PJM Generation Interconnection Request
Queue Y2-103
Zion Energy Center
Feasibility Study

Network Impacts

The Queue Project #Y2-103 was studied as a 360 MW (Capacity) injection at the Zion Energy Center TSS 974 345kV substation in the ComEd area. Project #Y2-103 was evaluated for compliance with reliability criteria for summer peak conditions in 2016. Potential network impacts were as follows:

Note: All of the reinforcements for violations that are in ComEd's area or on ComEd tie lines were submitted in lieu of a new 765 kV transmission line from Collins to Meadow Lake. The final outcome for the actual construction may be the 765 kV transmission line option; in that case the developer would have cost allocation that reinforcement instead of the reinforcements listed in this report.

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

None

Light Load Analysis

Not applicable.

Multiple Facility Contingency
(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

None

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

To be determined

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. The 05SOREN 765/345 kV transformer (from bus 243232 to bus 299951 ckt 1) loads from 100.43% to 100.66% (**DC power flow**) of its emergency rating (3040 MVA) for the

line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2904_C2'). This project contributes approximately 45.66 MW to the thermal violation.

```
CONTINGENCY '2904_C2'
 OPEN BRANCH FROM BUS 243206 TO BUS 299951 CKT 1          / 243206 05DUMONT 765 242928 05SOREN 765 1
 OPEN BRANCH FROM BUS 242922 TO BUS 242928 CKT 1          / 242922 05FLTLCK 765 242928 05MARYSV 765 1
 END
```

2. The 17GRNACR-G ACR; T 345 kV line (from bus 255104 to bus 270771 ckt 1) loads from 104.73% to 105.22% (**DC power flow**) of its emergency rating (1117 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT4-5__'). This project contributes approximately 34.06 MW to the thermal violation.

```
CONTINGENCY '112-65-BT4-5__'                    / CONTINGENCY # 376
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1          / WILTO;4M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1          / WILTO;4M 345 WILTO; R 345
 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1          / WILTO;4M 345 WILTO;4C 33
 END
```

3. The 17GRNACR-G ACR; T 345 kV line (from bus 255104 to bus 270771 ckt 1) loads from 104.73% to 105.22% (**DC power flow**) of its emergency rating (1117 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT3-4__'). This project contributes approximately 34.06 MW to the thermal violation.

```
CONTINGENCY '112-65-BT3-4__'                    / CONTINGENCY # 375
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1          / WILTO;3M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1          / WILTO;3M 345 WILTO; B 345
 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1          / WILTO;3M 345 WILTO;3C 33
 END
```

4. The 05MARYSV-05MALIS 765 kV line (from bus 242928 to bus 242926 ckt 1) loads from 102.87% to 103.08% (**DC power flow**) of its emergency rating (4106 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('05MOUNTN _05BELMON _102'). This project contributes approximately 54.71 MW to the thermal violation.

```
CONTINGENCY '05MOUNTN _05BELMON _102'
 DISCONNECT BRANCH FROM BUS 242516 TO BUS 242920 CKT 1        /* 765/765KV, AREA 205/205.
 END
```

5. The 05MARYSV-05MALIS 765 kV line (from bus 242928 to bus 242926 ckt 1) loads from 103.99% to 104.26% (**DC power flow**) of its emergency rating (4174 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2905_C2'). This project contributes approximately 68.76 MW to the thermal violation.

```
CONTINGENCY '2905_C2'
 OPEN BRANCH FROM BUS 242922 TO BUS 242928 CKT 1          / 242922 05FLTLCK 765 242928 05MARYSV 765 1
 OPEN BRANCH FROM BUS 242928 TO BUS 242939 CKT 1          / 242928 05MARYSV 765 242939 05MARYSV 345 1
 OPEN BRANCH FROM BUS 239133 TO BUS 242939 CKT 1          / 239133 02TANGY 345 242939 05MARYSV 345 1
 END
```

6. The 05MARYSV-05MALIS 765 kV line (from bus 242928 to bus 242926 ckt 1) loads from 104.32% to 104.51% (**DC power flow**) of its emergency rating (4174 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2908_C2_05MARYSV 345-L'). This project contributes approximately 49.69 MW to the thermal violation.

```
CONTINGENCY '2908_C2_05MARYSV 345-L'
 OPEN BRANCH FROM BUS 242928 TO BUS 242939 CKT 1          / 242928 05MARYSV 765 242939 05MARYSV 345 1
 OPEN BRANCH FROM BUS 239133 TO BUS 242939 CKT 1          / 239133 02TANGY 345 242939 05MARYSV 345 1
 OPEN BRANCH FROM BUS 243458 TO BUS 242939 CKT 1          / 243458 05HYATT 345 242939 05MARYSV 345 1
 END
```

