Generation Interconnection Feasibility Study Report Queue Position AD2-180

(Revised)

Interconnection Customer has proposed a 110 MW wind generating facility to be built in the Mineral County, West Virginia. PJM recognizes 15.0 MW as Capacity Interconnection Rights for this project. The proposed in-service date is December 31, 2020. **This study does not imply a Monongahela Power ("Mon Power" or "Transmission Owner") commitment to this in-service date.**

The AD2-180 will interconnect with the Mon Power 138 kV transmission system by one of the following two POI options:

- Option 1 or Primary POI will inject power directly into the Elk Garden 138 kV substation. This POI will be accomplished by reconfiguring the existing Elk Garden 138 kV substation into a four (4) breaker ring bus and terminating the Elk Garden – Kelso Gap 138 kV line along with the Elk Garden – Parr Run 138 kV line onto new terminals. The project will be modeled at bus line segment #235327 of the Elk Garden sub.
- Option 2 or Secondary POI will tap the Elk Garden – Parr Run 138 kV line by new three-breaker-ring-bus switching station at a point on the transmission line located approximately three (3) miles from Elk Garden substation. The Elk Garden – Parr Run 138 kV line will be looped into the new station. The project will be modeled at bus line segment #235327 for Elk Garden and bus #235501 for Parr Run.

Network Impacts

AD2-180 Option 1 POI - Summer Peak Analysis – 2021

The Queue Project AD2-180 was evaluated as a 110.0 MW (Capacity 15.1 MW) injection at the Elk Garden 138kV substation in the APS area. Project AD2-180 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-180 was studied with a commercial probability of 53%. Potential network impacts were as follows:

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

None

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

1. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 94.4% to 100.65% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-001'. This project contributes approximately 11.19 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-2-MP-138-001'                    /* ALBRIGHT-138-NORTH
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1      /* 01ALBRIG 138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1      /* 01ALBRIG 138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1      /* 01ALBRIG 138 01BRANDN 138
  END
```

2. (AP - AP) The 01DANSMTN-01CARLOS 138 kV line (from bus 237310 to bus 235449 ckt 1) loads from 99.13% to 105.79% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 12.13 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR
AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1      /* 01LKLYNN 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1      /* 01HAZELT 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  END
```

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

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. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 118.06% to 132.97% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 19.07 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                    /* ALBRIGHT BREAKER FAILURE - TIE BREAKER
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1      /* 01ALBRIG 138 01BRANDN 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1      /* 01ALBRIG 138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1      /* 01ALBRIG 138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1      /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1      /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  END
```

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

2. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 115.74% to 126.39% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 18.42 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-2-MP-138-101'                    /* ALBRIGHT-138-SOUTH
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1      /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1      /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  END
```

3. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 115.83% to 123.01% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-153'. This project contributes approximately 12.85 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-153'                    /* OAK PARK-KELSO GAP STK BKR AT
ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1      /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1      /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1      /* 01SNOW T 138 01SNWYCK 138
```

```
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1        /* 01SNOW T 138 01OAKPRK 138
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1        /* 01SNWYCK 138 01SNOW C 66
DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1        /* 01OAKPRK 138 01KELSOG 138
END
```

4. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 121.75% to 136.66% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 19.07 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                    /* ALBRIGHT BREAKER FAILURE - TIE BREAKER
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1      /* 01ALBRIG 138 01BRANDN 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1      /* 01ALBRIG 138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1      /* 01ALBRIG 138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1      /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1      /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  END
```

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

5. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 119.43% to 130.08% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 18.42 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-2-MP-138-101'                    /* ALBRIGHT-138-SOUTH
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1      /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1      /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  END
```

6. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 119.57% to 126.75% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-153'. This project contributes approximately 12.85 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-153'                    /* OAK PARK-KELSO GAP STK BKR AT
ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1      /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1      /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
```

```
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1        /* 01SNOW T 138 01SNWYCK 138
DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1        /* 01SNOW T 138 01OAKPRK 138
DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1        /* 01SNWYCK 138 01SNOW C 66
DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1        /* 01OAKPRK 138 01KELSOG 138
END
```

7. (AP - AP) The 01CARLOS-01GARRET 138 kV line (from bus 235449 to bus 235469 ckt 1) loads from 103.72% to 112.11% (**DC power flow**) of its emergency rating (172 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 14.42 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1      /* 01LKLYNN 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1      /* 01HAZELT 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  END
```

Please refer to Appendix 6 for a table containing the generators having contribution to this flowgate.

8. (AP - AP) The 01GARRET-AD1-068 TAP 138 kV line (from bus 235469 to bus 934440 ckt 1) loads from 113.11% to 114.97% (**DC power flow**) of its emergency rating (191 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 7.86 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1      /* 01LKLYNN 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1      /* 01HAZELT 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  END
```

Please refer to Appendix 7 for a table containing the generators having contribution to this flowgate.

Steady-State Voltage Requirements

To be determined at the system impact study stage.

Short Circuit

None

Affected System Analysis & Mitigation

NYISO Impacts:

NYISO Impacts to be determined during later study phases (as applicable).

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. (AP - AP) The 01ELKGRD-01PARRN 138 kV line (from bus 235327 to bus 235501 ckt 1) loads from 56.17% to 104.2% (**DC power flow**) of its emergency rating (229 MVA) for the single line contingency outage of 'AP-P1-2-MP-138-168'. This project contributes approximately 109.98 MW to the thermal violation.

```
CONTINGENCY 'AP-P1-2-MP-138-168'                    /* 2031
  DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1      /* 01OAKPRK 138 01KELSOG 138
  END
```

Light Load Analysis - 2021

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

System Reinforcements

Short Circuit

None

Stability and Reactive Power Requirement

To be determined at the system impact study stage.

Summer Peak Load Flow Analysis Reinforcements

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

Multiple Facility Contingency

1. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 94.4% to 100.65% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-001'. This project contributes approximately 11.19 MW to the thermal violation.

APS:
Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme. Estimated Cost Excluding Tax: $15,215,600. The estimated time to complete is 34 months.

2. (AP - AP) The 01DANSMTN-01CARLOS 138 kV line (from bus 237310 to bus 235449 ckt 1) loads from 99.13% to 105.79% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 12.13 MW to the thermal violation.

Same as Multiple Facility Contingency #1

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. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 118.06% to 132.97% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 19.07 MW to the thermal violation.

