Generation Interconnection
Feasibility Study Report
For
PJM Generation Interconnection Request Queue Position
AA2-039 Kewanee

September 2015

Network Impacts

The Queue Project AA2-039 was studied as a 150.0 MW (Capacity 19.5 MW) injection at the Bishop Hill138 kV substation in the Comed area. Project AA2-039 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AA2-039 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)

None

Multiple Facility Contingency

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

1. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 93.28% to 93.87% (**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 15.6 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. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 92.55% to 93.14% (**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 15.62 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
```

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```
END
```

3. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 93.04% to 93.63% (**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 15.6 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. (CE - MISO AMIL) The KEWANEE ;12-4EDWARDS3 138 kV line (from bus 271837 to bus 349637 ckt 1) loads from 94.23% to 109.98% (**DC power flow**) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of '155-38-L15508_'. This project contributes approximately 22.52 MW to the thermal violation.

```
CONTINGENCY '155-38-L15508_'
 TRIP BRANCH FROM BUS 271331 TO BUS 271333 CKT 1          / DIXON;8R 138 DIXON; R 138
 TRIP BRANCH FROM BUS 272097 TO BUS 271331 CKT 1          / NELSO;RT 138 DIXON;8R 138
 TRIP BRANCH FROM BUS 272097 TO BUS 272095 CKT 1          / NELSO;RT 138 NELSO; R 138
 TRIP BRANCH FROM BUS 272097 TO BUS 293710 CKT 1          / NELSO;RT 138 O29 138
 MOVE 100 PERCENT LOAD FROM BUS 271331 TO BUS 271330       / DIXON;8R 138 DIXON;7B 138
 DISCONNECT BUS 272095                    / NELSO; R 138
 END
```

5. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 94.51% to 95.04% (**DC power flow**) of its emergency rating (1117 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 13.12 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
```

<u>Contribution to Previously Identified Overloads</u>

(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 114.13% to 114.75% (**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 19.37 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
```

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

2. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 104.52% to 105.15% (**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 19.6 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
```

3. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 111.03% to 111.59% (**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 19.86 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
```

4. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 114.14% to 114.71% (**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 20.27 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
```

5. (CE - CE) The KEWANEE ;23-HENNEPIN ; T 138 kV line (from bus 271835 to bus 271655 ckt 1) loads from 135.72% to 162.63% (**DC power flow**) of its emergency rating (202 MVA) for the bus fault outage of '074_KE-138___1'. This project contributes approximately 54.36 MW to the thermal violation.

```
CONTINGENCY '074_KE-138___1'
 DISCONNECT BUS 271836                    / KEWAN; 1 138
 DISCONNECT BUS 271837                    / KEWAN; 5 138
 DISCONNECT BUS 271838                    / KEWAN; 4 138
 END
```

6. (CE - CE) The KEWANEE ;23-HENNEPIN ; T 138 kV line (from bus 271835 to bus 271655 ckt 1) loads from 135.72% to 162.63% (**DC power flow**) of its emergency rating (202 MVA) for

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the line fault with failed breaker contingency outage of '074-38-L7413__'. This project contributes approximately 54.36 MW to the thermal violation.

```
CONTINGENCY '074-38-L7413__'
 TRIP BRANCH FROM BUS 271836 TO BUS 271241 CKT 1          / KEWAN; 1 138 CRESC; R 138
 DISCONNECT BUS 271836                    / KEWAN; 1 138
 DISCONNECT BUS 271837                    / KEWAN; 5 138
 DISCONNECT BUS 271838                    / KEWAN; 4 138
 END
```

7. (CE - CE) The KEWANEE ;23-HENNEPIN ; T 138 kV line (from bus 271835 to bus 271655 ckt 1) loads from 135.72% to 162.63% (**DC power flow**) of its emergency rating (202 MVA) for the line fault with failed breaker contingency outage of '074-38-L7423__'. This project contributes approximately 54.36 MW to the thermal violation.