7. The 05MARYSV-05MALIS 765 kV line (from bus 242928 to bus 242926 ckt 1) loads from 104.4% to 104.58% (**DC power flow**) of its emergency rating (4174 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('6534_C2_05MARYSV 345-J'). This project contributes approximately 48.81 MW to the thermal violation.

```
CONTINGENCY '6534_C2_05MARYSV 345-J'
 OPEN BRANCH FROM BUS 242928 TO BUS 242939 CKT 1          / 242928 05MARYSV 765 242939 05MARYSV 345 1
 OPEN BRANCH FROM BUS 239133 TO BUS 242939 CKT 1          / 239133 02TANGY 345 242939 05MARYSV 345 1
 OPEN BRANCH FROM BUS 242939 TO BUS 247506 CKT 1          / 242939 05MARYSV 345 247506 05U2-041_C 345 1
 END
```

8. The 05DUMONT-05TWIN B 345 kV line (from bus 243219 to bus 243234 ckt 1) loads from 104.9% to 105.15% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('1725_C2'). This project contributes approximately 21.51 MW to the thermal violation.

```
CONTINGENCY '1725_C2'
 OPEN BRANCH FROM BUS 243205 TO BUS 243206 CKT 1          / 243205 05COOK 765 243206 05DUMONT 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 299951 CKT 1          / 243206 05DUMONT 765 242928 05SOREN 765 1
 END
```

9. The 05DUMONT-05TWIN B 345 kV line (from bus 243219 to bus 243234 ckt 2) loads from 104.9% to 105.15% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('1725_C2'). This project contributes approximately 21.51 MW to the thermal violation.

```
CONTINGENCY '1725_C2'
 OPEN BRANCH FROM BUS 243205 TO BUS 243206 CKT 1          / 243205 05COOK 765 243206 05DUMONT 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 299951 CKT 1          / 243206 05DUMONT 765 242928 05SOREN 765 1
 END
```

10. The BURNH;0R-17MUNSTR 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 105.53% to 106.08% (**DC power flow**) of its emergency rating (1374 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 46.63 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1          / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1          / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

11. The 17GRNACR-G ACR; T 345 kV line (from bus 255104 to bus 270771 ckt 1) loads from 106.27% to 106.75% (**DC power flow**) of its emergency rating (1117 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 33.31 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1          / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1          / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

12. The 17STLWEL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 106.22% to 106.96% (**DC power flow**) of its emergency rating (1409 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('765-L11215__-S'). This project contributes approximately 63.89 MW to the thermal violation.

```
CONTINGENCY '765-L11215__-S'
 DISCONNECT BRANCH FROM BUS 270644 TO BUS 243206 CKT 1      /* 765/765KV, AREA 222/205.
 END
```

13. The 05SOREN-05MARYSV 765 kV line (from bus 299951 to bus 242928 ckt 1) loads from 107.82% to 108.16% (**DC power flow**) of its emergency rating (4257 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('05HANG R _05JEFRSO _114'). This project contributes approximately 90.4 MW to the thermal violation.

```
CONTINGENCY '05HANG R _05JEFRSO _114'
 DISCONNECT BRANCH FROM BUS 242924 TO BUS 243208 CKT 1      /* 765/765KV, AREA 205/205.
 END
```

14. The CRETE;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 110.39% to 111.08% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('765-L11215__-S'). This project contributes approximately 46.72 MW to the thermal violation.

```
CONTINGENCY '765-L11215__-S'
 DISCONNECT BRANCH FROM BUS 270644 TO BUS 243206 CKT 1      /* 765/765KV, AREA 222/205.
 END
```

15. The 05TWIN B-18ARGNTA 345 kV line (from bus 243234 to bus 256000 ckt 1) loads from 113.14% to 113.36% (**DC power flow**) of its emergency rating (1409 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('7031'). This project contributes approximately 19.81 MW to the thermal violation.

```
CONTINGENCY '7031'
 OPEN BRANCH FROM BUS 247502 TO BUS 256019 CKT 1          / 247502 05T094 345 256019 18PALISD 345 1
 OPEN BRANCH FROM BUS 247502 TO BUS 256019 CKT 2          / 247502 05T094 345 256019 18PALISD 345 2
 END
```

16. The 05DUMONT-05SOREN 765 kV line (from bus 243206 to bus 299951 ckt 1) loads from 116.73% to 117.03% (**DC power flow**) of its emergency rating (4465 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('709_C2_05HANG R 765-D2'). This project contributes approximately 83.84 MW to the thermal violation.

```
CONTINGENCY '709_C2_05HANG R 765-D2'
 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1          / 242924 05HANG R 765 243208 05JEFRSO 765 1
 END
```

17. The WILTO;-05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 118.16% to 118.62% (**DC power flow**) of its emergency rating (4444 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('345-L94507_B-S_+_345-L97008_R-S'). This project contributes approximately 126.76 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
 OPEN BRANCH FROM BUS 243229 TO BUS 274804 CKT 1          / 243229 05OLIVE 345 274804 UPNOR;RP 345 1
 END
```

18. The 05DUMONT-05SOREN 765 kV line (from bus 243206 to bus 299951 ckt 1) loads from 119.38% to 119.68% (**DC power flow**) of its emergency rating (4465 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('6189_C2_05HANG R 765-D1'). This project contributes approximately 83.84 MW to the thermal violation.