Same as Multiple Facility Contingency #1

2. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 115.74% to 126.39% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 18.42 MW to the thermal violation.

Same as Multiple Facility Contingency #1

3. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 115.83% to 123.01% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-153'. This project contributes approximately 12.85 MW to the thermal violation.

Same as Multiple Facility Contingency #1

4. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 121.75% to 136.66% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 19.07 MW to the thermal violation.

Same as Multiple Facility Contingency #1

5. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 119.43% to 130.08% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 18.42 MW to the thermal violation.

Same as Multiple Facility Contingency #1

6. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 119.57% to 126.75% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-153'. This project contributes approximately 12.85 MW to the thermal violation.

Same as Multiple Facility Contingency #1

7. (AP - AP) The 01CARLOS-01GARRET 138 kV line (from bus 235449 to bus 235469 ckt 1) loads from 103.72% to 112.11% (**DC power flow**) of its emergency rating (172 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 14.42 MW to the thermal violation.

Same as Multiple Facility Contingency #1

8. (AP - AP) The 01GARRET-AD1-068 TAP 138 kV line (from bus 235469 to bus 934440 ckt 1) loads from 113.11% to 114.97% (**DC power flow**) of its emergency rating (191 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 7.86 MW to the thermal violation.

Same as Multiple Facility Contingency #1

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)

None

Option 2 POI - Summer Peak Analysis - 2021

The Queue Project AD2-180 was evaluated as a 110.0 MW (Capacity 15.1 MW) injection tapping the Elk Garden to Parr Run 138kV line in the APS area. Project AD2-180 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-180 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

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

None

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

1. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 94.4% to 100.59% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-001'. This project contributes approximately 11.08 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-2-MP-138-001'                    /* ALBRIGHT-138-NORTH
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1      /* 01ALBRIG 138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1      /* 01ALBRIG 138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1      /* 01ALBRIG 138 01BRANDN 138
  END
```

2. (AP - AP) The 01DANSMTN-01CARLOS 138 kV line (from bus 237310 to bus 235449 ckt 1) loads from 99.13% to 105.97% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 12.45 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR
AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1      /* 01LKLYNN 138 01 106 J 138
```

```
DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1        /* 01HAZELT 138 01 106 J 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG 138 01MTZION 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG 138 01SNOW T 138
DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG 138 01DENVER 138
END
```

Please refer to Appendix 8 for a table containing the generators having contribution to this flowgate.

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. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 118.06% to 132.71% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 18.59 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                    /* ALBRIGHT BREAKER FAILURE - TIE BREAKER
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1        /* 01ALBRIG 138 01BRANDN 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG 138 01 106 J 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG 138 01DENVER 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1        /* 01ALBRIG 138 01KINGWD 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1        /* 01ALBRIG 138 01RUTHBL 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG 138 01SNOW T 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG 138 AD1-068 TAP 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG 138 01METTIK 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG 138 01MTZION 138
 END
```

Please refer to Appendix 9 for a table containing the generators having contribution to this flowgate.

2. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 115.74% to 126.12% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 17.94 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-2-MP-138-101'                    /* ALBRIGHT-138-SOUTH
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG
138 AD1-068 TAP 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG
138 01METTIK 138
 DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
 END
```

3. (AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 115.83% to 123.01% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-153'. This project contributes approximately 12.85 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-153'                /* OAK PARK-KELSO GAP STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1        /* 01SNOW T 138 01SNWYCK 138
  DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1        /* 01SNOW T 138 01OAKPRK 138
  DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1        /* 01SNWYCK 138 01SNOW C 66
  DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1        /* 01OAKPRK 138 01KELSOG 138
  END
```

4. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 121.75% to 136.39% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 18.59 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                /* ALBRIGHT BREAKER FAILURE - TIE BREAKER
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1        /* 01ALBRIG 138 01BRANDN 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1        /* 01ALBRIG 138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1        /* 01ALBRIG 138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG 138 01MTZION 138
  END
```

Please refer to Appendix 10 for a table containing the generators having contribution to this flowgate.

5. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 119.43% to 129.81% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 17.94 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-2-MP-138-101'                /* ALBRIGHT-138-SOUTH
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG 138 01 106 J 138
  END
```

6. (AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 119.57% to 126.75% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-153'. This project contributes approximately 12.85 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-153'                    /* OAK PARK-KELSO GAP STK BKR AT
ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1      /* 01ALBRIG 138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1      /* 01ALBRIG 138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235402 TO BUS 235403 CKT 1      /* 01SNOW T 138 01SNWYCK 138
  DISCONNECT BRANCH FROM BUS 235402 TO BUS 235497 CKT 1      /* 01SNOW T 138 01OAKPRK 138
  DISCONNECT BRANCH FROM BUS 235403 TO BUS 237273 CKT 1      /* 01SNWYCK 138 01SNOW C 66
  DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1      /* 01OAKPRK 138 01KELSOG 138
  END
```

7. (AP - AP) The 01GARRET-AD1-068 TAP 138 kV line (from bus 235469 to bus 934440 ckt 1) loads from 113.11% to 115.05% (**DC power flow**) of its emergency rating (191 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 8.21 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR
AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1      /* 01ALBRIG 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1      /* 01LKLYNN 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1      /* 01HAZELT 138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1      /* 01ALBRIG 138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1      /* 01ALBRIG 138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  END
```

Please refer to Appendix 11 for a table containing the generators having contribution to this flowgate.

Steady-State Voltage Requirements

To be determined at system impact study stage.

Short Circuit

None

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. (AP - AP) The AD2-180 TAP-01PARRN 138 kV line (from bus 937360 to bus 235501 ckt 1) loads from 56.17% to 104.2% (**DC power flow**) of its emergency rating (229 MVA) for the single line contingency outage of 'AP-P1-2-MP-138-168'. This project contributes approximately 109.98 MW to the thermal violation.

