Generation Interconnection Feasibility Study Report Queue Position AD1-068

Albright – Garrett 138 kV

General

"Interconnection Customer" has proposed a new wind generation facility located in Preston County, West Virginia. The requested Maximum Facility Output is 80 MWs with 11.76 MW being recognized by PJM as Capacity Interconnection Rights (CIR). The proposed in-service date for this project is September 30, 2020. **This study does not imply a Monongahela Power ("MonPower" or "Transmission Owner") commitment to this in-service date.**

Point of Interconnection ("POI")

This project will interconnect with the MonPower distribution system by tapping the Albright-Garrett 138 kV transmission line at a point located approximately 6.4 miles east of Albright substation and 9 miles west of Garrett substation. A new three breaker ring bus station will be built adjacent to the line (within one span) and the POI will be at the exist side of the substation to the wind facility. For system configuration please refer to the one-line diagram in Appendix 2.

Network Impacts

The Queue Project AD1-068 was evaluated as a 80.0 MW (Capacity 11.8 MW) injection tapping Albright to Garrett 138kV line in the APS area. Project AD1-068 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-068 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 01DANSMTN-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 93.9% to 118.42% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 44.64 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 3 for a table containing the generators having contribution to this flowgate and to Appendix 5 for FirstEnergy Analysis confirming PJM findings.

2. (AP - AP) The 01DANSMTN-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 93.55% to 118.24% (**DC power flow**) of its emergency rating (182 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 44.94 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 01DANSMTN-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 93.43% to 117.99% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-159'. This project contributes approximately 44.7 MW to the thermal violation.

```
CONTINGENCY 'AP-P2-3-MP-138-159'                    /* ALBRIGHT-DENVER STK BKR AT ALBRIGHT
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 235320 CKT 1      /* 01ALBRIG 138 01DENVER 138
  DISCONNECT BRANCH FROM BUS 235320 TO BUS 235810 CKT 1      /* 01DENVER 138 01INT COAL 138
  DISCONNECT BRANCH FROM BUS 235338 TO BUS 235810 CKT 1      /* 01GRAFTN 138 01INT COAL 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 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
  END
```

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. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 148.5% to 166.89% (**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 32.64 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
```

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate and Appendix 5 for FirstEnergy Analysis confirming PJM findings.

2. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 137.58% to 143.1% (**DC power flow**) of its emergency rating (179 MVA) for the tower line contingency outage of 'AP-P7-1-PE-138-014'. This project contributes approximately 9.68 MW to the thermal violation.

```
CONTINGENCY 'AP-P7-1-PE-138-014'                    /* 111
  DISCONNECT BRANCH FROM BUS 235454 TO BUS 235558 CKT 1      /* 01CUMBRL 138 01SHORTG 138
  DISCONNECT BRANCH FROM BUS 235484 TO BUS 235504 CKT 1      /* 01MESSCK 138 01RIDGLY 138
  END
```

3. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 129.25% to 134.38% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'PN-P2-3-PN-230-20A'. This project contributes approximately 9.03 MW to the thermal violation.

```
CONTINGENCY 'PN-P2-3-PN-230-20A'                    /* 585
  DISCONNECT BRANCH FROM BUS 200793 TO BUS 200833 CKT 1      /* 26SEWARD 2 230 26SEWRDB34 22
  DISCONNECT BRANCH FROM BUS 200741 TO BUS 200793 CKT 11     /* 26SEWARD 115 26SEWARD 2 230
  DISCONNECT BRANCH FROM BUS 200741 TO BUS 200793 CKT 9      /* 26SEWARD 115 26SEWARD 2 230
  END
```

4. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 122.86% to 127.99% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'PN-P2-2-PN-230-018'. This project contributes approximately 9.04 MW to the thermal violation.