```
CONTINGENCY '6189_C2_05HANG R 765-D1'
 OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1          / 242921 05CORNU 765 242924 05HANG R 765 1
 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1          / 242924 05HANG R 765 243208 05JEFRSO 765 1
 END
```

19. The G ACR; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 120.39% to 120.95% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT4-5__'). This project contributes approximately 34.06 MW to the thermal violation.

```
CONTINGENCY '112-65-BT4-5__'                        / CONTINGENCY # 376
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1          / WILTO;4M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1          / WILTO;4M 345 WILTO; R 345
 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1          / WILTO;4M 345 WILTO;4C 33
 END
```

20. The G ACR; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 120.39% to 120.95% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT3-4__'). This project contributes approximately 34.06 MW to the thermal violation.

```
CONTINGENCY '112-65-BT3-4__'                    / CONTINGENCY # 375
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1        / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1        / WILTO;3M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1        / WILTO;3M 345 WILTO; B 345
 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1        / WILTO;3M 345 WILTO;3C 33
 END
```

21. The E FRA; B-CRETE;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 121.72% to 122.34% (**DC power flow**) of its emergency rating (1237 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT3-4__'). This project contributes approximately 47.42 MW to the thermal violation.

```
CONTINGENCY '112-65-BT3-4__'                    / CONTINGENCY # 375
 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
```

22. The E FRA; B-CRETE;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 121.78% to 122.4% (**DC power flow**) of its emergency rating (1237 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT4-5__'). This project contributes approximately 47.43 MW to the thermal violation.

```
CONTINGENCY '112-65-BT4-5__'                    / CONTINGENCY # 376
 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
```

23. The G ACR; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 122.16% to 122.71% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 33.31 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1        / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1        / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

24. The 05OLIVE-05COOK 345 kV line (from bus 243229 to bus 243215 ckt 1) loads from 122.01% to 122.3% (**DC power flow**) of its emergency rating (1409 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('446_A'). This project contributes approximately 25.37 MW to the thermal violation.

```
CONTINGENCY '446_A'
 OPEN BRANCH FROM BUS 243219 TO BUS 909180 CKT 2        / 243219 05DUMONT 345 909180 X2-052 TAP 345 2
 OPEN BRANCH FROM BUS 243219 TO BUS 243232 CKT 1        / 243219 05DUMONT 345 243232 05SORENS 345 1
 END
```

25. The E FRA; B-CRETE;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 122.66% to 123.27% (**DC power flow**) of its emergency rating (1237 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 46.81 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1          / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1          / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

26. The 05OLIVE-05COOK 345 kV line (from bus 243229 to bus 243215 ckt 1) loads from 123.25% to 123.54% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2977_C2_X2-052'). This project contributes approximately 25.75 MW to the thermal violation.

```
CONTINGENCY '2977_C2_X2-052'
 OPEN BRANCH FROM BUS 243206 TO BUS 243219 CKT 2          / 243206 05DUMONT 765 243219 05DUMONT 345 2
 OPEN BRANCH FROM BUS 243219 TO BUS 909180 CKT 2          / 243219 05DUMONT 345 243229 05OLIVE 345 2
 OPEN BRANCH FROM BUS 243219 TO BUS 243234 CKT 1          / 243219 05DUMONT 345 243234 05TWIN B 345 1
 END
```

27. The 05OLIVE-05COOK 345 kV line (from bus 243229 to bus 243215 ckt 1) loads from 123.27% to 123.61% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 30.48 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1          / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1          / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

28. The 05OLIVE-05COOK 345 kV line (from bus 243229 to bus 243215 ckt 1) loads from 124.24% to 124.49% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2979_C2_X1-020_X2-052'). This project contributes approximately 22.19 MW to the thermal violation.

```
CONTINGENCY '2979_C2_X1-020_X2-052'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1          / 243206 05DUMONT 765 243207 05GRNTWN 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 909180 CKT 2          / 243219 05DUMONT 345 243229 05OLIVE 345 2
 END
```

29. The 05OLIVE-05COOK 345 kV line (from bus 243229 to bus 243215 ckt 1) loads from 125.52% to 125.91% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('1750_C2'). This project contributes approximately 34.95 MW to the thermal violation.