```
CONTINGENCY 'AP-P1-2-MP-138-168'                    /* 2031
  DISCONNECT BRANCH FROM BUS 235497 TO BUS 237313 CKT 1        /* 01OAKPRK 138 01KELSOG 138
  END
```

Light Load Analysis - 2021

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

System Reinforcements

Short Circuit

None

Stability and Reactive Power Requirement

To be determined at system impact study stage.

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)

None

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)

None

Appendix 3

Flowgate Information: Contingency – 01DANSMTN-01CARLOS
PJM Queue Position: AD2-180

OPTION 1 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01DANSMTN-01CARLOS 138 kV line (from bus 237310 to bus 235449 ckt 1) loads from 99.13% to 105.79% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 12.13 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-
BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1        /* 01LKLYNN
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1        /* 01HAZELT
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  END
```

Appendix 3 – Continued from previous page

Flowgate Information: Contingency – 01DANSMTN-01CARLOS
PJM Queue Position: AD2-180

OPTION 1 POI

Bus Number	Gen. Bus Name	Full Contribution
LTF	AMIL	0.03
LTF	BAYOU	0.06
LTF	BIG_CAJUN1	0.08
LTF	BIG_CAJUN2	0.17
LTF	BLUEG	0.19
LTF	CALDERWOOD	0.02
LTF	CANNELTON	0.03
LTF	CARR	0.23
LTF	CBM-S2	0.12
LTF	CHEOAH	0.01
LTF	CHILHOWEE	< 0.01
LTF	CHOCTAW	0.05
LTF	CLIFTY	0.84
LTF	COTTONWOOD	0.23
LTF	CPLE	0.06
LTF	DEARBORN	0.15
LTF	EDWARDS	0.06
LTF	ELMERSMITH	0.09
LTF	FARMERCITY	0.03
LTF	G-007A	< 0.01
LTF	GIBSON	0.06
LTF	MORGAN	0.08
LTF	NEWTON	0.14
LTF	O-066	0.04
LTF	PRAIRIE	0.24
LTF	RENSSELAER	0.18
LTF	ROSETON	1.34
LTF	SANTEETLA	< 0.01
LTF	SMITHLAND	0.02
LTF	TATANKA	0.06
LTF	TILTON	0.07
LTF	TRIMBLE	0.04

Bus Number	Gen. Bus Name	Full Contribution
LTF	TVA	0.04
LTF	UNIONPOWER	< 0.01
937362	AD2-180 E O2	10.75
937361	AD2-180 C O2	1.71
934932	AD1-125 E	7.06
934931	AD1-125 C	1.22
932141	AC2-021	1.95
930262	AB1-065 E	2.06
930261	AB1-065 C	1.26
929522	U2-030 E	15.92
924002	AB2-041 E	4.97
924001	AB2-041 C	1.13
923971	AB2-038	0.22
918812	AA1-100 E	3.36
918342	AA1-047 E	18.45
918341	AA1-047 C	2.78
917091	Z2-013	0.37
885642	T-016 E	2.49
292401	K-028 E	8.31
291409	S-029B E	-0.06
290302	S-038 E	1.04
290229	S-014 E	23.18
237507	01CROSSCHOOL	0.38
237319	01FMR_U2-030	0.41
237312	01DANS_S-014	5.8
236001	01WARRIOR RN	9.44
235854	01KL_K28_T16	0.46
235531	01TR_U2-073A	0.42
235530	01TR_U2-073A	0.94
235520	01WVACO_S38	7.82
235099	U2-073B E	16.17
235098	U2-073A E	36.91
235093	N-047_E	8.86

Appendix 4

Flowgate Information: Contingency – 01PARSNS-01LOUGHL
PJM Queue Position: AD2-180

OPTION 1 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 118.06% to 132.97% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 19.07 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                    /* ALBRIGHT BREAKER
FAILURE - TIE BREAKER
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1        /* 01ALBRIG
138 01BRANDN 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1        /* 01ALBRIG
138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1        /* 01ALBRIG
138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG
138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG
138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  END
```

Appendix 4 – Continued from previous page

Flowgate Information: Contingency – 01PARSNS-01LOUGHL
PJM Queue Position: AD2-180

OPTION 1 POI

Bus Number	Gen. Bus Name	Full Contribution
LTF	AMIL	0.07
LTF	BAYOU	0.25
LTF	BIG_CAJUN1	0.38
LTF	BIG_CAJUN2	0.76
LTF	BLUEG	0.46
LTF	CALDERWOOD	0.13
LTF	CANNELTON	0.08
LTF	CATAWBA	0.07
LTF	CBM-N	0.05
LTF	CELEVELAND	0.19
LTF	CHEOAH	0.12
LTF	CHILHOWEE	0.04
LTF	CHOCTAW	0.25
LTF	CLIFTY	2
LTF	COTTONWOOD	0.98
LTF	DEARBORN	0.18
LTF	EDWARDS	0.13
LTF	ELMERSMITH	0.22
LTF	FARMERCITY	0.09
LTF	G-007A	0.5
LTF	GIBSON	0.15
LTF	HAMLET	0.19
LTF	MORGAN	0.41
LTF	NEWTON	0.33
LTF	NYISO	0.69
LTF	PRAIRIE	0.64
LTF	ROWAN	0.13
LTF	SANTEETLA	0.03
LTF	SMITHLAND	0.05

Bus Number	Gen. Bus Name	Full Contribution
LTF	TATANKA	0.15
LTF	TILTON	0.16
LTF	TRIMBLE	0.09
LTF	TVA	0.19
LTF	UNIONPOWER	0.16
LTF	VFT	1.34
937362	AD2-180 E	16.45
937361	AD2-180 C	2.61
934932	AD1-125 E	16.54
934931	AD1-125 C	2.85
933952	AD1-018 E	0.92
933951	AD1-018 C	0.56
932141	AC2-021	0.89
925971	AC1-073 C	-0.63
920072	AA2-103 E	11.99
918812	AA1-100 E	0.71
918462	AA1-062 E	116.93
918461	AA1-062 C	17.39
885642	T-016 E	4.39
292401	K-028 E	14.67
292310	K-019	1.36
290302	S-038 E	0.47
290229	S-014 E	3.42
237512	01ROTHROCK	0.67
237312	01DANS_S-014	0.85
235854	01KL_K28_T16	0.81
235625	01BACKB	31.66
235520	01WVACO_S38	3.56
235093	N-047_E	4.03
235091	U2-061_E	26.08

Appendix 5

Flowgate Information: Contingency – 01WILLIM-01PARSNS
PJM Queue Position: AD2-180

OPTION 1 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 121.75% to 136.66% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 19.07 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                    /* ALBRIGHT BREAKER
FAILURE - TIE BREAKER
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1        /* 01ALBRIG
138 01BRANDN 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1        /* 01ALBRIG
138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1        /* 01ALBRIG
138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG
138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG
138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  END
```