```
CONTINGENCY '074-38-L7423__'
 TRIP BRANCH FROM BUS 271837 TO BUS 349637 CKT 1          / KEWANEE ;12 138 4EDWARDS3 138
 DISCONNECT BUS 271836                    / KEWANEE ;11 138
 DISCONNECT BUS 271837                    / KEWANEE ;12 138
 DISCONNECT BUS 271838                    / KEWANEE ;13 138
 REMOVE UNIT 1 FROM BUS 290089
 REMOVE UNIT 1 FROM BUS 290090
 END
```

8. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 100.61% to 101.17% (**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 19.86 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 ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 102.69% to 103.26% (**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 20.27 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
```

Steady-State Voltage Requirements

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

To be determined

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Short Circuit
(Summary of impacted circuit breakers)

To be determined

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. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 104.32% to 104.95% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 19.61 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 ; B-17SHEFFIELD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 97.78% to 98.32% (**DC power flow**) of its emergency rating (1069 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 12.68 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 - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 91.78% to 92.37% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 15.64 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
```

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4. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 97.11% to 97.65% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 16.92 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 NELSON ; B-WALTO; B 345 kV line (from bus 270828 to bus 270932 ckt 1) loads from 107.82% to 108.29% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L0627__B-R'. This project contributes approximately 15.9 MW to the thermal violation.

```
CONTINGENCY '345-L0627__B-R'
 TRIP BRANCH FROM BUS 274768 TO BUS 270678 CKT 1              / LEECO;BP 345 BYRON; B 345
 END
```

6. (CE - CE) The WALTO; B-ELECT JCT; B 345 kV line (from bus 270932 to bus 270730 ckt 1) loads from 112.32% to 112.79% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L0627__B-R'. This project contributes approximately 15.9 MW to the thermal violation.

```
CONTINGENCY '345-L0627__B-R'
 TRIP BRANCH FROM BUS 274768 TO BUS 270678 CKT 1              / LEECO;BP 345 BYRON; B 345
 END
```

7. (CE - CE) The CRESCENT ; R-HENNEPIN ; T 138 kV line (from bus 271241 to bus 271655 ckt 1) loads from 152.77% to 167.41% (**DC power flow**) of its emergency rating (174 MVA) for the single line contingency outage of 'KEWANEE ;13-4KEWANEE N'. This project contributes approximately 25.49 MW to the thermal violation.

```
CONTINGENCY 'KEWANEE ;13-4KEWANEE N'
 DISCONNECT BRANCH FROM BUS 271838 TO BUS 348923 CKT 1
 END
```

8. (CE - CE) The HENNEPIN ; T-OGLESBY ; T 138 kV line (from bus 271655 to bus 272189 ckt 1) loads from 107.67% to 110.18% (**DC power flow**) of its emergency rating (268 MVA) for the single line contingency outage of '138-L91902_R-S'. This project contributes approximately 14.91 MW to the thermal violation.

```
CONTINGENCY '138-L91902_R-S'
 TRIP BRANCH FROM BUS 348918 TO BUS 271655 CKT 1              / HENNEPIN T143
 END
```

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9. (CE - MISO AMIL) The HENNEPIN ; T-4HENNEPIN S 138 kV line (from bus 271655 to bus 348918 ckt 1) loads from 193.85% to 197.21% (**DC power flow**) of its normal rating (160 MVA) for non-contingency condition. This project contributes approximately 11.93 MW to the thermal violation.

10. (CE - MISO AMIL) The HENNEPIN ; T-4HENNEPIN S 138 kV line (from bus 271655 to bus 348918 ckt 1) loads from 97.88% to 105.06% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'KEWANEE ;13-4KEWANEE N'. This project contributes approximately 32.24 MW to the thermal violation.

```
CONTINGENCY 'KEWANEE ;13-4KEWANEE N'
 DISCONNECT BRANCH FROM BUS 271838 TO BUS 348923 CKT 1
 END
```

11. (CE - CE) The KEWANEE ;23-HENNEPIN ; T 138 kV line (from bus 271835 to bus 271655 ckt 1) loads from 106.96% to 117.5% (**DC power flow**) of its emergency rating (190 MVA) for the single line contingency outage of '138-L91903_R-S'. This project contributes approximately 20.04 MW to the thermal violation.

