

Queue Project J468
System Impact Study Report

PJM Summer Peak Powerflow Analysis Input Assumptions:

- Model used – PJM AA2 Queue SIS 2019 Summer Peak case. All Active PJM queue projects modeled through the AA2 Queue along with all previously studied MISO DPP projects (studied through 2015). The MISO 2016 February Central generators being studied were added to the model.
- Contingencies used – All PJM category B (single) and C contingencies (tower, bus fault, fault with stuck breaker)
- Monitored areas – All PJM areas
- Analysis type – PJM Generation Deliverability Test
- MISO ERIS Projects were modeled as PJM Energy-Only projects.
- MISO NRIS Projects were modeled as PJM Capacity projects.
- Generators were scaled to their respective capacity portions for base case (N-0) and all contingencies.
- Generators were scaled to their respective summer energy-only capabilities for category C contingencies only.
- MISO generation sunk to MISO
- PJM generation sunk to PJM

Network Impacts

The Queue Project J468 was evaluated as a 202.0 MW (Capacity 30.3 MW) injection into a tap of the Kansas – Sidney 345 kV line in the AMEREN area. Project J468 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project J468 was studied with a commercial probability of 100%. 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)

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. (AEP - AEP) The 05DEQUIN-05MEADOW 345 kV line (from bus 243217 to bus 243878 ckt 1) loads from 139.97% to 141.32% (AC power flow) of its emergency rating (1304 MVA) for the line fault with failed breaker contingency outage of '6485_C2_05DEQUIN 345-C1'. This project contributes approximately 17.6 MW to the thermal violation.

CONTINGENCY '6485_C2_05DEQUIN 345-C1'

OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2	/ 243217
05DEQUIN 345 243878 05MEADOW 345 2	
OPEN BRANCH FROM BUS 243217 TO BUS 249525 CKT 1	/ 243217
05DEQUIN 345 249525 08WESTWD 345 1	
OPEN BRANCH FROM BUS 249525 TO BUS 249874 CKT 1	/ 249525
08WESTWD 345 249874 08WESTWD 138 1	
END	

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (AEP - AEP) The 05DEQUIN-05MEADOW 345 kV line (from bus 243217 to bus 243878 ckt 2) loads from 139.97% to 141.32% (AC power flow) of its emergency rating (1304 MVA) for the line fault with failed breaker contingency outage of '4704_C2_05DEQUIN 345-B1'. This project contributes approximately 17.6 MW to the thermal violation.

CONTINGENCY '4704_C2_05DEQUIN 345-B1'

OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 1	/ 243217
05DEQUIN 345 243878 05MEADOW 345 1	
OPEN BRANCH FROM BUS 243217 TO BUS 249525 CKT 1	/ 243217
05DEQUIN 345 249525 08WESTWD 345 1	
OPEN BRANCH FROM BUS 249525 TO BUS 249874 CKT 1	/ 249525
08WESTWD 345 249874 08WESTWD 138 1	
END	

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

3. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 142.49% to 144.01% (AC power flow) of its load dump rating (1371 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 20.8 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	

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

4. (CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 100.72% to 102.27% (AC power flow) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT5-6__'. This project contributes approximately 12.43 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

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

5. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 132.11% to 133.68% (AC power flow) of its load dump rating (1329 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 20.8 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

Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

Steady-State Voltage Requirements

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

None

Short Circuit

(Summary of impacted circuit breakers)

None

Affected System Analysis & Mitigation

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

1. (AEP - AEP) The 05ROCKPT-05JEFRSO 765 kV line (from bus 243209 to bus 243208 ckt 1) loads from 99.81% to 100.33% (AC power flow) of its normal rating (4055 MVA) for the single line contingency outage of '243878(05MEADOW)-255205(17REYNOLDS)_1'. This project contributes approximately 21.19 MW to the thermal violation.