Appendix 5 – Continued from previous page

Flowgate Information: Contingency – 01WILLIM-01PARSNS
PJM Queue Position: AD2-180

OPTION 1 POI

Bus Number	*Gen. Bus Name*	*Full Contribution*
LTF	*AMIL*	*0.07*
LTF	*BAYOU*	*0.25*
LTF	*BIG_CAJUN1*	*0.38*
LTF	*BIG_CAJUN2*	*0.76*
LTF	*BLUEG*	*0.46*
LTF	*CALDERWOOD*	*0.13*
LTF	*CANNELTON*	*0.08*
LTF	*CATAWBA*	*0.07*
LTF	*CBM-N*	*0.05*
LTF	*CELEVELAND*	*0.19*
LTF	*CHEOAH*	*0.12*
LTF	*CHILHOWEE*	*0.04*
LTF	*CHOCTAW*	*0.25*
LTF	*CLIFTY*	*2*
LTF	*COTTONWOOD*	*0.98*
LTF	*DEARBORN*	*0.18*
LTF	*EDWARDS*	*0.13*
LTF	*ELMERSMITH*	*0.22*
LTF	*FARMERCITY*	*0.09*
LTF	*G-007A*	*0.5*
LTF	*GIBSON*	*0.15*
LTF	*HAMLET*	*0.19*
LTF	*MORGAN*	*0.41*
LTF	*NEWTON*	*0.33*
LTF	*NYISO*	*0.69*
LTF	*PRAIRIE*	*0.64*
LTF	*ROWAN*	*0.13*
LTF	*SANTEETLA*	*0.03*
LTF	*SMITHLAND*	*0.05*

Bus Number	*Gen. Bus Name*	*Full Contribution*
LTF	*TATANKA*	*0.15*
LTF	*TILTON*	*0.16*
LTF	*TRIMBLE*	*0.09*
LTF	*TVA*	*0.19*
LTF	*UNIONPOWER*	*0.16*
LTF	*VFT*	*1.34*
937362	*AD2-180 E*	*16.45*
937361	*AD2-180 C*	*2.61*
934932	*AD1-125 E*	*16.54*
934931	*AD1-125 C*	*2.85*
933952	*AD1-018 E*	*0.92*
933951	*AD1-018 C*	*0.56*
932141	*AC2-021*	*0.89*
925971	*AC1-073 C*	*-0.63*
920072	*AA2-103 E*	*11.99*
918812	*AA1-100 E*	*0.71*
918462	*AA1-062 E*	*116.93*
918461	*AA1-062 C*	*17.39*
885642	*T-016 E*	*4.39*
292401	*K-028 E*	*14.67*
292310	*K-019*	*1.36*
290302	*S-038 E*	*0.47*
290229	*S-014 E*	*3.42*
237512	*01ROTHROCK*	*0.67*
237312	*01DANS_S-014*	*0.85*
235854	*01KL_K28_T16*	*0.81*
235625	*01BACKB*	*31.66*
235520	*01WVACO_S38*	*3.56*
235093	*N-047_E*	*4.03*
235091	*U2-061_E*	*26.08*

Appendix 6

Flowgate Information: Contingency – 01CARLOS-01GARRET
PJM Queue Position: AD2-180

OPTION 1 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01CARLOS-01GARRET 138 kV line (from bus 235449 to bus 235469 ckt 1) loads from 103.72% to 112.11% (**DC power flow**) of its emergency rating (172 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 14.42 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-
BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1        /* 01LKLYNN
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1        /* 01HAZELT
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  END
```

Appendix 6 – Continued from previous page

Flowgate Information: Contingency – 01CARLOS-01GARRET
PJM Queue Position: AD2-180

OPTION 1 POI

Bus Number	*Gen. Bus Name*	*Full Contribution*
LTF	*AMIL*	*0.03*
LTF	*BAYOU*	*0.06*
LTF	*BIG_CAJUN1*	*0.08*
LTF	*BIG_CAJUN2*	*0.17*
LTF	*BLUEG*	*0.2*
LTF	*CALDERWOOD*	*0.02*
LTF	*CANNELTON*	*0.03*
LTF	*CARR*	*0.25*
LTF	*CBM-S2*	*0.13*
LTF	*CHEOAH*	*0.01*
LTF	*CHILHOWEE*	*< 0.01*
LTF	*CHOCTAW*	*0.05*
LTF	*CLIFTY*	*0.86*
LTF	*COTTONWOOD*	*0.24*
LTF	*CPLE*	*0.06*
LTF	*DEARBORN*	*0.16*
LTF	*EDWARDS*	*0.06*
LTF	*ELMERSMITH*	*0.09*
LTF	*FARMERCITY*	*0.03*
LTF	*G-007A*	*< 0.01*
LTF	*GIBSON*	*0.07*
LTF	*MORGAN*	*0.08*
LTF	*NEWTON*	*0.14*
LTF	*O-066*	*0.05*
LTF	*PRAIRIE*	*0.24*
LTF	*RENSSELAER*	*0.19*
LTF	*ROSETON*	*1.41*
LTF	*SANTEETLA*	*< 0.01*
LTF	*SMITHLAND*	*0.02*
LTF	*TATANKA*	*0.07*
LTF	*TILTON*	*0.07*
LTF	*TRIMBLE*	*0.04*
LTF	*TVA*	*0.04*

Bus Number	*Gen. Bus Name*	*Full Contribution*
LTF	*UNIONPOWER*	*< 0.01*
937362	*AD2-180 E*	*12.44*
937361	*AD2-180 C*	*1.98*
934932	*AD1-125 E*	*7.7*
934931	*AD1-125 C*	*1.33*
933952	*AD1-018 E*	*3.88*
933951	*AD1-018 C*	*2.38*
932141	*AC2-021*	*2.05*
930262	*AB1-065 E*	*2.07*
930261	*AB1-065 C*	*1.27*
929522	*U2-030 E*	*16.05*
924002	*AB2-041 E*	*5.01*
924001	*AB2-041 C*	*1.14*
923971	*AB2-038*	*0.22*
918812	*AA1-100 E*	*3.38*
918342	*AA1-047 E*	*18.6*
918341	*AA1-047 C*	*2.8*
917091	*Z2-013*	*0.37*
885642	*T-016 E*	*2.96*
292401	*K-028 E*	*9.9*
291409	*S-029B E*	*-0.07*
290302	*S-038 E*	*1.09*
290229	*S-014 E*	*22.02*
237507	*01CROSSCHOOL*	*0.4*
237319	*01FMR_U2-030*	*0.41*
237312	*01DANS_S-014*	*5.5*
236001	*01WARRIOR RN*	*9.51*
235854	*01KL_K28_T16*	*0.55*
235531	*01TR_U2-073A*	*0.42*
235530	*01TR_U2-073A*	*0.95*
235520	*01WVACO_S38*	*8.19*
235099	*U2-073B E*	*16.29*
235098	*U2-073A E*	*37.2*
235093	*N-047_E*	*9.28*

Appendix 7

Flowgate Information: Contingency – 01GARRET-AD1-068 TAP 138 kV line
PJM Queue Position: AD2-180

OPTION 1 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01GARRET-AD1-068 TAP 138 kV line (from bus 235469 to bus 934440 ckt 1) loads from 113.11% to 114.97% (**DC power flow**) of its emergency rating (191 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 7.86 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-
BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1        /* 01LKLYNN
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1        /* 01HAZELT
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  END
```