```
CONTINGENCY '138-L91903_R-S'
 TRIP BRANCH FROM BUS 271241 TO BUS 271655 CKT 1              / CRESCENT RIDGE T143
 END
```

12. (CE - CE) The KEWANEE ;11-CRESCENT ; R 138 kV line (from bus 271836 to bus 271241 ckt 1) loads from 89.62% to 101.54% (**DC power flow**) of its emergency rating (214 MVA) for the single line contingency outage of 'KEWANEE ;13-4KEWANEE N'. This project contributes approximately 25.5 MW to the thermal violation.

```
CONTINGENCY 'KEWANEE ;13-4KEWANEE N'
 DISCONNECT BRANCH FROM BUS 271838 TO BUS 348923 CKT 1
 END
```

13. (CE - MISO AMIL) The KEWANEE ;13-4KEWANEE N 138 kV line (from bus 271838 to bus 348923 ckt 1) loads from 97.48% to 114.38% (**DC power flow**) of its normal rating (244 MVA) for non-contingency condition. This project contributes approximately 41.24 MW to the thermal violation.

14. (CE - CE) The KEWANEE ;21-KEWANEE ;13 138 kV line (from bus 271845 to bus 271838 ckt 1) loads from 81.15% to 104.8% (**DC power flow**) of its emergency rating (449

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MVA) for the single line contingency outage of '074-L6101___'. This project contributes approximately 106.17 MW to the thermal violation.

```
CONTINGENCY '074-L6101___'
 TRIP BRANCH FROM BUS 271835 TO BUS 271655 CKT 1              / KEWAN; 2 138 HENNE; T 138
 END
```

15. (CE - CE) The KEWANEE ;21-KEWANEE ;13 138 kV line (from bus 271845 to bus 271838 ckt 1) loads from 77.19% to 103.75% (**DC power flow**) of its normal rating (351 MVA) for non-contingency condition. This project contributes approximately 93.25 MW to the thermal violation.

16. (CE - CE) The OGLESBY ; T-MAZON ; R 138 kV line (from bus 272189 to bus 271987 ckt 1) loads from 173.98% to 179.46% (**DC power flow**) of its emergency rating (115 MVA) for the single line contingency outage of '138-L0112__B-S'. This project contributes approximately 14.0 MW to the thermal violation.

```
CONTINGENCY '138-L0112__B-S'
 TRIP BRANCH FROM BUS 271844 TO BUS 271908 CKT 1              / KICKA; B 138 LASCO; B 138
 END
```

17. (CE - CE) The ROCK FALL; R-NELSON ; R 138 kV line (from bus 272367 to bus 272095 ckt 1) loads from 145.38% to 151.89% (**DC power flow**) of its emergency rating (223 MVA) for the single line contingency outage of '187-L15508__'. This project contributes approximately 32.25 MW to the thermal violation.

```
CONTINGENCY '187-L15508__'
 TRIP BRANCH FROM BUS 293710 TO BUS 272097 CKT 1              / O29 ; 138 NELSO;RT 138
 END
```

18. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 114.53% to 115.07% (**DC power flow**) of its emergency rating (1390 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 16.68 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
```

19. (CE - CE) The LEE CO EC;BP-BYRON ; B 345 kV line (from bus 274768 to bus 270678 ckt 1) loads from 99.91% to 100.36% (**DC power flow**) of its emergency rating (1726 MVA) for the single line contingency outage of '345-L18402_B-R'. This project contributes approximately 18.41 MW to the thermal violation.

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```
CONTINGENCY '345-L18402_B-R'
 TRIP BRANCH FROM BUS 270932 TO BUS 270730 CKT 1              / WALTO; B 345 ELECT; B 345
 END
```

20. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 105.41% to 106.02% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 13.16 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
```

21. (CE - CE) The O-09 OP1 138-ROCK FALL; R 138 kV line (from bus 293510 to bus 272367 ckt 1) loads from 185.56% to 192.66% (**DC power flow**) of its emergency rating (214 MVA) for the single line contingency outage of '187-L15508__'. This project contributes approximately 33.73 MW to the thermal violation.

```
CONTINGENCY '187-L15508__'
 TRIP BRANCH FROM BUS 293710 TO BUS 272097 CKT 1              / O29 ; 138 NELSO;RT 138
 END
```

22. (CE - CE) The O-09 OP1 138-ROCK FALL; R 138 kV line (from bus 293510 to bus 272367 ckt 1) loads from 117.63% to 122.71% (**DC power flow**) of its normal rating (173 MVA) for non-contingency condition. This project contributes approximately 19.53 MW to the thermal violation.