```
CONTINGENCY 'PN-P2-2-PN-230-018'                    /* SEWARD 230KV BUS FAULT
  DISCONNECT BRANCH FROM BUS 200793 TO BUS 200741 CKT 9      /* 26SEWARD 2 230 26SEWARD 115
  DISCONNECT BRANCH FROM BUS 200793 TO BUS 200741 CKT 11     /* 26SEWARD 2 230 26SEWARD 115
  END
```

5. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 123.01% to 125.09% (**DC power flow**) of its emergency rating (179 MVA) for the tower line contingency outage of 'PN-P7-1-PN-230-001'. This project contributes approximately 8.0 MW to the thermal violation.

```
CONTINGENCY 'PN-P7-1-PN-230-001'                    /* HOMER CITY - HOOVERSVILLE 230KV & SEWARD -
TOWER 51 115KV
  DISCONNECT BRANCH FROM BUS 200767 TO BUS 200768 CKT 1      /* 26HOMER CT 230 26QUEMAHON 230
  DISCONNECT BRANCH FROM BUS 200768 TO BUS 200796 CKT 1      /* 26QUEMAHON 230 26HOOVRSVL 230
  DISCONNECT BRANCH FROM BUS 200796 TO BUS 200743 CKT 3      /* 26HOOVRSVL 230 26HOOVERSV 115
  DISCONNECT BRANCH FROM BUS 200741 TO BUS 200742 CKT 1      /* 26SEWARD 115 26TOWER 51 115
  END
```

Steady-State Voltage Requirements

To be determined during later study phases

Short Circuit

There are no Monongahela Power transmission circuit breakers that will exceed their interrupting capability with the implementation of this interconnection project.

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 01DANSMTN-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 92.83% to 117.69% (**DC power flow**) of its emergency rating (182 MVA) for the single line contingency outage of 'AP-P1-2-MP-138-160-A'. This project contributes approximately 45.25 MW to the thermal violation.

```
CONTINGENCY 'AP-P1-2-MP-138-160-A'                    /* 1518
  DISCONNECT BRANCH FROM BUS 235120 TO BUS 934440 CKT 1        /* 01ALBRIG 138 AD1-068 TAP 138
  END
```

2. (AP - AP) The AD1-068 TAP-01ALBRIG 138 kV line (from bus 934440 to bus 235120 ckt 1) loads from 136.9% to 172.33% (**DC power flow**) of its emergency rating (191 MVA) for the single line contingency outage of 'PN-P1-2-PN-115-068'. This project contributes approximately 67.71 MW to the thermal violation.