Appendix 7 – Continued from previous page

Flowgate Information: Contingency – 01GARRET-AD1-068 TAP 138 kV line
PJM Queue Position: AD2-180

OPTION 1 POI

Bus Number	Gen. Bus Name	Full Contribution
237312	01DANS_S-014	3.89
237319	01FMR_U2-030	0.29
235530	01TR_U2-073A	0.66
235531	01TR_U2-073A	0.29
236001	01WARRIOR RN	6.63
235520	01WVACO_S38	5.4
200890	26BF_G21_K23	9.44
200891	26CSLMN_L13	0.31
200840	26DEEPCRK1	0.79
200841	26DEEPCRK2	0.79
200835	26DSGENWIN	0.4
200846	26FORWARD	1.67
200892	26LOOKOUT	0.29
202225	26SCI_S29B	0.13
200889	26STNY CRK	0.19
200834	26SW_E13_K22	0.23
200813	26YOUGH	0.32
932001	AC2-004 C	1.48
932002	AC2-004 E	9.92
932141	AC2-021	1.35
932981	AC2-122 C	4.27
932982	AC2-122 E	6.97
933951	AD1-018 C	1.65
933952	AD1-018 E	2.7
937361	AD2-180 C	1.08
937362	AD2-180 E	6.78
LTF	AMIL	0.14
LTF	BAYOU	0.47
LTF	BIG_CAJUN1	0.72
LTF	BIG_CAJUN2	1.45
LTF	BLUEG	0.88
LTF	CALDERWOOD	0.24
LTF	CANNELTON	0.15
LTF	CATAWBA	0.13
LTF	CBM-N	0.25
LTF	CELEVELAND	0.37
LTF	CHEOAH	0.22
LTF	CHILHOWEE	0.08
LTF	CHOCTAW	0.48
LTF	CLIFTY	3.73
LTF	COTTONWOOD	1.87
LTF	DEARBORN	0.4
LTF	EDWARDS	0.26
LTF	ELMERSMITH	0.43
LTF	FARMERCITY	0.17

Bus Number	Gen. Bus Name	Full Contribution
LTF	G-007A	1.19
LTF	GIBSON	0.29
LTF	HAMLET	0.38
292340	K-022	0.04
292350	K-023	0.23
292401	K-028 E	5.16
292542	L-013 1	7.19
LTF	MORGAN	0.78
235093	N-047_E	6.12
LTF	NEWTON	0.65
LTF	NYISO	3.78
293902	O-048 E	6.47
294903	P-060 E	4.52
LTF	PRAIRIE	1.23
293432	R-040 E	0.4
LTF	ROWAN	0.25
290229	S-014 E	15.57
291409	S-029B E	0.14
290302	S-038 E	0.72
LTF	SANTEETLA	0.06
LTF	SMITHLAND	0.1
885642	T-016 E	1.54
LTF	TATANKA	0.3
LTF	TILTON	0.31
LTF	TRIMBLE	0.17
LTF	TVA	0.35
929522	U2-030 E	11.19
235098	U2-073A E	25.93
235099	U2-073B E	11.36
LTF	UNIONPOWER	0.31
LTF	VFT	3.23
913141	Y1-033 C OP1	0.23
913142	Y1-033 E OP1	9.02
917091	Z2-013	0.26
918331	AA1-046 C	1.3
918332	AA1-046 E	8.69
918341	AA1-047 C	1.95
918342	AA1-047 E	12.96
918812	AA1-100 E	2.36
930261	AB1-065 C	0.89
930262	AB1-065 E	1.44
923971	AB2-038	0.15
924001	AB2-041 C	0.79
924002	AB2-041 E	3.49
926991	AC1-186 C	1.29
926992	AC1-186 E	8.67

Appendix 8

Flowgate Information: Contingency – 01DANSMTN-01CARLOS 138 kV line
PJM Queue Position: AD2-180

OPTION 2 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01DANSMTN-01CARLOS 138 kV line (from line bus 237310 to line bus 235449 ckt 1) loads from 99.13% to 105.97% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 12.45 MW to the thermal violation.

CONTINGENCY 'AP-P2-3-MP-138-150' /* ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT

DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1 /* 01ALBRIG 138 01 106 J 138

DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1 /* 01LKLYNN 138 01 106 J 138

DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1 /* 01HAZELT 138 01 106 J 138

DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1 /* 01ALBRIG 138 01MTZION 138

DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1 /* 01ALBRIG 138 01SNOW T 138

DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1 /* 01ALBRIG 138 01DENVER 138

END

Appendix 8 – Continued from previous page

Flowgate Information: Contingency – 01DANSMTN-01CARLOS 138 kV line
PJM Queue Position: AD2-180