23. (CE - CE) The O-029-NELSON ;RT 138 kV line (from bus 293710 to bus 272097 ckt 1) loads from 150.1% to 155.83% (**DC power flow**) of its emergency rating (264 MVA) for the single line contingency outage of '133-CB_23___'. This project contributes approximately 33.58 MW to the thermal violation.

```
CONTINGENCY '133-CB_23___'
 TRIP BRANCH FROM BUS 272367 TO BUS 293510 CKT 1              / R FAL; R 138 O9 138
 END
```

24. (CE - CE) The O-029-NELSON ;RT 138 kV line (from bus 293710 to bus 272097 ckt 1) loads from 118.85% to 123.03% (**DC power flow**) of its normal rating (208 MVA) for non-contingency condition. This project contributes approximately 19.28 MW to the thermal violation.

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25. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 148.32% to 149.69% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '286_B2_TOR1687'. This project contributes approximately 18.31 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
```

26. (MISO AMIL - AEP) The 7BUNSONVILLE-05EUGENE 345 kV line (from bus 348885 to bus 243221 ckt 1) loads from 159.4% to 161.4% (**DC power flow**) of its normal rating (822 MVA) for the single line contingency outage of '685_B2_TOR1686'. This project contributes approximately 16.43 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
```

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)

Multiple Facility Contingency

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1. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line:
The limiting element is owned by NIPSCO; this violation will be further evaluated in the SIS phase.

2. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line:
The limiting element is owned by NIPSCO; this violation will be further evaluated in the SIS phase.

3. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line:
The limiting element is owned by NIPSCO; this violation will be further evaluated in the SIS phase.

4. (CE - MISO AMIL) The KEWANEE ;12-4EDWARDS3 138 kV line:
The limiting element is owned by AMIL; this violation will be further evaluated in the SIS phase.

5. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line:
ComEd:
No upgrades required.
AEP:
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 mile section of line would need to be rebuilt. Estimated Cost for the Sag Study: $160,000. Estimated Cost to re-conductor AEP section of line: $45 Million. If deemed necessary to rebuild section of line, Estimated Cost: $125 Million.
(1) Sag Study: 6 to 12 months
(2) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.

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:
To mitigate the overload on the Dumont-Stillwell 345 kV, AEP would need to do a sag study on AEP owned section of the line. After mitigating violations identified under the sag study, the new ratings on this circuit will be 1409/1718 MVA (SN/SE). Per AEP current records, the wave trap at Dumont station will set the new limit. AEP owns approximately 9 miles of the line. Depending on the sag study results, cost for this upgrade is expected to be between $40,000 (no remediation required) and $18 million (complete line rebuild required).

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(1) Sag Study: 6 to 12 months.
(2) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.

2. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line:
Same reinforcement as Previously Identified #1

3. (CE - CE) The WILTON; 765/345 kV transformer:
The upgrade is a third 765/345 kV transformer at TSS 112 Wilton Center along with station required upgrades associated with the new transformer. Cost is $30M. Timeline is 30-36 months (preliminary estimate).

4. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line:
Same reinforcement as Previously Identified #3

5. (CE - CE) The KEWANEE ;23-HENNEPIN ; T 138 kV line:
Re-conductor approx. 31 miles of overhead conductor. Preliminary estimate is $44.4 M. Timeline is 18 – 24 months.

6. (CE - CE) The KEWANEE ;23-HENNEPIN ; T 138 kV line:
Same reinforcement as Previously Identified #5

7. (CE - CE) The KEWANEE ;23-HENNEPIN ; T 138 kV line:
Same reinforcement as Previously Identified #5

8. (CE - CE) The WILTON ; 765/345 kV transformer:
Same reinforcement as Previously Identified #3

9. (CE - CE) The WILTON ; 765/345 kV transformer:
Same reinforcement as Previously Identified #3

10. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line:The ComEd portion of this line will need to be re-conductored to 2156 kcmil, approx. 4.7 miles. NIPSCO will also have to review this overload. The preliminary estimate is $10M. The timeline is 18 – 24 months.

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