Generation Interconnection Feasibility Study Report Queue Position AD1-061

General

Interconnection Customer has proposed a solar generation facility located in Franklin County, Pennsylvania. The installed facilities will have capability of 19.9 MW with 7.6 MW of this output being recognized by PJM as capacity.

The following table shows the MW net contributions of each inverter to the Maximum Facility Output (MFO) at the Point of Interconnection:

	Queue No.	Total # of Inverters	MW/Inverter	Total MW
	AC2-061	20	0.99	19.9
Total MFO MW				19.9

The following table shows the MW net contributions of each inverter to the total Capacity Interconnection Rights (CIR) at the Point of Interconnection:

	Queue No.	Total # of Inverters	MW/Inverter	Total MW
	AC2-061	20	0.38	7.6
Total CIR MW				7.6

The proposed in-service date is September 1, 2021. This study does not imply a **West Penn Powe ("West Penn") company commitment to this in-service date.**

Point of Interconnection (POI)

This project will interconnect with the West Penn Power distribution system by tapping the McConnellsburg – Mercersburg 34.5 kV line at a point located approximately 6.8 miles from McConnelsburg substation and 1.5 miles from Mercersburg substation. Please refer to Appendix 2 for a one-line diagram of the system configuration.

Network Impacts

The Queue Project AD1-061 was evaluated as a 19.9 MW (Capacity 7.6 MW) injection tapping Mercersburg to McConnellsburg 34.5kV line in the APS area. Project AD1-061 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-061 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)

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 01RINGLD-01WOLFSVILLE 138 kV line (from bus 235505 to bus 237323 ckt 1) loads from 100.52% to 100.97% (**DC power flow**) of its emergency rating (192 MVA) for the tower line contingency outage of 'AP-P7-1-PE-230-004'. This project contributes approximately 1.93 MW to the thermal violation.

```
CONTINGENCY 'AP-P7-1-PE-230-004'                    /* 120
  DISCONNECT BRANCH FROM BUS 235459 TO BUS 235543 CKT 1     /* 01DOUBS 230 01FROSTN 230
  DISCONNECT BRANCH FROM BUS 235506 TO BUS 235543 CKT 1     /* 01RINGLD 230 01FROSTN 230
  DISCONNECT BRANCH FROM BUS 235543 TO BUS 235544 CKT 1     /* 01FROSTN 230 01BOONES 230
  DISCONNECT BRANCH FROM BUS 235488 TO BUS 235494 CKT 1     /* 01MONOCY 230 01OLDFRM 230
  DISCONNECT BRANCH FROM BUS 235494 TO BUS 235506 CKT 1     /* 01OLDFRM 230 01RINGLD 230
  END
```

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

Steady-State Voltage Requirements

To be determined at later study phases.

Short Circuit

None. (No overdutied circuit breakers identified)

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.

None

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 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)

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)

1. (AP - AP) The 01RINGLD-01WOLFSVILLE 138 kV line (from bus 235505 to bus 237323 ckt 1) loads from 100.52% to 100.97% (**DC power flow**) of its emergency rating (192 MVA) for the tower line contingency outage of 'AP-P7-1-PE-230-004'. This project contributes approximately 1.93 MW to the thermal violation.

APS:
PJM b2743.7 - Rebuild/Reconductor the Ringgold - Catoctin 138 kV circuit and upgrade terminal equipment on both ends. The scheduled in-service date is 06/01/2020.

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

PJM Queue Position: AD1-061
Flowgate Contingency Information

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 01RINGLD-01WOLFSVILLE 138 kV line (from bus 235505 to bus 237323 ckt 1) loads from 100.52% to 100.97% (**DC power flow**) of its emergency rating (192 MVA) for the tower line contingency outage of 'AP-P7-1-PE-230-004'. This project contributes approximately 1.93 MW to the thermal violation.

```
CONTINGENCY 'AP-P7-1-PE-230-004'                /* 120

 DISCONNECT BRANCH FROM BUS 235459 TO BUS
235543 CKT 1          /* 01DOUBS 230 01FROSTN 230
  DISCONNECT BRANCH FROM BUS 235506 TO BUS
235543 CKT 1          /* 01RINGLD 230 01FROSTN 230
  DISCONNECT BRANCH FROM BUS 235543 TO BUS
235544 CKT 1          /* 01FROSTN 230 01BOONES 230
  DISCONNECT BRANCH FROM BUS 235488 TO BUS
235494 CKT 1          /* 01MONOCY 230 01OLDFRM 230
  DISCONNECT BRANCH FROM BUS 235494 TO BUS
235506 CKT 1          /* 01OLDFRM 230 01RINGLD 230

  END
```

Bus Number	*Bus Name*	*Full Contribution*
235723	*01GUILF1*	*0.97*
235724	*01GUILF2*	*0.97*
237329	*01CHBRG_I12*	*0.66*
901241	*W1-045C OP1*	*0.47*
901242	*W1-045E OP1*	*0.77*
905554	*W4-102 E*	*1.08*
918661	*AA1-080 C*	*0.17*
918662	*AA1-080 E*	*0.09*
918731	*AA1-092 C*	*0.73*
918732	*AA1-092 E*	*0.37*
918741	*AA1-093 C*	*0.16*
918742	*AA1-093 E*	*0.08*
918761	*AA1-095 C*	*0.48*
918762	*AA1-095 E*	*0.24*
918771	*AA1-096 C*	*0.17*
918772	*AA1-096 E*	*0.09*
920011	*AA2-085 C*	*0.27*
920012	*AA2-085 E*	*0.43*
920561	*AA2-159 C*	*0.61*
920562	*AA2-159 E*	*0.51*
923731	*AB2-004 C*	*0.18*
923732	*AB2-004 E*	*0.29*
923872	*AB2-027 E*	*0.49*
924482	*AB2-097 E*	*1.15*
927171	*AC1-211 C*	*4.52*
927172	*AC1-211 E*	*2.06*
927231	*AC1-217 C*	*3.87*
927232	*AC1-217 E*	*1.76*
930782	*AB1-123 E*	*0.96*
930821	*AB1-127 C*	*0.77*
930822	*AB1-127 E*	*1.25*
930831	*AB1-128 C*	*0.77*
930832	*AB1-128 E*	*1.25*
933251	*AC2-136 C*	*0.95*
933252	*AC2-136 E*	*1.09*
934361	*AD1-060 C*	*0.57*
934362	*AD1-060 E*	*0.93*
934371	*AD1-061 C*	*0.74*
934372	*AD1-061 E*	*1.19*