CONTINGENCY '243878(05MEADOW)-255205(17REYNOLDS)_1'
OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 1
END

2. (AEP - MISO IPL) The 05BREED-16WHEAT 345 kV line (from bus 243213 to bus 254539 ckt 1) loads from 120.38% to 121.69% (DC power flow) of its normal rating (1386 MVA) for the single line contingency outage of '363_B2_TOR1682'. This project contributes approximately 18.06 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

3. (AEP - AEP) The 05DEQUIN-05MEADOW 345 kV line (from bus 243217 to bus 243878 ckt 1) loads from 181.81% to 183.61% (AC power flow) of its normal rating (971 MVA) for the single line contingency outage of '6490_B2_TOR16000'. This project contributes approximately 17.52 MW to the thermal violation.

CONTINGENCY '6490_B2_TOR16000'

OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217
05DEQUIN 345 243878 05MEADOW 345 2
END

4. (AEP - AEP) The 05DEQUIN-05MEADOW 345 kV line (from bus 243217 to bus 243878 ckt 2) loads from 181.81% to 183.61% (AC power flow) of its normal rating (971 MVA) for the single line contingency outage of '6472_B2_TOR15258'. This project contributes approximately 17.52 MW to the thermal violation.

CONTINGENCY '6472_B2_TOR15258'

OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 1 / 243217
05DEQUIN 345 243878 05MEADOW 345 1
END

5. (AEP - AEP) The 05EUGENE-05DEQUIN 345 kV line (from bus 243221 to bus 243217 ckt 1) loads from 122.8% to 124.48% (AC power flow) of its normal rating (971 MVA) for the single line contingency outage of '667_B2_TOR1697'. This project contributes approximately 16.27 MW to the thermal violation.

CONTINGENCY '667_B2_TOR1697'

OPEN BRANCH FROM BUS 243213 TO BUS 243217 CKT 1 / 243213 05BREED
345 243217 05DEQUIN 345 1
END

6. (AEP - AEP) The 05MEADOW-05OLIVE 345 kV line (from bus 243878 to bus 243229 ckt 1) loads from 117.2% to 118.24% (AC power flow) of its normal rating (971 MVA) for the single line contingency outage of '8695_B2'. This project contributes approximately 10.11 MW to the thermal violation.

CONTINGENCY '8695_B2'

OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 1 / 243878
05MEADOW 345 255205 17REYNOLDS 345 1
END

7. (AEP - MISO NIPS) The 05MEADOW-17REYNOLDS 345 kV line (from bus 243878 to bus 255205 ckt 1) loads from 177.89% to 179.19% (DC power flow) of its normal rating (1409 MVA) for the single line contingency outage of '363_B2_TOR1682'. This project contributes approximately 18.25 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

8. (CE - CE) The BLUEMOUND; B-PONTIAC ; B 345 kV line (from bus 270668 to bus 270852 ckt 1) loads from 99.67% to 100.84% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8001____-S_A'. This project contributes approximately 17.84 MW to the thermal violation.

CONTINGENCY '345-L8001____-S_A'

TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1 / PONTI; R 345 Z2-
087 TAP 345
END

9. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 152.6% to 154.23% (AC power flow) of its emergency rating (1280 MVA) for the

single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 20.82 MW to the thermal violation.

CONTINGENCY '345-L8014_T_-S'

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

10. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 141.46% to 143.14% (AC power flow) of its emergency rating (1241 MVA) for the single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 20.82 MW to the thermal violation.

CONTINGENCY '345-L8014_T_-S'

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

11. (CE - CE) The PONTIAC ; R-DRESDEN ; R 345 kV line (from bus 270853 to bus 270717 ckt 1) loads from 127.84% to 129.35% (AC power flow) of its emergency rating (1481 MVA) for the single line contingency outage of '345-L11212_B-S'. This project contributes approximately 22.32 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

12. (MISO AMIL - AEP) The 7CASEY-05BREED 345 kV line (from bus 346809 to bus 243213 ckt 1) loads from 130.56% to 134.56% (AC power flow) of its normal rating (1332 MVA) for the single line contingency outage of '348885(7BUNSONVILLE)-348887(7SIDNEY)_1'. This project contributes approximately 53.26 MW to the thermal violation.