```
CONTINGENCY 'PN-P1-2-PN-115-068'                    /* ROCKWOOD - SOMERSET 115KV
  DISCONNECT BRANCH FROM BUS 200744 TO BUS 200746 CKT 1        /* 26SOMERST 115 26ROCKWOOD 115
  DISCONNECT BRANCH FROM BUS 200746 TO BUS 200773 CKT 1        /* 26ROCKWOOD 115 26ROCKWOOD 23
  END
```

3. (AP - AP) The AD1-068 TAP-01ALBRIG 138 kV line (from bus 934440 to bus 235120 ckt 1) loads from 99.3% to 136.66% (**DC power flow**) of its normal rating (164 MVA) for non-contingency condition. This project contributes approximately 61.28 MW to the thermal violation.

4. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 141.87% to 148.16% (**DC power flow**) of its normal rating (148 MVA) for non-contingency condition. This project contributes approximately 9.15 MW to the thermal violation.

Light Load Analysis - 2021

Not required for this project

Please refer to Appendix 5 for FirstEnergy Contingency Analysis Results.

System Reinforcements

Short Circuit

No circuit breaker reinforcements will be required.

Stability and Reactive Power Requirement

To be determined during later study phases

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 01DANSMTN-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 93.9% to 118.42% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 44.64 MW to the thermal violation.

APS:
In conjunction with AD1-125 generation project, the reconfiguration of the Albright substation eliminates the P2 contingency at Albright. The estimated cost of the reconfiguration is less than the combined estimated cost of the reconductors and line upgrades for both projects. Again, this fixes the contingencies identified. Cost estimate and timeframe will be provided in the feasibility report, and PJM will be responsible for allocating costs. Furthermore, the affected line overload is also represented in the Delivery of Energy Portion of this report, for the single contingency loss of the Albright – AD1-068 Tap line. This contingency is the equivalent to the Albright stuck breaker or bus contingencies with very similar results. Therefore, PJM will allow the Generator the option to fix the overload or redispatch.

Please refer to Appendix 6 for a conceptual one-line diagram

2. (AP - AP) The 01DANSMTN-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 93.55% to 118.24% (**DC power flow**) of its emergency rating (182 MVA) for the bus fault outage of 'AP-P2-2-MP-138-101'. This project contributes approximately 44.94 MW to the thermal violation.

Same as Multiple Facility #1

3. (AP - AP) The 01DANSMTN-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 93.43% to 117.99% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-3-MP-138-159'. This project contributes approximately 44.7 MW to the thermal violation.

Same as Multiple Facility #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)

1. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 148.5% to 166.89% (**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 32.64 MW to the thermal violation.

APS:
The upgrade is to rebuild the Rockwood-Somerset 115kV Line, approximately 8.12 miles of 795 ACSS high temperature conductor; replace the Rockwood 115kV breaker, line trap, terminal conductor, and line relaying at Somerset Substation; replace Somerset 115kV Wave trap, line conductor, and line relaying at Rockwood Substation. The cost to perform this upgrade is $21,528,900 (w/o Tax: 15,215,800).

Please refer to Appendix 7 for a conceptual one-line diagram.

2. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 137.58% to 143.1% (**DC power flow**) of its emergency rating (179 MVA) for the tower line contingency outage of 'AP-P7-1-PE-138-014'. This project contributes approximately 9.68 MW to the thermal violation.

Same as Contribution to Previously Identified #1

3. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 129.25% to 134.38% (**DC power flow**) of its emergency rating (179 MVA) for the line fault with failed breaker contingency outage of 'PN-P2-3-PN-230-20A'. This project contributes approximately 9.03 MW to the thermal violation.

Same as Contribution to Previously Identified #1

4. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 122.86% to 127.99% (**DC power flow**) of its emergency rating (179 MVA) for the bus fault outage of 'PN-P2-2-PN-230-018'. This project contributes approximately 9.04 MW to the thermal violation.

Same as Contribution to Previously Identified #1

5. (PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 123.01% to 125.09% (**DC power flow**) of its emergency rating (179 MVA) for the tower line contingency outage of 'PN-P7-1-PN-230-001'. This project contributes approximately 8.0 MW to the thermal violation.

Same as Contribution to Previously Identified #1

Light Load Load Flow Analysis Reinforcements

None

Appendix 3

Flowgate Information: Contingency - Albright Breaker Failure - Tie Breaker
PJM Queue Position: AD1-068

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-01RIDGLY 138 kV line (from bus 237310 to bus 235504 ckt 1) loads from 93.9% to 118.42% (**DC power flow**) of its emergency rating (182 MVA) for the line fault with failed breaker contingency outage of 'AP-P2-4-MP-138-200'. This project contributes approximately 44.64 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
```

Bus Number	***Bus Name***	***Full Contribution***
200813	*26YOUGH*	*0.37*
200834	*26SW_E13_K22*	*0.28*
200835	*26DSGENWIN*	*0.47*
200840	*26DEEPCRK1*	*0.92*
200841	*26DEEPCRK2*	*0.92*
200846	*26FORWARD*	*1.75*
200889	*26STNY CRK*	*0.23*
200890	*26BF_G21_K23*	*9.76*
200891	*26CSLMN_L13*	*0.36*
200892	*26LOOKOUT*	*0.35*
202225	*26SCI_S29B*	*0.16*
237312	*01DANS_S-014*	*10.83*
290229	*S-014 E*	*43.32*
291409	*S-029B E*	*0.15*
292340	*K-022*	*0.05*
292350	*K-023*	*0.27*
292542	*L-013 1*	*7.43*
293432	*R-040 E*	*0.42*
293902	*O-048 E*	*6.69*
294903	*P-060 E*	*4.71*
913141	*Y1-033 C OP1*	*0.27*
913142	*Y1-033 E OP1*	*9.32*
917672	*Z2-108 E*	*4.18*
918331	*AA1-046 C*	*1.35*
918332	*AA1-046 E*	*9.04*
918812	*AA1-100 E*	*1.64*
926991	*AC1-186 C*	*1.36*
926992	*AC1-186 E*	*9.1*
932001	*AC2-004 C*	*1.53*
932002	*AC2-004 E*	*10.26*
932981	*AC2-122 C*	*4.41*
932982	*AC2-122 E*	*7.2*
933951	*AD1-018 C*	*1.17*
933952	*AD1-018 E*	*1.91*
934441	***AD1-068 C***	***6.56***
934442	***AD1-068 E***	***38.08***