```
CONTINGENCY '1750_C2'
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1          / 243206 05DUMONT 765 270644 WILTO; 765 1
```

```
 OPEN BRANCH FROM BUS 243206 TO BUS 243219 CKT 1          / 243206 05DUMONT 765 243219 05DUMONT 345 1
 END
```

30. The 05DUMONT-05SOREN 765 kV line (from bus 243206 to bus 299951 ckt 1) loads from 127.1% to 127.43% (**DC power flow**) of its emergency rating (4465 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2932_C2_05JEFRSO 765-A2'). This project contributes approximately 92.11 MW to the thermal violation.

```
CONTINGENCY '2932_C2_05JEFRSO 765-A2'
 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1          / 242924 05HANG R 765 243208 05JEFRSO 765 1
 OPEN BRANCH FROM BUS 243208 TO BUS 248000 CKT 1          / 243208 05JEFRSO 765 248000 06CLIFTY 345 1
 END
```

31. The 05SOREN-05MARYSV 765 kV line (from bus 299951 to bus 242928 ckt 1) loads from 128.19% to 128.51% (**DC power flow**) of its emergency rating (4465 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('6189_C2_05HANG R 765-D1'). This project contributes approximately 90.4 MW to the thermal violation.

```
CONTINGENCY '6189_C2_05HANG R 765-D1'
 OPEN BRANCH FROM BUS 242921 TO BUS 242924 CKT 1          / 242921 05CORNU 765 242924 05HANG R 765 1
 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1          / 242924 05HANG R 765 243208 05JEFRSO 765 1
 END
```

32. The 05T094-18PALISD 345 kV line (from bus 247502 to bus 256019 ckt 1) loads from 129.13% to 129.35% (**DC power flow**) of its emergency rating (1859 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('7024_B2_TOR8201690'). This project contributes approximately 25.12 MW to the thermal violation.

```
CONTINGENCY '7024_B2_TOR8201690'
 OPEN BRANCH FROM BUS 247502 TO BUS 256019 CKT 2          / 247502 05T094 345 256019 18PALISD 345 2
 END
```

33. The 05T094-18PALISD 345 kV line (from bus 247502 to bus 256019 ckt 2) loads from 129.36% to 129.58% (**DC power flow**) of its emergency rating (1859 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('7022_B2_TOR8001689'). This project contributes approximately 25.17 MW to the thermal violation.

```
CONTINGENCY '7022_B2_TOR8001689'
 OPEN BRANCH FROM BUS 247502 TO BUS 256019 CKT 1          / 247502 05T094 345 256019 18PALISD 345 1
 END
```

34. The 05MOUNTN-05BELMON 765 kV line (from bus 242516 to bus 242920 ckt 1) loads from 131.03% to 131.19% (**DC power flow**) of its emergency rating (4055 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('1589_B3_05CLOVRD 765-10_WOMOAB'). This project contributes approximately 41.39 MW to the thermal violation.

```
CONTINGENCY '1589_B3_05CLOVRD 765-10_WOMOAB'
```

```
OPEN BRANCH FROM BUS 242512 TO BUS 242514 CKT 1          / 242512 05CLOVRD 765 242514 05J.FERR 765 1
OPEN BRANCH FROM BUS 242512 TO BUS 242515 CKT 1          / 242512 05CLOVRD 765 242515 05JOSHUA 765 1
OPEN BRANCH FROM BUS 242512 TO BUS 242524 CKT 10          / 242512 05CLOVRD 765 242524 05CLOVRD 345 10
END
```

35. The 05SOREN-05MARYSV 765 kV line (from bus 299951 to bus 242928 ckt 1) loads from 133.69% to 134.04% (**DC power flow**) of its emergency rating (4465 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2932_C2_05JEFRSO 765-A2'). This project contributes approximately 97.35 MW to the thermal violation.

```
CONTINGENCY '2932_C2_05JEFRSO 765-A2'
 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1          / 242924 05HANG R 765 243208 05JEFRSO 765 1
 OPEN BRANCH FROM BUS 243208 TO BUS 248000 CKT 1          / 243208 05JEFRSO 765 248000 06CLIFTY 345 1
 END
```

36. The 05OLIVE-X2-052 TAP 345 kV line (from bus 243229 to bus 909180 ckt 2) loads from 136.6% to 136.98% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT3-4__'). This project contributes approximately 34.22 MW to the thermal violation.

```
CONTINGENCY '112-65-BT3-4__'                    / CONTINGENCY # 375
 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
```

37. The 05OLIVE-X2-052 TAP 345 kV line (from bus 243229 to bus 909180 ckt 2) loads from 136.61% to 136.99% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT4-5__'). This project contributes approximately 34.22 MW to the thermal violation.

```
CONTINGENCY '112-65-BT4-5__'                    / CONTINGENCY # 376
 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
```

38. The 05OLIVE-X2-052 TAP 345 kV line (from bus 243229 to bus 909180 ckt 2) loads from 137.68% to 138.03% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 30.56 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1          / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1          / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

39. The CRETE;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 143.08% to 143.69% (**DC power flow**) of its emergency rating (1237 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT3-4__'). This project contributes approximately 46.83 MW to the thermal violation.