CONTINGENCY '348885(7BUNSONVILLE)-348887(7SIDNEY)_1'

OPEN BRANCH FROM BUS 348885 TO BUS 348887 CKT 1
END

13. (MISO AMIL - CE) The 7BROKAW-Z2-087 TAP 345 kV line (from bus 348847 to bus 917500 ckt 1) loads from 103.25% to 104.85% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8002____-S'. This project contributes approximately 24.36 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

14. (MISO AMIL - AEP) The 7BUNSONVILLE-05EUGENE 345 kV line (from bus 348885 to bus 243221 ckt 1) loads from 133.87% to 141.92% (AC power flow) of its normal rating (822 MVA) for the single line contingency outage of '685_B2_TOR1686'. This project contributes approximately 66.13 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

15. (CE - CE) The Z2-087 TAP-PONTIAC ; R 345 kV line (from bus 917500 to bus 270853 ckt 1) loads from 111.85% to 113.44% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8002____-S'. This project contributes approximately 24.36 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

Light Load Analysis - 2019

1. (AEP – MISO NIPS) The 05MEADOW-17REYNOLDS 345 kV line (from bus 243878 to bus 255205 ckt 1) loads from 107.20% to 108.23% (AC power flow) of its emergency rating (1409 MVA) for the line fault with single contingency outage of '363_B2_TOR1682'. This project contributes approximately 14.5553 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

Light Load MISO Overloads (Information purposes only) – 2019

1. (MISO AMIL – MISO AMIL) The 7SIDNEY - 7BUNSONVILLE345 kV line (from bus 348887to bus 348885ckt 1) loads from 109.88% to 115.51% (AC power flow) of its emergency rating (908 MVA) for the line fault with single contingency outage of '685_B2_TOR1686'. This project contributes approximately 50.9024 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

2. (MISO AMIL – MISO AMIL) The 7SIDNEY - 7BUNSONVILLE345 kV line (from bus 348887to bus 348885ckt 1) loads from 104.28% to 108.81% (AC power flow) of its emergency rating (908 MVA) for the line fault with single contingency outage of '695_B2'. This project contributes approximately 41.6023 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. (MISO AMIL – MISO AMIL) The 7SIDNEY - 7BUNSONVILLE345 kV line (from bus 348887to bus 348885ckt 1) loads from 96.99% to 102.44% (AC power flow) of its emergency rating (908 MVA) for the line fault with stuck breaker contingency outage of '685_C2_05BREED 345-D1'. This project contributes approximately 50.9024 MW to the thermal violation.

CONTINGENCY '685_C2_05BREED 345-D1'

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

4. (MISO AMIL – MISO AMIL) The 7SIDNEY - 7BUNSONVILLE345 kV line (from bus 348887to bus 348885ckt 1) loads from 95.07% to 100.33% (AC power flow) of its emergency rating (908 MVA) for the line fault with stuck breaker contingency outage of '3106_C2_05BREED 345-D'. This project contributes approximately 48.9987 MW to the thermal violation.

CONTINGENCY '3106_C2_05BREED 345-D'

OPEN BRANCH FROM BUS 243213 TO BUS 243216 CKT 1 / 243213 05BREED
345 243216 05DARWIN 345 1
OPEN BRANCH FROM BUS 243213 TO BUS 346809 CKT 1 / 243213 05BREED
345 346809 7CASEY 345 1
END