OPTION 2 POI

Bus Number	*Gen. Bus Name*	*Full Contribution*
LTF	*AMIL*	*0.03*
LTF	*BAYOU*	*0.06*
LTF	*BIG_CAJUN1*	*0.08*
LTF	*BIG_CAJUN2*	*0.17*
LTF	*BLUEG*	*0.19*
LTF	*CALDERWOOD*	*0.02*
LTF	*CANNELTON*	*0.03*
LTF	*CARR*	*0.23*
LTF	*CBM-S2*	*0.12*
LTF	*CHEOAH*	*0.01*
LTF	*CHILHOWEE*	*< 0.01*
LTF	*CHOCTAW*	*0.05*
LTF	*CLIFTY*	*0.84*
LTF	*COTTONWOOD*	*0.23*
LTF	*CPLE*	*0.06*
LTF	*DEARBORN*	*0.15*
LTF	*EDWARDS*	*0.06*
LTF	*ELMERSMITH*	*0.09*
LTF	*FARMERCITY*	*0.03*
LTF	*G-007A*	*< 0.01*
LTF	*GIBSON*	*0.06*
LTF	*MORGAN*	*0.08*
LTF	*NEWTON*	*0.14*
LTF	*O-066*	*0.04*
LTF	*PRAIRIE*	*0.24*
LTF	*RENSSELAER*	*0.18*
LTF	*ROSETON*	*1.34*
LTF	*SANTEETLA*	*< 0.01*
LTF	*SMITHLAND*	*0.02*
LTF	*TATANKA*	*0.06*
LTF	*TILTON*	*0.07*
LTF	*TRIMBLE*	*0.04*

Bus Number	*Gen. Bus Name*	*Full Contribution*
LTF	*TVA*	*0.04*
LTF	*UNIONPOWER*	*< 0.01*
937362	*AD2-180 E O2*	*10.75*
937361	*AD2-180 C O2*	*1.71*
934932	*AD1-125 E*	*7.06*
934931	*AD1-125 C*	*1.22*
932141	*AC2-021*	*1.95*
930262	*AB1-065 E*	*2.06*
930261	*AB1-065 C*	*1.26*
929522	*U2-030 E*	*15.92*
924002	*AB2-041 E*	*4.97*
924001	*AB2-041 C*	*1.13*
923971	*AB2-038*	*0.22*
918812	*AA1-100 E*	*3.36*
918342	*AA1-047 E*	*18.45*
918341	*AA1-047 C*	*2.78*
917091	*Z2-013*	*0.37*
885642	*T-016 E*	*2.49*
292401	*K-028 E*	*8.31*
291409	*S-029B E*	*-0.06*
290302	*S-038 E*	*1.04*
290229	*S-014 E*	*23.18*
237507	*01CROSSCHOOL*	*0.38*
237319	*01FMR_U2-030*	*0.41*
237312	*01DANS_S-014*	*5.8*
236001	*01WARRIOR RN*	*9.44*
235854	*01KL_K28_T16*	*0.46*
235531	*01TR_U2-073A*	*0.42*
235530	*01TR_U2-073A*	*0.94*
235520	*01WVACO_S38*	*7.82*
235099	*U2-073B E*	*16.17*
235098	*U2-073A E*	*36.91*
235093	*N-047_E*	*8.86*

Appendix 9

Flowgate Information: Contingency – 01PARSNS-01LOUGHL 138 kV Line
PJM Queue Position: AD2-180

OPTION 2 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01PARSNS-01LOUGHL 138 kV line (from bus 235385 to bus 235362 ckt 1) loads from 118.06% to 132.71% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 18.59 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                    /* ALBRIGHT BREAKER
FAILURE - TIE BREAKER
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1        /* 01ALBRIG
138 01BRANDN 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1        /* 01ALBRIG
138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1        /* 01ALBRIG
138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG
138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG
138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  END
```

Appendix 9 – Continued from previous page

Flowgate Information: Contingency – 01PARSNS-01LOUGHL 138 kV Line
PJM Queue Position: AD2-180

OPTION 2 POI

Bus Number	Gen. Bus Name	Full Contribution
LTF	AMIL	0.07
LTF	BAYOU	0.25
LTF	BIG_CAJUN1	0.38
LTF	BIG_CAJUN2	0.76
LTF	BLUEG	0.46
LTF	CALDERWOOD	0.13
LTF	CANNELTON	0.08
LTF	CATAWBA	0.07
LTF	CBM-N	0.05
LTF	CELEVELAND	0.19
LTF	CHEOAH	0.12
LTF	CHILHOWEE	0.04
LTF	CHOCTAW	0.25
LTF	CLIFTY	2
LTF	COTTONWOOD	0.98
LTF	DEARBORN	0.18
LTF	EDWARDS	0.13
LTF	ELMERSMITH	0.22
LTF	FARMERCITY	0.09
LTF	G-007A	0.5
LTF	GIBSON	0.15
LTF	HAMLET	0.19
LTF	MORGAN	0.41
LTF	NEWTON	0.33
LTF	NYISO	0.69
LTF	PRAIRIE	0.64
LTF	ROWAN	0.13
LTF	SANTEETLA	0.03
LTF	SMITHLAND	0.05

Bus Number	Gen. Bus Name	Full Contribution
LTF	TATANKA	0.15
LTF	TILTON	0.16
LTF	TRIMBLE	0.09
LTF	TVA	0.19
LTF	UNIONPOWER	0.16
LTF	VFT	1.34
937362	AD2-180 E O2	16.04
937361	AD2-180 C O2	2.55
934932	AD1-125 E	16.54
934931	AD1-125 C	2.85
933952	AD1-018 E	0.92
933951	AD1-018 C	0.56
932141	AC2-021	0.89
925971	AC1-073 C	-0.63
920072	AA2-103 E	11.99
918812	AA1-100 E	0.71
918462	AA1-062 E	116.93
918461	AA1-062 C	17.39
885642	T-016 E	4.39
292401	K-028 E	14.67
292310	K-019	1.36
290302	S-038 E	0.47
290229	S-014 E	3.42
237512	01ROTHROCK	0.67
237312	01DANS_S-014	0.85
235854	01KL_K28_T16	0.81
235625	01BACKB	31.66
235520	01WVACO_S38	3.56
235093	N-047_E	4.03
235091	U2-061_E	26.08

Appendix 10

Flowgate Information: Contingency – 01WILLIM-01PARSNS 138 kV line
PJM Queue Position: AD2-180

OPTION 2 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01WILLIM-01PARSNS 138 kV line (from bus 235427 to bus 235385 ckt 1) loads from 121.75% to 136.39% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 18.59 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-4-MP-138-200'                    /* ALBRIGHT BREAKER
FAILURE - TIE BREAKER
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235304 CKT 1        /* 01ALBRIG
138 01BRANDN 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235356 CKT 1        /* 01ALBRIG
138 01KINGWD 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235398 CKT 1        /* 01ALBRIG
138 01RUTHBL 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG
138 AD1-068 TAP 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235485 CKT 1        /* 01ALBRIG
138 01METTIK 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  END
```

