Network Impacts for Primary POI

The Queue Project Z2-087 was studied as a 200.0 MW (Capacity 26.0 MW) injection as a tap of the Pontiac – Brokaw 345 kV substation in the ComEd area. Project Z2-087 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project Z2-087 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2018

Generator Deliverability

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

None

Multiple Facility Contingency

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

None

Contribution to Previously Identified Overloads

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

1. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 101.97% to 104.44% (**DC power flow**) of its emergency rating (825 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 20.41 MW to the thermal violation.

```
CONTINGENCY '012-45-BT11-14'
 TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1          / DRESDEN ; R 345 ELWOOD ; R 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

2. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 103.92% to 107.22% (**DC power flow**) of its emergency rating (825 MVA) for the line fault with failed breaker contingency outage of '080-45-BT7-8__A'. This project contributes approximately 27.23 MW to the thermal violation.

```
CONTINGENCY '080-45-BT7-8__A'
 TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1          / PONTIAC ; R 345 Z2-087 TAP 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
```

```
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

3. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 109.65% to 110.59% (**DC power flow**) of its emergency rating (825 MVA) for the line fault with failed breaker contingency outage of '080-45-BT4-5__'. This project contributes approximately 17.15 MW to the thermal violation.

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

4. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 111.24% to 112.21% (**DC power flow**) of its emergency rating (825 MVA) for the line fault with failed breaker contingency outage of '080-45-BT5-6__'. This project contributes approximately 17.9 MW to the thermal violation.

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

5. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 115.06% to 116.08% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT4-5__'. This project contributes approximately 11.96 MW to the thermal violation.

```
CONTINGENCY '900-45-BT4-5__'
 TRIP BRANCH FROM BUS 270737 TO BUS 270767 CKT 1          / ELWOO; R 345 GOODI;1R 345
 TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1          / ELWOO; B 345 ELWOO; R 345
 END
```

6. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 115.1% to 116.12% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT4-5__'. This project contributes approximately 11.96 MW to the thermal violation.

```
CONTINGENCY '900-45-BT4-5__'
 TRIP BRANCH FROM BUS 270737 TO BUS 270767 CKT 1          / ELWOO; R 345 GOODI;1R 345
 TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1          / ELWOO; B 345 ELWOO; R 345
 END
```

7. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 125.26% to 131.04% (**DC power flow**) of its emergency rating (1329 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 76.85 MW to the thermal violation.

```
CONTINGENCY '012-45-BT11-14'
 TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1          / DRESDEN ; R 345 ELWOOD ; R 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

8. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 135.19% to 140.79% (**DC power flow**) of its emergency rating (1371 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 76.78 MW to the thermal violation.

```
CONTINGENCY '012-45-BT11-14'
 TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1          / DRESDEN ; R 345 ELWOOD ; R 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

Steady-State Voltage Requirements

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

To be determined

System Reinforcements

New System Reinforcements

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

None

Contribution to Previously Identified System Reinforcements

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

1 - 4. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line:
The limiting element is owned by AMIL; this violation will be further evaluated in the SIS phase.

5. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line:

The upgrade is to install a new transformer at an estimated cost of $30 million. The time required to install this reinforcement is 2-3 years.

6. (CE - CE) The DRESDEN ; R 345/138 kV transformer:
Same reinforcement as Contribution to Previously Identified #5

7. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line:
The upgrade is to re-conductor the line at an estimated cost of $20 million. The time required to install this reinforcement is 2-3 years.

8. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line:
The upgrade is to re-conductor the line at an estimated cost of $50 million. The time required to install this reinforcement is 2-3 years.

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

None

Stability and Reactive Power Requirement
(Results of the dynamic studies should be inserted here)

To be determined

Light Load Analysis - 2018

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

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. (CE - CE) The Z2-087 TAP-PONTIAC ; R 345 kV line (from bus 917500 to bus 270853 ckt 1) loads from 91.77% to 99.15% (**DC power flow**) of its emergency rating (1441 MVA) for the single line contingency outage of '345-L8002___-S'. This project contributes approximately 106.45 MW to the thermal violation.

CONTINGENCY '345-L8002___-S'

```
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1              / PONTI; B 345 BLUEM; B 345
 END
```

2. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 105.1% to 106.67% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '4839_B1_05ROCKPT 765-1'. This project contributes approximately 20.88 MW to the thermal violation.

```
CONTINGENCY '4839_B1_05ROCKPT 765-1'
 OPEN BRANCH FROM BUS 243209 TO BUS 243442 CKT 1              / 243209 05ROCKPT 765 243442 05RKG1 26.0 1
 REMOVE UNIT 1H FROM BUS 243442                        / 243442 05RKG1 26.0
 REMOVE UNIT 1L FROM BUS 243442                        / 243442 05RKG1 26.0
 END
```

3. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 106.57% to 110.81% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 50.92 MW to the thermal violation.

4. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 110.69% to 113.63% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 43.53 MW to the thermal violation.

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

5. (CE - CE) The PONTIAC ; R-DRESDEN ; R 345 kV line (from bus 270853 to bus 270717 ckt 1) loads from 118.58% to 123.77% (**DC power flow**) of its emergency rating (1481 MVA) for the single line contingency outage of '345-L11212_B-S'. This project contributes approximately 76.86 MW to the thermal violation.