System Reinforcements

Short Circuit

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

None

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

None

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements

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

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. To relieve the Dequine – Meadowlake #1 345 kV line overload: There is a planned 2020 Baseline upgrade B2668 to reconductor the line. New ratings to be 1409/1959 MVA SN/SE. J468 can wait until B2668 is placed into service or J468 can pay an advancement cost to place B2668 into service earlier, if feasible per AEP. If J468 intends to come into service prior to the baseline upgrade, an interim study will need to be requested and completed.
2. To relieve the Dequine – Meadowlake #2 345 kV line overload: There are planned baseline upgrades to reconductor this line. 2020 baseline upgrade B2668 and 2021 baseline upgrade B2776 (reconductor line, replace Dequine riser and wavetrap, adjust Meadowlake relay trip limit) to achieve ratings of 1825/2062 MVA SN/SE. J468 can wait until B2668 and B2776 are placed into service or J468 can pay an advancement cost to place these baseline upgrades into service earlier, if feasible per AEP. If J468 intends to come into service prior to the baseline upgrades, an interim study will need to be requested and completed.
3. To relieve the Kincaid - Pawnee 345 kV line overload: The ComEd-end ratings 1195/1195/1494 MVA SN/SE/ALDR are sufficient. The AMIL/MISO-end ratings for Planning year 2019 are 956/956 MVA SN/SE. These ratings are sufficient. J468 has no cost responsibility here.

4. To relieve the Loretto - Wilton 345 kV line overload: There is a planned 2019 baseline upgrade B2728 to remove sag limitations on the line and upgrade terminal equipment at Wilton. The new ComEd-end ratings to be 1364/1528/2221 MVA SN/SE/SLD. J468 has no cost responsibility here.
5. To relieve the Pontiac - Loretto 345 kV line overload: There is a planned 2020 baseline upgrade B2732.2 to raise towers to remove the sag limitations. Project B2732.2 is now in-service. The new ComEd-end ratings are 1364/1528/1912 MVA SN/SE/SLD. J468 has no cost responsibility here.

Light Load Load Flow Analysis Reinforcements

New System Reinforcements

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

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. To relieve the Meadowlake - Reynolds 345 kV line overload: There is a planned 2017 baseline upgrade B2449 to rebuild the line. The new AEP-end ratings to be 2114/2938 MVA SN/SE. There is planned MISO/NIPSCO work at Reynolds associated with the Reynolds MVP project which is expected to be complete by summer 2018. The MISO-end ratings to be 3585/3585 MVA SN/SE. The AEP and NIPSCO planned work is expected to be complete by summer 2019, which is the Planning case used to evaluate J468. J468 has no cost responsibility here.

=====

To be provided by Transmission Owner as applicable:

Direct Connection Network Upgrades

(New facilities that once placed into service will have parallel flows (e.g. three-breaker ring bus))

TO Attachment Facilities

(New facilities to connect the generation or customer owned merchant transmission facilities to the system that will be owned by the TO once placed into service, will serve only the Interconnection Customer, and will not have parallel flows (e.g. disconnect switch, backbone structure))

Required Relaying and Communications

(List of impacted substations and estimates for relaying setting changes, replacements)

Metering

(Revenue metering if to be owned and maintained by the TO - If TO does not wish to own metering please state this for customers information)

Facilities Study Estimate

(If a Facilities Study is required, provide the estimated duration and cost estimate to perform Facilities Study)

Additional Interconnection Customer Responsibilities:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.
2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.
3. The Interconnection Customer seeking to interconnect a wind generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per item 5.iv. of Schedule H to the Interconnection Service Agreement.

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(AEP - AEP) The 05DEQUIN-05MEADOW 345 kV line (from bus 243217 to bus 243878 ckt 1) loads from 139.97% to 141.32% (AC power flow) of its emergency rating (1304 MVA) for the line fault with failed breaker contingency outage of '6485_C2_05DEQUIN 345-C1'. This project contributes approximately 17.6 MW to the thermal violation.