Appendix 10 – Continued from previous page

Flowgate Information: Contingency – 01WILLIM-01PARSNS 138 kV line
PJM Queue Position: AD2-180

OPTION 2 POI

Bus Number	Gen. Bus Name	Full Contribution
LTF	AMIL	0.07
LTF	BAYOU	0.25
LTF	BIG_CAJUN1	0.38
LTF	BIG_CAJUN2	0.76
LTF	BLUEG	0.46
LTF	CALDERWOOD	0.13
LTF	CANNELTON	0.08
LTF	CATAWBA	0.07
LTF	CBM-N	0.05
LTF	CELEVELAND	0.19
LTF	CHEOAH	0.12
LTF	CHILHOWEE	0.04
LTF	CHOCTAW	0.25
LTF	CLIFTY	2
LTF	COTTONWOOD	0.98
LTF	DEARBORN	0.18
LTF	EDWARDS	0.13
LTF	ELMERSMITH	0.22
LTF	FARMERCITY	0.09
LTF	G-007A	0.5
LTF	GIBSON	0.15
LTF	HAMLET	0.19
LTF	MORGAN	0.41
LTF	NEWTON	0.33
LTF	NYISO	0.69
LTF	PRAIRIE	0.64
LTF	ROWAN	0.13
LTF	SANTEETLA	0.03
LTF	SMITHLAND	0.05

Bus Number	Gen. Bus Name	Full Contribution
LTF	TATANKA	0.15
LTF	TILTON	0.16
LTF	TRIMBLE	0.09
LTF	TVA	0.19
LTF	UNIONPOWER	0.16
LTF	VFT	1.34
937362	AD2-180 E O2	16.04
937361	AD2-180 C O2	2.55
934932	AD1-125 E	16.54
934931	AD1-125 C	2.85
933952	AD1-018 E	0.92
933951	AD1-018 C	0.56
932141	AC2-021	0.89
925971	AC1-073 C	-0.63
920072	AA2-103 E	11.99
918812	AA1-100 E	0.71
918462	AA1-062 E	116.93
918461	AA1-062 C	17.39
885642	T-016 E	4.39
292401	K-028 E	14.67
292310	K-019	1.36
290302	S-038 E	0.47
290229	S-014 E	3.42
237512	01ROTHROCK	0.67
237312	01DANS_S-014	0.85
235854	01KL_K28_T16	0.81
235625	01BACKB	31.66
235520	01WVACO_S38	3.56
235093	N-047_E	4.03
235091	U2-061_E	26.08

Appendix 11

Flowgate Information: Contingency – 01GARRET-AD1-068 TAP 138 kV line
PJM Queue Position: AD2-180

OPTION 2 POI

This appendix contains additional information about the flowgate presented in the body of the report. The intent of this 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.