Appendix 4

Flowgate Information: Contingency – Albright-138-South
PJM Queue Position: AD1-068

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.

(PENELEC - PENELEC) The 26ROCKWOOD-26SOMERST 115 kV line (from bus 200746 to bus 200744 ckt 1) loads from 148.5% to 166.89% (**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 32.64 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
```

Bus Number	*Bus Name*	*Full Contribution*
237312	*01DANS_S-014*	*2.69*
200813	*26YOUGH*	*0.78*
200835	*26DSGENWIN*	*1.54*
200840	*26DEEPCRK1*	*0.96*
200841	*26DEEPCRK2*	*0.96*
200890	*26BF_G21_K23*	*31.64*
200891	*26CSLMN_L13*	*1.18*
200892	*26LOOKOUT*	*1.12*
235098	*U2-073A E*	*14.83*
235099	*U2-073B E*	*6.49*
235530	*01TR_U2-073A*	*0.43*
235531	*01TR_U2-073A*	*0.19*
236001	*01WARRIOR RN*	*4.95*
237319	*01FMR_U2-030*	*0.17*
290229	*S-014 E*	*10.77*
291409	*S-029B E*	*-0.16*
292350	*K-023*	*0.89*
292542	*L-013 1*	*24.11*
293432	*R-040 E*	*1.36*
293902	*O-048 E*	*21.7*
913141	*Y1-033 C OP1*	*0.71*
913142	*Y1-033 E OP1*	*24.11*
917091	*Z2-013*	*0.17*
917231	*Z2-038 C*	*1*
917232	*Z2-038 E*	*1.61*
917672	*Z2-108 E*	*13.56*
918812	*AA1-100 E*	*1.54*
923971	*AB2-038*	*0.1*
924001	*AB2-041 C*	*0.45*
924002	*AB2-041 E*	*2*