```
CONTINGENCY '112-65-BT3-4__'                    / CONTINGENCY # 375
 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
```

40. The CRETE;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 143.14% to 143.76% (**DC power flow**) of its emergency rating (1237 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT4-5__'). This project contributes approximately 46.84 MW to the thermal violation.

```
CONTINGENCY '112-65-BT4-5__'                    / CONTINGENCY # 376
 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
```

41. The CRETE;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 143.5% to 144.1% (**DC power flow**) of its emergency rating (1237 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 46.22 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1        / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1        / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

42. The WILTO; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 147.09% to 147.69% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT5-6__'). This project contributes approximately 58.6 MW to the thermal violation.

```
CONTINGENCY '112-65-BT5-6__'                    / CONTINGENCY # 377
 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
```

43. The WILTO; B-WILTO;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 147.09% to 147.69% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY

DESCRIPTION ('112-65-BT5-6__'). This project contributes approximately 58.6 MW to the thermal violation.

```
CONTINGENCY '112-65-BT5-6__'                    / CONTINGENCY # 377
 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
```

44. The WILTO; R-WILTO;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 150.04% to 150.64% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT2-3__'). This project contributes approximately 59.82 MW to the thermal violation.

```
CONTINGENCY '112-65-BT2-3__'                    / CONTINGENCY # 374
 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
```

45. The WILTO; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 150.04% to 150.64% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT2-3__'). This project contributes approximately 59.82 MW to the thermal violation.

```
CONTINGENCY '112-65-BT2-3__'                    / CONTINGENCY # 374
 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
```

46. The UPNOR;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 150.16% to 150.84% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT3-4__'). This project contributes approximately 40.81 MW to the thermal violation.

```
CONTINGENCY '112-65-BT3-4__'                    / CONTINGENCY # 375
 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
```

47. The UPNOR;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 150.19% to 150.87% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('112-65-BT4-5__'). This project contributes approximately 40.82 MW to the thermal violation.

```
CONTINGENCY '112-65-BT4-5__'                    / CONTINGENCY # 376
 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
```

48. The UPNOR;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 151.28% to 151.95% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 40.09 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1        / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1        / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

49. The 19MON12-Y1-069 TAP 345 kV line (from bus 264612 to bus 913450 ckt 1) loads from 154.75% to 154.76% (**DC power flow**) of its emergency rating (1494 MVA) for the tower line contingency outage of CONTINGENCY DESCRIPTION ('C5-TWL-WR021'). This project contributes approximately 22.96 MW to the thermal violation.

```
CONTINGENCY 'C5-TWL-WR021'              /* ALLEN JCT-MAJESTIC-MONROE 345KV & LEYMONE-MAJESTIC 345KV
 DISCONNECT BRANCH FROM BUS 238530 TO BUS 264594 CKT 1      /* 02ALLEN 345.00 19LULU 345.00
 DISCONNECT BRANCH FROM BUS 264594 TO BUS 264839 CKT 1      /* 19LULU 345.00 19MILAN 345.00
 DISCONNECT BRANCH FROM BUS 264594 TO BUS 264613 CKT 1      /* 19LULU 345.00 19MON34 345.00
 DISCONNECT BRANCH FROM BUS 238889 TO BUS 264599 CKT 1      /* 02LEMOYN 345.00 19MAJTC 345.00
 END
```

50. The 05OLIVE-X2-052 TAP 345 kV line (from bus 243229 to bus 909180 ckt 2) loads from 156.25% to 156.56% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2877_C2_05OLIVE 345-B1'). This project contributes approximately 27.26 MW to the thermal violation.

```
CONTINGENCY '2877_C2_05OLIVE 345-B1'
 OPEN BRANCH FROM BUS 243215 TO BUS 243229 CKT 1        / 243215 05COOK 345 243229 05OLIVE 345 1
 OPEN BRANCH FROM BUS 243229 TO BUS 243353 CKT 2        / 243229 05OLIVE 345 243353 05OLIVE 138 2
 OPEN BRANCH FROM BUS 243327 TO BUS 243353 CKT 1        / 243327 05LAPORT 138 243353 05OLIVE 138 1
 END
```

51. The 17STLWEL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 159.37% to 160.07% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2978_C2_X1-020'). This project contributes approximately 61.21 MW to the thermal violation.

```
CONTINGENCY '2978_C2_X1-020'
 OPEN BRANCH FROM BUS 243206 TO BUS 907020 CKT 1        / 243206 05DUMONT 765 243207 05GRNTWN 765 1
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1        / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
```

52. The 05OLIVE-05COOK 345 kV line (from bus 243229 to bus 243215 ckt 1) loads from 160.28% to 160.59% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2879_C2_05OLIVE 345-E1_X2-052'). This project contributes approximately 27.15 MW to the thermal violation.