(AP - AP) The 01GARRET-AD1-068 TAP 138 kV line (from bus 235469 to bus 934440 ckt 1) loads from 113.11% to 115.05% (**DC power flow**) of its emergency rating (191 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-150'. This project contributes approximately 8.21 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-150'                    /* ALBRIGHT-
BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235305 CKT 1        /* 01ALBRIG
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235122 TO BUS 235305 CKT 1        /* 01LKLYNN
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235297 TO BUS 235305 CKT 1        /* 01HAZELT
138 01 106 J 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235492 CKT 1        /* 01ALBRIG
138 01MTZION 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235402 CKT 1        /* 01ALBRIG
138 01SNOW T 138
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1        /* 01ALBRIG
138 01DENVER 138
  END
```

Appendix 11 – Continued from previous page

Flowgate Information: Contingency – 01GARRET-AD1-068 TAP 138 kV line
PJM Queue Position: AD2-180

OPTION 2 POI

Bus Number	Gen. Bus Name	Full Contribution
LTF	AMIL	0.14
LTF	BAYOU	0.47
LTF	BIG_CAJUN1	0.72
LTF	BIG_CAJUN2	1.45
LTF	BLUEG	0.88
LTF	CALDERWOOD	0.24
LTF	CANNELTON	0.15
LTF	CATAWBA	0.13
LTF	CBM-N	0.25
LTF	CELEVELAND	0.37
LTF	CHEOAH	0.22
LTF	CHILHOWEE	0.08
LTF	CHOCTAW	0.48
LTF	CLIFTY	3.73
LTF	COTTONWOOD	1.87
LTF	DEARBORN	0.4
LTF	EDWARDS	0.26
LTF	ELMERSMITH	0.43
LTF	FARMERCITY	0.17
LTF	G-007A	1.19
LTF	GIBSON	0.29
LTF	HAMLET	0.38
LTF	MORGAN	0.78
LTF	NEWTON	0.65
LTF	NYISO	3.78
LTF	PRAIRIE	1.23
LTF	ROWAN	0.25
LTF	SANTEETLA	0.06
LTF	SMITHLAND	0.1
LTF	TATANKA	0.3
LTF	TILTON	0.31
LTF	TRIMBLE	0.17
LTF	TVA	0.35
LTF	UNIONPOWER	0.31
LTF	VFT	3.23
937362	AD2-180 E O2	7.08
937361	AD2-180 C O2	1.13
933952	AD1-018 E	2.7
933951	AD1-018 C	1.65
932982	AC2-122 E	6.97
932981	AC2-122 C	4.27
932141	AC2-021	1.35
932002	AC2-004 E	9.92
932001	AC2-004 C	1.48
930262	AB1-065 E	1.44

Bus Number	Gen. Bus Name	Full Contribution
930261	AB1-065 C	0.89
929522	U2-030 E	11.19
926992	AC1-186 E	8.67
926991	AC1-186 C	1.29
924002	AB2-041 E	3.49
924001	AB2-041 C	0.79
923971	AB2-038	0.15
918812	AA1-100 E	2.36
918342	AA1-047 E	12.96
918341	AA1-047 C	1.95
918332	AA1-046 E	8.69
918331	AA1-046 C	1.3
917091	Z2-013	0.26
913142	Y1-033 E OP1	9.02
913141	Y1-033 C OP1	0.23
885642	T-016 E	1.54
294903	P-060 E	4.52
293902	O-048 E	6.47
293432	R-040 E	0.4
292542	L-013 1	7.19
292401	K-028 E	5.16
292350	K-023	0.23
292340	K-022	0.04
291409	S-029B E	0.14
290302	S-038 E	0.72
290229	S-014 E	15.57
237319	01FMR_U2-030	0.29
237312	01DANS_S-014	3.89
236001	01WARRIOR RN	6.63
235531	01TR_U2-073A	0.29
235530	01TR_U2-073A	0.66
235520	01WVACO_S38	5.4
235099	U2-073B E	11.36
235098	U2-073A E	25.93
235093	N-047_E	6.12
202225	26SCI_S29B	0.13
200892	26LOOKOUT	0.29
200891	26CSLMN_L13	0.31
200890	26BF_G21_K23	9.44
200889	26STNY CRK	0.19
200846	26FORWARD	1.67
200841	26DEEPCRK2	0.79
200840	26DEEPCRK1	0.79
200835	26DSGENWIN	0.4
200834	26SW_E13_K22	0.23
200813	26YOUGH	0.32

Appendix 12
PJM Primary POI Power Flow Results Summary
PJM Queue Position: AD1-180

Table 1: PJM Summer Peak Transmission Analysis

Contingency Description	Overloaded Element	Rating (MVA)	% Loading After [QUEUE]	Final % Loading	FE Comments/Reinforcements
Albright 138 kV North Bus	William – Parsons 138 kV Line	179	94.4%	100.65%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright – Brandonville 106 Junction Breaker Failure at Albright	Dans Mountain – Carlos 138 kV Line	182	99.13%	105.79%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright – Brandonville 106 Junction Breaker Failure at Albright	Garrett – AD1-068 Tap 138 kV Line	191	113.11%	114.97%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Loughs Lane – Parsons 138 kV Line	179	118.06%	132.97%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	William – Parsons 138 kV Line	179	121.75%	133.66%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	Loughs Lane – Parsons 138 kV Line	179	115.74%	126.39%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	William – Parsons 138 kV Line	179	119.43%	130.08%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Oak Park – Kelso Gap Breaker Failure at Albright	Loughs Lane – Parsons 138 kV Line	179	115.83%	123.01%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Oak Park – Kelso Gap Breaker Failure at Albright	William – Parsons 138 kV Line	179	119.57%	126.75%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Oak Park – Kelso Gap 138 kV Line	Elk Garden – Parr Run 138 kV Line	229	56.17%	104.2%	Non-Direct Connection CT and relay setting change at Parr Run will increase emergency rating of Elk Garden – Parr Run 138 kV line to 268 MVA.

Appendix 12 – Continued from previous page

FirstEnergy Primary POI Power Flow Results Summary
PJM Queue Position: AD1-180

Table 2: FirstEnergy Summer Peak Transmission <100 kV Analysis

Contingency Description	Overloaded Element	Rating (MVA)	% Loading After [QUEUE]	Final % Loading	[QUEUE] MW Contrib.	FE Comments/Reinforcements
Albright – Brandonville 106 Junction Breaker Failure at Albright	Snowy Creek 138-69 kV Transformer	36	13.17%	154.37%	24.30	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright – Denver Breaker Failure at Albright	Snowy Creek 138-69 kV Transformer	36	13.17%	149.74%	23.82	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Snowy Creek 138-69 kV Transformer	36	2.94%	141.99%	23.21	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Rowlesburg Tap – Presco 69 kV Line	33	35.30%	129.15%	12.15	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	Rowlesburg Tap – Presco 69 kV Line	33	36.06%	124.52%	11.77	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Snowy Creek – Rowlesburg Tap 69 kV Line	42	24.00%	105.21%	12.15	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	Snowy Creek – Rowlesburg Tap 69 kV Line	42	24.60%	101.58%	11.77	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme

Appendix 13

PJM Secondary POI Power Flow Results Summary
PJM Queue Position: AD1-180

Table 1: PJM Summer Peak Transmission Analysis

Contingency Description	Overloaded Element	Rating (MVA)	% Loading After [QUEUE]	Final % Loading	FE Comments/Reinforcements
Albright 138 kV North Bus	William – Parsons 138 kV Line	179	94.4%	100.59%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright – Brandonville 106 Junction Breaker Failure at Albright	Dans Mountain – Carlos 138 kV Line	182	99.13%	105.97%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright – Brandonville 106 Junction Breaker Failure at Albright	Garrett – AD1-068 Tap 138 kV Line	191	113.11%	115.05%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Loughs Lane – Parsons 138 kV Line	179	118.06%	132.71%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	William – Parsons 138 kV Line	179	121.75%	136.39%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	Loughs Lane – Parsons 138 kV Line	179	115.74%	126.12%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	William – Parsons 138 kV Line	179	119.43%	129.81%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Oak Park – Kelso Gap Breaker Failure at Albright	Loughs Lane – Parsons 138 kV Line	179	115.83%	123.01%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Oak Park – Kelso Gap Breaker Failure at Albright	William – Parsons 138 kV Line	179	119.57%	126.75%	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Oak Park – Kelso Gap 138 kV Line	AD2-180 Tap – Parr Run 138 kV Line	229	56.17%	104.2%	Non-Direct Connection CT and relay setting change at Parr Run will increase emergency rating of AD2-180 Tap – Parr Run 138 kV line to 268 MVA.

Appendix 12 – Continued from previous page

FirstEnergy Secondary POI Power Flow Results Summary
PJM Queue Position: AD1-180

Table 2: FirstEnergy Summer Peak Transmission <100 kV Analysis

Contingency Description	Overloaded Element	Rating (MVA)	% Loading After [QUEUE]	Final % Loading	[QUEUE] MW Contrib.	FE Comments/Reinforcements
Albright – Brandonville 106 Junction Breaker Failure at Albright	Snowy Creek 138-69 kV Transformer	36	13.17%	154.37%	24.30	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright – Denver Breaker Failure at Albright	Snowy Creek 138-69 kV Transformer	36	13.17%	149.74%	23.82	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Snowy Creek 138-69 kV Transformer	36	2.94%	141.99%	23.21	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Rowlesburg Tap – Presco 69 kV Line	33	35.30%	129.15%	12.15	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	Rowlesburg Tap – Presco 69 kV Line	33	36.06%	124.52%	11.77	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV Breaker Failure – Tie Breaker	Snowy Creek – Rowlesburg Tap 69 kV Line	42	24.00%	105.21%	12.15	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme
Albright 138 kV South Bus	Snowy Creek – Rowlesburg Tap 69 kV Line	42	24.60%	101.58%	11.77	Convert Albright 138 kV Substation to Breaker-and-a-Half Scheme

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