CONTINGENCY '6485_C2_05DEQUIN 345-C1'

OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 2 / 243217
05DEQUIN 345 243878 05MEADOW 345 2
OPEN BRANCH FROM BUS 243217 TO BUS 249525 CKT 1 / 243217
05DEQUIN 345 249525 08WESTWD 345 1
OPEN BRANCH FROM BUS 249525 TO BUS 249874 CKT 1 / 249525
08WESTWD 345 249874 08WESTWD 138 1
END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
243859	05FR-11G C	1.21
247900	05FR-11G E	42.02
243862	05FR-12G C	1.19
247901	05FR-12G E	41.32
243864	05FR-21G C	1.27
247902	05FR-21G E	44.16
243866	05FR-22G C	1.21
247903	05FR-22G E	42.29
243870	05FR-3G C	2.46
247904	05FR-3G E	85.65
243873	05FR-4G C	1.9
247905	05FR-4G E	64.4
927331	J196 C	0.99
927332	J196 E	3.94
997641	J401	1.
997772	J453 E	1.08
900404	X3-028 C	182.96
900405	X3-028 E	243.94
998111	AB1-002 C	2.64
998112	AB1-002 E	14.96
998120	AB1-003	60.

Appendix 2

(AEP - AEP) The 05DEQUIN-05MEADOW 345 kV line (from bus 243217 to bus 243878 ckt 2) loads from 139.97% to 141.32% (AC power flow) of its emergency rating (1304 MVA) for the line fault with failed breaker contingency outage of '4704_C2_05DEQUIN 345-B1'. This project contributes approximately 17.6 MW to the thermal violation.

CONTINGENCY '4704_C2_05DEQUIN 345-B1'

OPEN BRANCH FROM BUS 243217 TO BUS 243878 CKT 1 / 243217

05DEQUIN 345 243878 05MEADOW 345 1

OPEN BRANCH FROM BUS 243217 TO BUS 249525 CKT 1 / 243217

05DEQUIN 345 249525 08WESTWD 345 1

OPEN BRANCH FROM BUS 249525 TO BUS 249874 CKT 1 / 249525

08WESTWD 345 249874 08WESTWD 138 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
243859	05FR-11G C	1.21
247900	05FR-11G E	42.02
243862	05FR-12G C	1.19
247901	05FR-12G E	41.32
243864	05FR-21G C	1.27
247902	05FR-21G E	44.16
243866	05FR-22G C	1.21
247903	05FR-22G E	42.29
243870	05FR-3G C	2.46
247904	05FR-3G E	85.65
243873	05FR-4G C	1.9
247905	05FR-4G E	64.4
927331	J196 C	0.99
927332	J196 E	3.94
997641	J401	1.
997772	J453 E	1.08
900404	X3-028 C	182.96
900405	X3-028 E	243.94
998111	AB1-002 C	2.64
998112	AB1-002 E	14.96
998120	AB1-003	60.

Appendix 3

(CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 142.49% to 144.01% (AC power flow) of its load dump rating (1371 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 20.8 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274890	CAYUG;1U E	64.98
274891	CAYUG;2U E	64.98
274863	CAYUGA RI;1U	1.87
274864	CAYUGA RI;2U	1.87
927331	J196 C	1.07
927332	J196 E	4.28
997761	J291	4.18
927641	J339	11.84
274650	KINCAID ;1U	12.52
274651	KINCAID ;2U	12.51
296308	R-030 C1	14.91
296271	R-030 C2	14.91
296125	R-030 C3	15.09
296309	R-030 E1	59.65
296272	R-030 E2	59.65
296128	R-030 E3	60.37
290261	S-027 C	1.68
290265	S-028 C	1.68
274853	TWINGROVE;U1	58.54
274854	TWINGROVE;U2	58.54