```
CONTINGENCY '2879_C2_05OLIVE 345-E1_X2-052'
 OPEN BRANCH FROM BUS 243219 TO BUS 909180 CKT 2          / 243219 05DUMONT 345 243229 05OLIVE 345 2
 OPEN BRANCH FROM BUS 243229 TO BUS 243353 CKT 2          / 243229 05OLIVE 345 243353 05OLIVE 138 2
 OPEN BRANCH FROM BUS 243327 TO BUS 243353 CKT 1          / 243327 05LAPORT 138 243353 05OLIVE 138 1
 END
```

53. The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 168.72% to 168.98% (**DC power flow**) of its emergency rating (1466 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('1261_B2'). This project contributes approximately 22.99 MW to the thermal violation.

```
CONTINGENCY '1261_B2'
 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1          / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1
 END
```

54. The X2-052 TAP-05DUMONT 345 kV line (from bus 909180 to bus 243219 ckt 2) loads from 188.16% to 188.46% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of CONTINGENCY DESCRIPTION ('2877_C2_05OLIVE 345-B1'). This project contributes approximately 27.26 MW to the thermal violation.

```
CONTINGENCY '2877_C2_05OLIVE 345-B1'
 OPEN BRANCH FROM BUS 243215 TO BUS 243229 CKT 1          / 243215 05COOK 345 243229 05OLIVE 345 1
 OPEN BRANCH FROM BUS 243229 TO BUS 243353 CKT 2          / 243229 05OLIVE 345 243353 05OLIVE 138 2
 OPEN BRANCH FROM BUS 243327 TO BUS 243353 CKT 1          / 243327 05LAPORT 138 243353 05OLIVE 138 1
 END
```

Steady-State Voltage Requirements

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

To be determined

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

There is an existing stability trip scheme at TSS 974 Zion Energy Center. If all three existing units are operating, the scheme will automatically trip Unit 12 for selected faults cleared in delayed time, to prevent instability.

If all three units are operating, the scheme will also automatically trip Unit 12 if the stability trip scheme is disabled, or if the associated communication signal is lost, for more than 60 minutes.

The adequacy of this scheme will be addressed in the System Impact Study.

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

None

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

1. The 05SOREN 765/345 kV transformer:
Replace the Sorenson 765/345 kV transformer. Estimated cost (2013 Dollars): $32,000,000.
Note from AEP: The contingency Description ('2904_C2') is category C3 contingency; AEP doesn't require upgrade for Category C3 contingency. Sorenson 765/345 kV transformer doesn't require upgrade.

2, 3, 11. The 17GRNACR-G ACR; T 345 kV line:
The upgrade that is listed for the G ACR; T – 05OLIVE 345 kV line violation also covers these violations.

4. The 05MARYSV-05MALIS 765 kV line:
Replace the Maliszewski 765 kV Non Oil Breaker (3000A) D. Estimated Cost (2013 Dollars): $3,000,000.

5, 6, 7. The 05MARYSV-05MALIS 765 kV line:
Replace the Maliszewski 765 kV Non Oil Breaker (3000A) D. Estimated Cost (2013 Dollars): $3,000,000. Replace the Maliszewski 765 kV Wavetrap (3000A). Estimated Cost (2013 Dollars): $200,000.

8, 9. The 05DUMONT-05TWIN B 345 kV line:
A sag check will be required for the ACSR 954 conductor section 1 to determine if the line section can be operated above its emergency rating of 1409 MVA. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 17 mile section of line would need to be rebuilt; Estimated Cost (2013 Dollars) for the sag study: $68,000.

10. The BURNH;0R-17MUNSTR 345 kV line:
No ComEd upgrade is required; the limiting element is on the MISO side. No MISO upgrade is required at this time; this violation will be further analyzed during the SIS phase.

12, 51. The 17STLWEL-05DUMONT 345 kV line:

A sag check will be required for the ACSR 954 conductor section 1 to determine if the line section can be operated above its emergency rating of 1409 MVA. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 8.5 mile section of line would need to be rebuilt; Estimated Cost (2013 Dollars) for the sag study: $34,000.

13. The 05SOREN-05MARYSV 765 kV line:
Replace the Marysville 765 kV Wavetrap (3150A). Estimated Cost (2013 Dollars): $200,000.

14, 39, 40, 41. The CRETE;BP-17STJOHN 345 kV line:
Upgrade 2156 ACSR station conductor at TSS 945 Crete EC. Estimated cost: $500,000. The total time frame to complete engineering, procurement, and construction for the ComEd portion of this project is approximately 18 – 24 months after the Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA) are executed.

15. The 05TWIN B-18ARGNTA 345 kV line:
A sag check will be required for the ACSR 954 conductor section 1 to determine if the line section can be operated above its emergency rating of 1409 MVA. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 50.5 mile section of line would need to be rebuilt; Estimated Cost (2013 Dollars) for the sag study: $202,000.

