.43 MW to the thermal violation.

AEP

Reinforcement: A Sag Study will be required on the 33.46 mile section of line to mitigate the overload on the Collingwood - Hiple 345 kV line.

Cost: Depending on the sag study results, cost for this upgrade is expected to be between \$133,840 (no remediations required just sag study) and \$67 million (complete line rebuild required).

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

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

2. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 121.24% to 123.93% (**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 83.93 MW to the thermal violation.

AEP

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 9 mile section of line would need to be rebuilt.

Replace the Dumont Wavetrap (2500 A)

Cost: \$40,000-sag study. \$18,000,000-line rebuild. \$300,000-Dumont Wave trap replacement

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

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

3. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 111.08% to 113.82% (**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 85.73 MW to the thermal violation.

Same as Contribution to Previously Identified Overloads #2

4. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 110.99% to 113.74% (**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 85.84 MW to the thermal violation.

Same as Contribution to Previously Identified Overloads #2

5. (CE - AEP) The WILTON ; -05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 108.85% to 110.78% (**DC power flow**) of its emergency rating (4444 MVA) for the tower line contingency outage of '345-L94507__B-S+_345-L97008_R-S'. This project contributes approximately 190.16 MW to the thermal violation.

Comed

Reinforcement: ComEd 765kV L11215. SLD is 4802 MVA. The relay thermal for this line is 5466 MVA. Based on the contingency above, the overload exceeds the relay thermal rating therefore the upgrade will be a new 765kV line. Contingent upon procurement of a right of way assuming the current right of way containing L11215 does not have land.

Cost: \$300M

Time: 36 months

AEP

Reinforcement: AEP rating of Dumont - Wilton Center 765 kV tie is S/N: 3555 MVA and S/E: 4105 MVA. The Dumont Wavetrap (2500A) will have to be replaced;

Cost: \$500,000.

Time: 12-24 months

6. (CE - AEP) The WILTON ; -05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 107.33% to 109.26% (**DC power flow**) of its emergency rating (4444 MVA) for the tower line contingency outage of '345-L6607__B-S+_345-L97008_R-S'. This project contributes approximately 190.41 MW to the thermal violation.

Same as Contribution to Previously Identified Overloads #5

7. (CE - MISO NIPS) The BURNHAM ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 106.64% to 108.98% (**DC power flow**) of its emergency rating (1069 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 55.79 MW to the thermal violation.

Comed

No upgrade required.

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

8. (CE - MISO NIPS) The BURNHAM ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 106.36% to 108.7% (**DC power flow**) of its emergency rating (1069 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 55.79 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #7

9. (CE - MISO NIPS) The BURNHAM ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 105.96% to 108.31% (**DC power flow**) of its emergency rating (1069 MVA) for the line fault with failed breaker contingency outage of '023-65-BT4-5__'. This project contributes approximately 56.11 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #7

10. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 117.14% to 119.48% (**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 83.36 MW to the thermal violation.

Reinforcement: The limit is Tr. 93 @ TSS 112 Wilton Center. The SLD is 1601 MVA (ALDR is 1841 MVA). Upgrade required at TSS 112 Wilton Center. Relocate 765kV L11216 from Bus 6 to Bus 8. Build out the 765kV bus and install 2 new 765kV Bus Tie CB's (BT 6-8 & 8-2), upgrade Tr. 93 station conductor and upgrade Tr. 93 forward relay trip setting. Upon completion the new ratings will be 1248/1479/1982 MVA, SN/SE/SLD (ALDR of 2279 MVA).

Cost: \$13M

Time: 24-30 months

11. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 120.37% to 122.77% (**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 85.12 MW to the thermal violation.

Reinforcement: The limit is Tr. 94 @ TSS 112 Wilton Center.

The SLD is 1601 MVA (ALDR is 1841 MVA). Upgrade required at TSS 112 Wilton Center. Relocate 765kV L11216 from Bus 6 to Bus 8. Build out the 765kV bus and install 2 new 765kV Bus Tie CB's (BT 6-8 & 8-2) and upgrade Tr. 93 station conductor at TSS 112, Tr. 94 CT upgrades and Forward Relay Trip reviewed and upgraded. The new ratings would be 1248/1479/2221 MVA SN/SE/SLD (ALDR of 2390 MVA).