<i>276150</i>	<i>W2-048 E</i>	<i>15.76</i>
<i>905081</i>	<i>W4-005 C</i>	<i>14.1</i>
<i>905082</i>	<i>W4-005 E</i>	<i>94.41</i>
<i>909052</i>	<i>X2-022 E</i>	<i>47.66</i>
<i>900404</i>	<i>X3-028 C</i>	<i>1.33</i>
<i>900405</i>	<i>X3-028 E</i>	<i>1.77</i>
<i>916512</i>	<i>Z1-107 E</i>	<i>1.1</i>
<i>917501</i>	<i>Z2-087 C</i>	<i>11.65</i>
<i>917502</i>	<i>Z2-087 E</i>	<i>77.96</i>
<i>LTF</i>	<i>AA1-001</i>	<i>5.82</i>
<i>918972</i>	<i>AA1-116 E</i>	<i>1.1</i>
<i>918982</i>	<i>AA1-117 E</i>	<i>1.19</i>
<i>998111</i>	<i>AB1-002 C</i>	<i>3.12</i>
<i>998112</i>	<i>AB1-002 E</i>	<i>17.68</i>

Appendix 4

(CE - MISO AMIL) The KINCAID ; B-7PAWNEE 345 kV line (from bus 270796 to bus 347962 ckt 1) loads from 100.72% to 102.27% (AC power flow) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT5-6__'. This project contributes approximately 12.43 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274890	CAYUG;1U E	10.71
274891	CAYUG;2U E	10.71
927331	J196 C	0.86
927332	J196 E	3.43
927641	J339	8.69
274650	KINCAID ;1U	26.88
274651	KINCAID ;2U	27.11
296308	R-030 C1	3.66
296271	R-030 C2	3.66
296125	R-030 C3	3.71
296309	R-030 E1	14.65
296272	R-030 E2	14.65
296128	R-030 E3	14.83
290261	S-027 C	1.22
290265	S-028 C	1.22
274853	TWINGROVE;U1	42.52
274854	TWINGROVE;U2	42.52
276150	W2-048 E	14.71
905081	W4-005 C	12.24
905082	W4-005 E	81.97

<i>909052</i>	<i>X2-022 E</i>	<i>44.48</i>
<i>917501</i>	<i>Z2-087 C</i>	<i>2.88</i>
<i>917502</i>	<i>Z2-087 E</i>	<i>19.27</i>
<i>998111</i>	<i>AB1-002 C</i>	<i>1.86</i>
<i>998112</i>	<i>AB1-002 E</i>	<i>10.56</i>

Appendix 5

(CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 132.11% to 133.68% (AC power flow) of its load dump rating (1329 MVA) for the line fault with failed breaker contingency outage of '012-45-BT11-14'. This project contributes approximately 20.8 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
927331	J196 C	1.07
927332	J196 E	4.28
997761	J291	4.18
927641	J339	11.84
274650	KINCAID ;1U	12.54
274651	KINCAID ;2U	12.53
296308	R-030 C1	14.92
296271	R-030 C2	14.92
296125	R-030 C3	15.1
296309	R-030 E1	59.69
296272	R-030 E2	59.69
296128	R-030 E3	60.41
290261	S-027 C	1.68
290265	S-028 C	1.68
274853	TWINGROVE;U1	58.59
274854	TWINGROVE;U2	58.59
276150	W2-048 E	15.78
905081	W4-005 C	14.11
905082	W4-005 E	94.51
909052	X2-022 E	47.72

<i>900404</i>	<i>X3-028 C</i>	<i>1.34</i>
<i>900405</i>	<i>X3-028 E</i>	<i>1.78</i>
<i>916512</i>	<i>Z1-107 E</i>	<i>1.09</i>
<i>917501</i>	<i>Z2-087 C</i>	<i>11.66</i>
<i>917502</i>	<i>Z2-087 E</i>	<i>78.02</i>
<i>LTF</i>	<i>AA1-001</i>	<i>5.85</i>
<i>918972</i>	<i>AA1-116 E</i>	<i>1.09</i>
<i>918982</i>	<i>AA1-117 E</i>	<i>1.19</i>
<i>998111</i>	<i>AB1-002 C</i>	<i>3.12</i>
<i>998112</i>	<i>AB1-002 E</i>	<i>17.68</i>