Generation Interconnection Feasibility Study Report Queue Position AC1-055

General

The Interconnection Customer has proposed an ***uprate*** to prior queue project AA2-119 consisting of 1 x 1 single shaft combined cycle natural gas generation facility located approximately 1.5 miles southeast of Glen Falls substation in Harrison County, West Virginia. The increased capability associated with queue position AC1-055 is achieved through improved efficiencies that maximizes the utilization of existing plant equipment. AC1-055 will increase the Maximum Facility Output from 550.0 MW to 580.0 MW, as follows:

- AA2-119 requested 550.0 MW Energy (MFO) and 550.0 MW Capacity Interconnection Rights (CIRs);
- AC1-055 requested an uprate of 30.0 MW Energy and 30.0 MW CIRs; and
- Both projects combined, AA2-119 and AC1-005, will have a total capability of 580.0 MW Energy (MFO) and 580.0 MW CIRs.

The proposed in-service date for the AC1-055 project is 6-1-2020. Note that this is the same in-service date for all three queue projects AA2-119. **This study does not imply a Monongahela Power Company ("Transmission Owner" or "Mon Power) to this in-service date.**

Point of Interconnection

AC1-055 *will interconnect with the Mon Power transmission system at the Glen Falls 138 kV substation, at the same POI of prior project AA2-119. Please refer to the single-line diagram in Appendix 2 for system configuration.*

Network Impacts

The Queue Project AC1-055 was evaluated as a 30.0 MW (Capacity 30.0 MW) injection increase into Glen Falls 138 kV substation in the APS area. Project AC1-055 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-055 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2020

Generator Deliverability

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

1. (AP - AP) The 01GLENFL-01NATLCN 138 kV line (from bus 235334 to bus 235375 ckt 1) loads from 98.69% to 103.34% (**DC power flow**) of its emergency rating (143 MVA) for the single line contingency outage of 'B2-MP-138-073'. This project contributes approximately 6.64 MW to the thermal violation.

```
CONTINGENCY 'B2-MP-138-073'                          /* 1836
  DISCONNECT BRANCH FROM BUS 235334 TO BUS 235380 CKT 1
                                  /* 01GLENFL 138 01OAKMND 138
  END
```

2. (AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 99.06% to 102.65% (**DC power flow**) of its emergency rating (192 MVA) for the single line contingency outage of 'B2-MP-138-023'. This project contributes approximately 6.88 MW to the thermal violation.

```
CONTINGENCY 'B2-MP-138-023'          /* 235417 01VARNER 138 235432 01WALDORN 138 1
  DISCONNECT BRANCH FROM BUS 235334 TO BUS 235812 CKT 1
                                    /* 01GLENFL 138 01CHIEFTON 138
  DISCONNECT BRANCH FROM BUS 235417 TO BUS 235812 CKT 1
                                    /* 01VARNER 138 01CHIEFTON 138
  DISCONNECT BRANCH FROM BUS 235417 TO BUS 235432 CKT 1
                                    /* 01VARNER 138 01WALDORN 138
  END
```

Multiple Facility Contingency

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

None.

Contribution to Previously Identified Overloads

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

1. (AP - AP) The 01GLENFL-01NATLCN 138 kV line (from bus 235334 to bus 235375 ckt 1) loads from 171.44% to 179.44% (**DC power flow**) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-026'. This project contributes approximately 11.44 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-026'
        /* GLEN FALLS-BRIDGEPORT HILL STK BKR AT GLEN FALLS
 DISCONNECT BRANCH FROM BUS 235306 TO BUS 235334 CKT 1
        /* 01BRIDGP 138 01GLENFL 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235812 CKT 1
        /* 01GLENFL 138 01CHIEFTON 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235380 CKT 1
        /* 01GLENFL 138 01OAKMND 138
 END
```

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

2. (AP - AP) The 01GLENFL-01NATLCN 138 kV line (from bus 235334 to bus 235375 ckt 1) loads from 170.95% to 178.95% (**DC power flow**) of its emergency rating (143 MVA) for the bus fault outage of 'C1-MP-138-014'. This project contributes approximately 11.44 MW to the thermal violation.