929522	*U2-030 E*	*5.83*
932001	*AC2-004 C*	*4.97*
932002	*AC2-004 E*	*33.26*
932981	*AC2-122 C*	*14.31*
932982	*AC2-122 E*	*23.35*
933951	*AD1-018 C*	*1.14*
933952	*AD1-018 E*	*1.86*
934441	***AD1-068 C***	***4.8***
934442	***AD1-068 E***	***27.84***

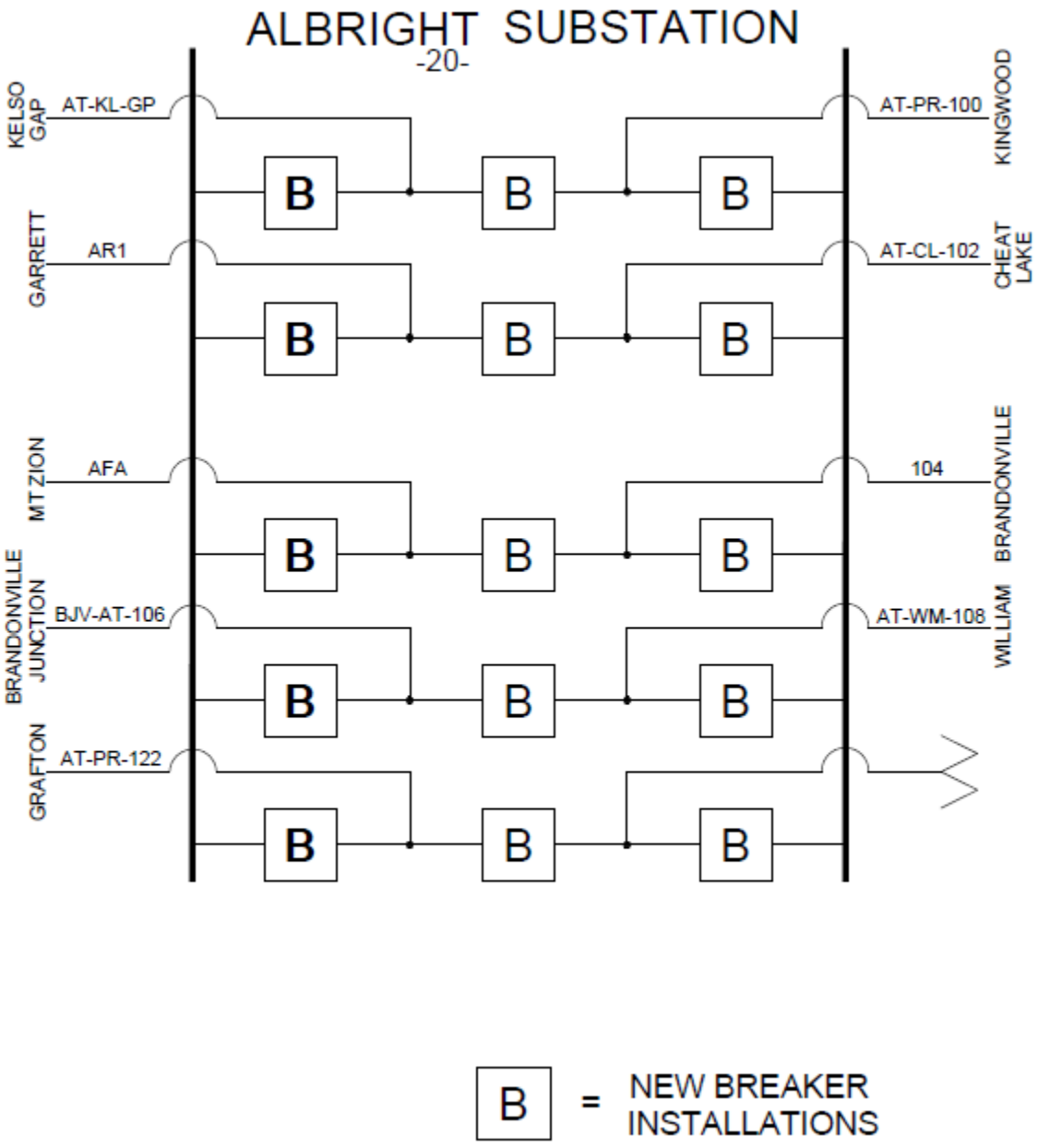
Appendix 5

FirstEnergy Contingency Analysis Results
PJM Queue Position: AD1-068

Overloaded Facility	Contingency Description	Rating (MVA)	% Loading	Reinforcement
Dan's Mountain-Ridgeley 138 kV line	Albright Substation Tie Breaker Failure	182 MVA	**118.42%**	**Proposed Upgrade:** Convert Albright 138 kV Substation to Breaker and a Half Scheme
Rockwood-Somerset 115 kV Line	Albright Substation 138 kV South Bus Fault	179 MVA	**166.89%**	**Proposed Upgrade:** Rebuild the Rockwood-Somerset 115 kV line with 795 ACSS.
Carlos Junction to Garret 138 kV	ALBRIGHT-BRANDONVILLE 106 JCT. STK BKR AT ALBRIGHT	172 MVA*	**102.05%***	**Proposed Upgrade:** N/A since actual line rating is 206 MVA STE

Appendix 6

Network Facility Reinforcement Conceptual One Line Diagrams
PJM Queue Position: AD1-068



Appendix 7

Network Facility Reinforcement Conceptual One Line Diagram
PJM Queue Position: AD1-068

Rockwood – Somerset line