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

6. (AEP - MISO IPL) The 05BREED-16WHEAT 345 kV line (from bus 243213 to bus 254539 ckt 1) loads from 166.02% to 166.51% (**DC power flow**) of its normal rating (956 MVA) for the single line contingency outage of '363_B2_TOR1682'. This project contributes approximately 10.37 MW to the thermal violation.

```
CONTINGENCY '363_B2_TOR1682'
  OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1               / 243208 05JEFRSO 765 243209 05ROCKPT 765 1
  END
```

Attachment Facilities for Alternate POI

The proposed interconnection of Z2-087 into TSS 80 Pontiac Midpoint to interconnect developer's generator lead. The scope of work includes installation of an additional 345kV circuit breaker in the ring bus.

Network Impacts for Alternate POI

The Queue Project Z2-087 was studied as a 200.0 MW (Capacity 26.0 MW) injection at the Pontiac Midpoint 345 kV substation in the ComEd area. Project Z2-087 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project Z2-087 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2018

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

None

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

None

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

1. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 103.92% to 104.65% (**DC power flow**) of its emergency rating (825 MVA) for the line fault with failed breaker contingency outage of '080-45-BT7-8__'. This project contributes approximately 13.35 MW to the thermal violation.

```
CONTINGENCY '080-45-BT7-8__'
 TRIP BRANCH FROM BUS 270853 TO BUS 348847 CKT 1          / PONTIAC ; R 345 7BROKAW T1 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

2. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 109.65% to 110.33% (**DC power flow**) of its emergency rating (825 MVA) for the

line fault with failed breaker contingency outage of '080-45-BT4-5__'. This project contributes approximately 12.36 MW to the thermal violation.

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

3. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 111.24% to 111.97% (**DC power flow**) of its emergency rating (825 MVA) for the line fault with failed breaker contingency outage of '080-45-BT5-6__'. This project contributes approximately 13.38 MW to the thermal violation.

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

4. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 115.06% to 116.31% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT4-5__'. This project contributes approximately 14.66 MW to the thermal violation.

```
CONTINGENCY '900-45-BT4-5__'
 TRIP BRANCH FROM BUS 270737 TO BUS 270767 CKT 1          / ELWOO; R 345 GOODI;1R 345
 TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1          / ELWOO; B 345 ELWOO; R 345
 END
```

5. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 115.1% to 116.35% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT4-5__'. This project contributes approximately 14.66 MW to the thermal violation.

```
CONTINGENCY '900-45-BT4-5__'
 TRIP BRANCH FROM BUS 270737 TO BUS 270767 CKT 1          / ELWOO; R 345 GOODI;1R 345
 TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1          / ELWOO; B 345 ELWOO; R 345
 END
```

6. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 125.25% to 132.21% (**DC power flow**) of its emergency rating (1329 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 92.54 MW to the thermal violation.

```
CONTINGENCY '012-45-BT11-14'
  TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1          / DRESDEN ; R 345 ELWOOD ; R 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

7. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 135.19% to 141.94% (**DC power flow**) of its emergency rating (1371 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 92.48 MW to the thermal violation.

```
CONTINGENCY '012-45-BT11-14'
 TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1          / DRESDEN ; R 345 ELWOOD ; R 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

Steady-State Voltage Requirements

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

To be determined

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 AMIL - AEP) The 7BUNSONVILLE-05EUGENE 345 kV line (from bus 348885 to bus 243221 ckt 1) loads from 102.39% to 105.83% (**DC power flow**) of its normal rating (822 MVA) for the single line contingency outage of '685_B2'. This project contributes approximately 28.23 MW to the thermal violation.

```
CONTINGENCY '685_B2'
 OPEN BRANCH FROM BUS 243213 TO BUS 346809 CKT 1          / 243213 05BREED 345 346809 7CASEY 345 1
 END
```

2. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 106.32% to 106.93% (**DC power flow**) of its normal rating (1332 MVA) for the single line contingency outage of '4839_B1_05ROCKPT 765-1'. This project contributes approximately 17.8 MW to the thermal violation.

```
CONTINGENCY '4839_B1_05ROCKPT 765-1'
 OPEN BRANCH FROM BUS 243209 TO BUS 243442 CKT 1          / 243209 05ROCKPT 765 243442 05RKG1 26.0 1
 REMOVE UNIT 1H FROM BUS 243442                  / 243442 05RKG1 26.0
 REMOVE UNIT 1L FROM BUS 243442                  / 243442 05RKG1 26.0
 END
```

3. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 106.57% to 111.66% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 61.12 MW to the thermal violation.

4. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 110.69% to 114.27% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 52.96 MW to the thermal violation.

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

5. (CE - CE) The PONTIAC ; R-DRESDEN ; R 345 kV line (from bus 270853 to bus 270717 ckt 1) loads from 118.58% to 124.85% (**DC power flow**) of its emergency rating (1481 MVA) for the single line contingency outage of '345-L11212_B-S'. This project contributes approximately 92.88 MW to the thermal violation.

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

Steady-State Voltage Requirements

To be determined in the System Impact Study

Stability and Reactive Power Requirement

To be determined in the System Impact Study

Common Potential Issues (either POI)

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