16, 18. The 05DUMONT-05SOREN 765 kV line:
Replace the Dumont 765 kV Wavetrap (3150A). Estimated Cost (2013 Dollars): $200,000

17. The WILTO;-05DUMONT 765 kV line:
AEP:
Replace the Dumont Wavetrap (3150A); Estimated Cost (2013 Dollars): $200,000.
ComEd:
Mitigate sag limitations on 27.8 miles of 4-1277.2 ACSR & upgrade BT CB's 3-4 & 4-5 at TSS 112 Wilton Center. Estimated cost: $27 M. The total time frame to complete engineering, procurement, and construction for the ComEd portion of this project is approximately 18 – 24 months after the Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA) are executed.

19, 20, 23. The G ACR; T-05OLIVE 345 kV line:
AEP:
A sag study will be required for the ACSR/PE 1414 conductor section 1 to determine if the line section can be operated above its emergency rating of 971 MVA. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 40.64 mile section of line would need to be rebuilt; Estimated Cost (2013 Dollars): $162,560.
ComEd:
Mitigate sag limitations on 6.8 miles of 1414 ACSR. Estimated cost: $2.5 M. The total time frame to complete engineering, procurement, and construction for the ComEd

portion of this project is approximately 18 – 24 months after the Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA) are executed.

21, 22, 25. The E FRA; B-CRETE;BP 345 kV line:
Reconductor ~12.5 miles of 1414 ACSR & upgrade 345kV BT 9-14 CB at TSS 66 E Frankfort. Estimated cost: $13 M. The total time frame to complete engineering, procurement, and construction for the ComEd portion of this project is approximately 18 – 24 months after the Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA) are executed.

24, 26, 27, 28 ,29. The 05OLIVE-05COOK 345 kV line:
The Bundled ACSR 954 conductor is the limiting element

A sag check is required to determine if the line section can be operated above its emergency rating. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 25 mile section of line would need to be rebuilt. Estimated Cost (2013 Dollars) for the sag study: $100,000.

30. The 05DUMONT-05SOREN 765 kV line:
Replace the Dumont Wavetrap 765 kV (3150A). Estimated Cost (2013 Dollars): $200,000.
An engineering study will need to be conducted to determine if the relay thermal limit settings can be adjusted to mitigate the overload. A new relay package will be required if the relay thermal settings cannot be adjusted. Estimated Cost (2013 Dollars) for the relay package: $300,000.

31, 35. The 05SOREN-05MARYSV 765 kV line:
An engineering study will need to be conducted to determine if the relay thermal limit settings can be adjusted to mitigate the overload. A new relay package will be required if the relay thermal settings cannot be adjusted. Estimated Cost (2013 Dollars) for the relay package: $300,000. Replace the Marysville 765 kV Wavetrap (3150A). Estimated Cost (2013 Dollars): $200,000.

32. The 05T094-18PALISD 345 kV line:
MISO and PJM are working on a coordinated effort for IPP T-094; The Point of Interconnection is in METC territory.

34. The 05MOUNTN-05BELMON 765 kV line:
Upgrade remote end equipment. Estimated Cost: $1.5 M

36, 37, 38, 50. The 05OLIVE-X2-052 TAP 345 kV line:
The Bundled ACSR 954 conductor is the limiting element

A sag check is required to determine if the line section can be operated above its emergency rating. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 15 mile section of line would need to be rebuilt. Estimated Cost (2013 Dollars) for the sag study: $60,000.

The Dumont Breaker G2 is a limiting element
Replace the breaker. Estimated Cost (2013 Dollars): $850,000
The Dumont Wavetrap is a limiting element
Replace the wavetrap. Estimated Cost (2013 Dollars): $100,000
The Olive Wavetrap is a limiting element
Replace the wavetrap. Estimated Cost (2013 Dollars): $100,000

42, 43, 44, 45.
Install 2 new 765 kV circuit breakers at TSS 112. Estimated cost: $ 19.5 M. The total time frame to complete engineering, procurement, and construction for the ComEd portion of this project is approximately 18 – 24 months after the Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA) are executed.

46, 47, 48. The UPNOR;RP-05OLIVE 345 kV line:
AEP:
Rebuild the entire 40.64 mile section of ACSR/PE 1414 conductor; Estimated Cost (2013 Dollars):$70,000,000. Replace Olive Switch to Line Risers; Estimated Cost (2013 Dollars): $50,000. An engineering study will need to be conducted to determine if the relay thermal limit settings can be adjusted to mitigate the overload. A new relay package will be required if the relay thermal settings cannot be adjusted; Estimated Cost (2013 Dollars) for the relay package: $300,000.
ComEd:
Reconductor approximately 32.5 miles of 1414 ACSR; Estimated cost: $30.5 M. The total time frame to complete engineering, procurement, and construction for the ComEd portion of this project is approximately 18 – 24 months after the Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA) are executed.

49. The 19MON12-Y1-069 TAP 345 kV line:
Loop the Lemoyne-Majestic 345kV tie-line between FE and ITC into ITC's Monroe substation. Minor changes would be needed at FE's Lemoyne sub.
Note from ATSI: ITC would need to comment on the feasibility and cost of this proposed project. It would seem to require 3.1 miles of new double-circuit 345kV to loop the line into Monroe sub, as well as substation modifications. ITC is not required to provide a reinforcement at this time. This violation will be further evaluated in the SIS phase.

52. The 05OLIVE-05COOK 345 kV line:
The Bundled ACSR 954 conductor is the limiting element
A sag check is required to determine if the line section can be operated above its emergency rating. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 25 mile section of line would need to be rebuilt. Estimated Cost (2013 Dollars) for the sag study: $100,000.
The Olive Wavetrap is a limiting element
Replace wavetrap. Estimated Cost (2013 Dollars): $100,000
The Cook Wavetrap is a limiting element
Replace wavetrap. Estimated Cost (2013 Dollars): $100,000

53. The 7CASEY-05BREED 345 kV line:
1. Reynolds - Greentown765 kV line and a 765/345 kV transformer at Reynolds
Cost of Reynolds – Greentown 165 kV line: $185,000,000
Cost of station work at Greentown: $30,000,000
Cost of station work at Reynolds: $55,000,000
2. Reynolds – Sullivan 765 kV line
Cost of Reynolds – Sullivan 765 kV line: $300,000,000
Cost of station work at Sullivan: $30,000,000
Total estimated cost for Pioneer project is $600,000,000.
Reynolds – Greentown 765 kV segment and the 765/345 kV transformer at Reynolds is slated for an in-service date in 2018 by Midwest ISO. If Y2-095 in-service date is after Reynolds – Greentown segment energizes, then Y2-095 will only be responsible for the cost the remaining Sullivan – Reynolds 765 kV segment and work at Sullivan station. This cost may be further reduced by allocation to other MTXs in PJM interconnection queue. Such allocation will be determined by PJM.

54. The X2-052 TAP-05DUMONT 345 kV line:
The Bundled ACSR 954 conductor is the limiting element
A sag check is required to determine if the line section can be operated above its emergency rating. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 15 mile section of line would need to be rebuilt. Estimated Cost (2013 Dollars) for the sag study: $60,000.
The Dumont Breaker G2 is a limiting element
Replace the breaker. Estimated Cost (2013 Dollars): $850,000
The Dumont Wavetrap is a limiting element
Replace the wavetrap. Estimated Cost (2013 Dollars): $100,000
The Olive Wavetrap is a limiting element
Replace the wavetrap. Estimated Cost (2013 Dollars): $100,000
The Dumont Bus is a limiting element
Replace the bus. Estimated Cost (2013 Dollars): $400,000
The Dumont Riser is a limiting element
Replace the riser. Estimated Cost (2013 Dollars): $100,000
The Olive Riser is a limiting element
Replace the riser. Estimated Cost (2013 Dollars): $100,000
The Dumont Relay Compliance Trip (Relay Compliance Trip Limit 3762 Amps) is a limiting element
An engineering study will need to be conducted to determine if the relay compliance trip limit settings can be adjusted to mitigate the overload. Estimated Cost (2013 Dollars): $10,000.
The Dumont – Olive Circuit (Relay Compliance Trip Limit 3995 Amps) is a limiting element
An engineering study will need to be conducted to determine if the relay compliance trip limit settings can be adjusted to mitigate the overload. Estimated Cost (2013 Dollars): $10,000.
The Dumont CT Thermal Limit (CT Thermal Limit 3995 Amps) is a limiting element

An engineering study will need to be conducted to determine if the CT thermal limit settings can be adjusted to mitigate the overload. Estimated Cost (2013 Dollars): $10,000.

The Dumont Switch (3000A) is a limiting element

Replace the switch. Estimated Cost (2013 Dollars): $300,000

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.

Not Applicable

Potential Issues

All of the reinforcements for violations that are in ComEd's area or on ComEd tie lines were submitted in lieu of a new 765 kV transmission line from Collins to Meadow Lake. The final outcome for the actual construction may be the 765 kV transmission line option; in that case the developer would have cost allocation that reinforcement instead of the reinforcements listed in this report.

Impacts on the MISO member transmission systems are not included in this analysis, but they will be included in the System Impact Study, which may reveal upgrades needed in the MISO system not identified in this Feasibility Study.