```
CONTINGENCY 'C1-MP-138-014'                  /* GLEN-FALLS-138-WEST
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235380 CKT 1
                                             /* 01GLENFL 138 01OAKMND 138
 DISCONNECT BRANCH FROM BUS 235306 TO BUS 235334 CKT 1
                                             /* 01BRIDGP 138 01GLENFL 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235812 CKT 1
                                             /* 01GLENFL 138 01CHIEFTON 138
 DISCONNECT BRANCH FROM BUS 235417 TO BUS 235812 CKT 1
                                             /* 01VARNER 138 01CHIEFTON 138
 END
```

3. (AP - AP) The 01GLENFL-01NATLCN 138 kV line (from bus 235334 to bus 235375 ckt 1) loads from 169.91% to 177.9% (**DC power flow**) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-027'. This project contributes approximately 11.44 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-027'          /* GLEN FALLS-CHEIFTON STK BKR AT GLEN FALLS
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235380 CKT 1
                                             /* 01GLENFL 138 01OAKMND 138
 DISCONNECT BRANCH FROM BUS 235306 TO BUS 235334 CKT 1
                                             /* 01BRIDGP 138 01GLENFL 138
 DISCONNECT BRANCH FROM BUS 235417 TO BUS 235432 CKT 1
```

```
                                                    /* 01VARNER 138 01WALDORN 138
DISCONNECT BRANCH FROM BUS 235417 TO BUS 235812 CKT 1
                                                    /* 01VARNER 138 01CHIEFTON 138
DISCONNECT BRANCH FROM BUS 235334 TO BUS 235812 CKT 1
                                                    /* 01GLENFL 138 01CHIEFTON 138
END
```

4. (AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 129.78% to 136.72% (**DC power flow**) of its emergency rating (192 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-024'. This project contributes approximately 13.32 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-024'      /* GLEN FALLS-HARRISON TAP STK BKR AT GLEN FALLS
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235349 CKT 1
                                          /* 01GLENFL 138 01HARR T 138
 DISCONNECT BRANCH FROM BUS 235347 TO BUS 235349 CKT 1
                                          /* 01HARSNR 138 01HARR T 138
 DISCONNECT BRANCH FROM BUS 235349 TO BUS 235367 CKT 1
                                          /* 01HARR T 138 01MARGAR 138
 DISCONNECT BRANCH FROM BUS 235347 TO BUS 235396 CKT 1
                                          /* 01HARSNR 138 01ROBERT 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235442 CKT 1
                                          /* 01GLENFL 138 01MCALPN 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235375 CKT 1
                                          /* 01GLENFL 138 01NATLCN 138
 END
```

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

5. (AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 129.73% to 136.67% (**DC power flow**) of its emergency rating (192 MVA) for the bus fault outage of 'C1-MP-138-013'. This project contributes approximately 13.32 MW to the thermal violation.

```
CONTINGENCY 'C1-MP-138-013'           /* GLEN-FALLS-138-EAST
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235375 CKT 1
                                          /* 01GLENFL 138 01NATLCN 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235349 CKT 1
                                          /* 01GLENFL 138 01HARR T 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235442 CKT 1
                                          /* 01GLENFL 138 01MCALPN 138
 END
```

6. 6. (AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 129.73% to 136.67% (**DC power flow**) of its emergency rating (192 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-023'. This project contributes approximately 13.32 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-023'          /* GLEN FALLS-MCALPIN STK BKR AT GLEN FALLS
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235349 CKT 1
                                     /* 01GLENFL 138 01HARR T 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235375 CKT 1
                                     /* 01GLENFL 138 01NATLCN 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235442 CKT 1
                                     /* 01GLENFL 138 01MCALPN 138
 END
```

7. 7. (AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 129.73% to 136.67% (**DC power flow**) of its emergency rating (192 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-025'. This project contributes approximately 13.32 MW to the thermal violation.

```
CONTINGENCY 'C2-MP-138-025'   /* GLEN FALLS-NATIONAL CARBON STK BKR AT GLEN FALLS
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235349 CKT 1
                                     /* 01GLENFL 138 01HARR T 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235442 CKT 1
                                     /* 01GLENFL 138 01MCALPN 138
 DISCONNECT BRANCH FROM BUS 235422 TO BUS 235375 CKT 1
                                     /* 01W MILF 138 01NATLCN 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235375 CKT 1
                                     /* 01GLENFL 138 01NATLCN 138
 END
```