Cost: \$13M
Time: 24-30 months.

12. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 121.75% to 124.16% (**DC power flow**) of its emergency rating (1390 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 74.3 MW to the thermal violation.

ComEd

ComEd Transmission Planning Comments- The limiting element is 345kV L94507. ComEd ALDR for L94507 is 1925 MVA. No upgrade from ComEd. Verify with MISO given this is a tie line with NIPSCO.

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

13. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 121.85% to 124.25% (**DC power flow**) of its emergency rating (1390 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 73.81 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #12

14. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 121.69% to 124.1% (**DC power flow**) of its emergency rating (1390 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 74.28 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #12

15. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 114.72% to 117.41% (**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 57.96 MW to the thermal violation.

ComEd

The limiting element is 345kV L97008. ComEd SLD rating for L94507 is 1237 MVA (ALDR is 1423 MVA). No upgrade from ComEd. Verify with AEP given this is a tie line.

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. The Olive switches to Line Riser will have to be replaced. For Olive RCTL, an engineering study will need to be conducted to determine if the Relay Compliance Trip limits settings can be adjusted to mitigate the overload. New relay packages will be required if the settings cannot be adjusted

Cost: \$162,440-sag study. \$81,220,000- reconductor/rebuild AEP section of line. \$1,400,000- Olive switches. :\$600,000-Relays

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

16. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 113.32% to 116.03% (**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 58.43 MW to the thermal violation.

Same as Contribution as Previously Identified Overloads #15

17. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 113.29% to 116.0% (**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 58.43 MW to the thermal violation.

Same as Contribution as Previously Identified Overloads #15

18. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 106.72% to 109.06% (**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 83.36 MW to the thermal violation.

Reinforcement: ComEd Transmission Planning Comments- The limit is Tr. 93 @ TSS 112 Wilton Center. The SLD is 1601 MVA (ALDR is 1841 MVA). Upgrade required at TSS 112 Wilton Center will be installation of a third transformer (3-333.3 MVA), 2-765kV Circuit Breakers to be and 1-345kV Circuit Breaker.

Cost: \$25M

Time: 24-30 months

19. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 108.92% to 111.32% (**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 85.12 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #18

20. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 111.2% to 112.78% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '286_B2_TOR1687'. This project contributes approximately 46.47 MW to the thermal violation.

AEP

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.

This is an AEP-AMIL tie line therefore, PJM is going to have to coordinate this upgrade with Ameren IL. Per our records, AMIL's portion of the conductor also needs to be reconducted/rebuilt to mitigate this overload. Ratings provided are based on the fact that AEP owned 3000A wavetrap at Sullivan will set new limits.

Cost: \$2 Million

Time: 24-36 months

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

21. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 111.4% to 112.89% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '1363_B2'. This project contributes approximately 44.07 MW to the thermal violation.

Same as Contribution to Previously Identified Overloads #20

22. (MISO AMIL - AEP) The 7BUNSONVILLE-05EUGENE 345 kV line (from bus 348885 to bus 243221 ckt 1) loads from 106.26% to 108.46% (**DC power flow**) of its normal rating (822 MVA) for the single line contingency outage of '685_B2_TOR1686'. This project contributes approximately 40.06 MW to the thermal violation.

AEP

Comments: This facility is an AEP-Ameren IL tie.

SN/SE ratings on this facility is 1692/1793 MVA. Therefore, under these ratings, this facility should not exceed its ratings for this IPP and under this event.

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

23. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 909144 to bus 243219 ckt 2) loads from 113.91% to 115.32% (**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 44.19 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.. If deemed necessary to rebuild section of line,

Cost: \$56,000 Sag Study. \$28,000,000. Line rebuild

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

24. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 909144 to bus 243219 ckt 2) loads from 103.37% to 104.88% (**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 47.26 MW to the thermal violation.

Same as Contribution to Previously Identified Overloads #23

25. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 909144 to bus 243219 ckt 2) loads from 103.36% to 104.87% (**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 47.26 MW to the thermal violation.

Same as Contribution to Previously Identified Overloads #23