8. 8. (AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 111.29% to 115.37% (**DC power flow**) of its emergency rating (192 MVA) for the tower line contingency outage of 'C5-MP-138-015'. This project contributes approximately 7.83 MW to the thermal violation.

```
CONTINGENCY 'C5-MP-138-015'                 /* GLF-WUN-GLF-MRG
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235349 CKT 1
                                     /* 01GLENFL 138 01HARR T 138
 DISCONNECT BRANCH FROM BUS 235347 TO BUS 235349 CKT 1
                                     /* 01HARSNR 138 01HARR T 138
 DISCONNECT BRANCH FROM BUS 235349 TO BUS 235367 CKT 1
                                     /* 01HARR T 138 01MARGAR 138
 DISCONNECT BRANCH FROM BUS 235417 TO BUS 235432 CKT 1
                                     /* 01VARNER 138 01WALDORN 138
 DISCONNECT BRANCH FROM BUS 235417 TO BUS 235812 CKT 1
                                     /* 01VARNER 138 01CHIEFTON 138
 DISCONNECT BRANCH FROM BUS 235347 TO BUS 235396 CKT 1
                                     /* 01HARSNR 138 01ROBERT 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235812 CKT 1
                                     /* 01GLENFL 138 01CHIEFTON 138
 END
```

9. 9. (AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 100.37% to 106.02% (**DC power flow**) of its emergency rating

(192 MVA) for the tower line contingency outage of 'C5-MP-138-011'. This project contributes approximately 10.84 MW to the thermal violation.

```
CONTINGENCY 'C5-MP-138-011'                          /* GLF-BPH-GLF-BKH
 DISCONNECT BRANCH FROM BUS 235306 TO BUS 235334 CKT 1
                                                      /* 01BRIDGP 138 01GLENFL 138
 DISCONNECT BRANCH FROM BUS 235334 TO BUS 235375 CKT 1
                                                      /* 01GLENFL 138 01NATLCN 138
 END
```

Steady-State Voltage Requirements:

To be determined during system impact study phase.

Short Circuit:

None.

Affected System Analysis & Mitigation

NYISO Impacts: to be determined during system impact study phase.

Delivery of Energy Portion of Interconnection Request

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

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

Not Applicable

Light Load Analysis – 2020:

Not required.

System Reinforcements

Short Circuit:

None.

Stability and Reactive Power Requirement:

To be determined during system impact study phase.

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 for mitigating 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

The following appendix contains additional information about the flowgate presented in the body of the report. A description of the flowgate and its contingency was included for convenience. However, 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 this appendix section is full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.**

(AP - AP) The 01GLENFL-01NATLCN 138 kV line (from bus 235334 to bus 235375 ckt 1) loads from 171.44% to 179.44% (**DC power flow**) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-026'. This project contributes approximately 11.44 MW to the thermal violation

CONTINGENCY

'C2-MP-138-026' /* GLEN FALLS-BRIDGEPORT HILL STK BKR AT GLEN FALLS

DISCONNECT BRANCH FROM BUS 235306 TO BUS 235334 CKT 1
/* 01BRIDGP 138 01GLENFL 138
DISCONNECT BRANCH FROM BUS 235334 TO BUS 235812 CKT 1
/* 01GLENFL 138 01CHIEFTON 138
DISCONNECT BRANCH FROM BUS 235334 TO BUS 235380 CKT 1
/* 01GLENFL 138 01OAKMND 138

END

Bus Number	*Bus Name*	*Full Contribution*
922132	*AA2-119*	*209.67*
925791	*AC1-055*	*11.44*

Appendix 4

The following appendix contains additional information about the flowgate presented in the body of the report. A description of the flowgate and its contingency was included for convenience. However, 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 this appendix section is full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.**

(AP - AP) The 01GLENFL-01OAKMND 138 kV line (from bus 235334 to bus 235380 ckt 1) loads from 129.78% to 136.72% (**DC power flow**) of its emergency rating (192 MVA) for the line fault with failed breaker contingency outage of 'C2-MP-138-024'. This project contributes approximately 13.32 MW to the thermal violation.

CONTINGENCY

'C2-MP-138-024' /* GLEN FALLS-HARRISON TAP STK BKR AT GLEN FALLS

DISCONNECT BRANCH FROM BUS 235334 TO BUS 235349 CKT 1
/* 01GLENFL 138 01HARR T 138
DISCONNECT BRANCH FROM BUS 235347 TO BUS 235349 CKT 1
/* 01HARSNR 138 01HARR T 138
DISCONNECT BRANCH FROM BUS 235349 TO BUS 235367 CKT 1
/* 01HARR T 138 01MARGAR 138
DISCONNECT BRANCH FROM BUS 235347 TO BUS 235396 CKT 1
/* 01HARSNR 138 01ROBERT 138
DISCONNECT BRANCH FROM BUS 235334 TO BUS 235442 CKT 1
/* 01GLENFL 138 01MCALPN 138
DISCONNECT BRANCH FROM BUS 235334 TO BUS 235375 CKT 1
/* 01GLENFL 138 01NATLCN 138
END

Bus Number	*Bus Name*	*Full Contribution*
922132	*AA2-119*	*244.28*
925791	*AC1-055*	*13.32*