Generation Interconnection Feasibility Study Report Queue Positions AD2-113 and AD2-114

(Revised)

Interconnection Customer entered the AD2-Queue proposing an uprate to its existing natural gas generation facility. The uprate consists of improvements on existing units which will result in an increase of 70 MW Energy and 60.6 MW Capacity. This part of the uprate project is designated Queue #AD2-113. In addition, this uprate project includes the installation of a new generation unit of 470 MW Energy and 400 MW Capacity. The new project will raise the net MW capability of the facility at the Point of Interconnection by 480 MW to a total of 1200 MW. PJM recognizes 1170 MWs as Capacity Interconnection Rights. The project will be slated at the South Bend facility which is located at 2313 State Route 156 in Shelocta, Pennsylvania.

The proposed in-service date for this project is May 31, 2022. **This study does not imply a West Penn Power ("Transmission Owner") to this in-service date.**

Point of Interconnection ("POI")

The existing POI remains unchanged. The project designated AD2-113 and AD2-114 will interconnect with the West Penn Power transmission system through the same existing POI as in prior Queue requests Z1-055 and Z1-056.

Network Impacts

The queues were studied separately. You will see first the AD2-113 summer peak analysis results followed by the results for AD2-114.

AD2-113 Summer Peak Analysis – 2021

The Queue Project AD2-113 was evaluated as a 70.0 MW (Capacity 60.6 MW) injection at the South Bend 500 kV substation in the APS area. Project AD2-113 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-113 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)

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)

None

Steady-State Voltage Requirements

To be determined at the 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.

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.

AD2-113 required no short circuit analysis since the project is an uprate to an existing facility and the electrical characteristics of the machines and GSUs did not change.

AD2-114 was found to contribute to two existing over-duty breakers that already have baseline upgrades.

The following chart shows short circuit analysis results.

Bus #	Bus Name	BREAKER	Rating Type	Breaker Capacity (Amps)	Duty Percent With AD2-114	Duty Percent Without AD2-114	Duty Percent Difference	Duty Amps With AD2-114	Duty Amps Without AD2-114	Baseline Upgrade ID
11	KEYSTONE 500.kV	NO.14 CABOT	S	40000	110.13%	103.41%	6.72%	44053.2	41365.9	b2953
11	KEYSTONE 500.kV	NO.16 CABOT	S	40000	110.13%	103.41%	6.72%	44053.2	41365.9	b2954

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

AD2-114 Summer Peak Analysis – 2021

The Queue Project AD2-114 was evaluated as a 410.0 MW (Capacity 400.0 MW) injection at the South Bend 500 kV substation in the APS area. Project AD2-114 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-114 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)

1. (PJM500 - AP) The KEYSTONE-01CABOT 500 kV line (from bus 200011 to bus 235104 ckt 1) loads from 98.6% to 104.61% (**DC power flow**) of its emergency rating (2598 MVA) for the single line contingency outage of 'AP-P1-2-WP-500-008'. This project contributes approximately 159.08 MW to the thermal violation.

```
CONTINGENCY 'AP-P1-2-WP-500-008'                    /* SOUTH BEND - YUKON 500KV
  DISCONNECT BRANCH FROM BUS 235116 TO BUS 235118 CKT 1        /* 01YUKON 500 01SOBEND
500
  END
```

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

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)

None

Steady-State Voltage Requirements

To be determined at system impact study stage.

Short Circuit

APS:
Both over-duty breakers are baseline upgrades.
b2953 - Replace the Keystone 500kV breaker "NO.14 Cabot" with 50kA breaker
b2954 - Replace the Keystone 500kV breaker "NO.16 Cabot" with 50kA breaker

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 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)

Generator Deliverability

1. (PJM500 - AP) The KEYSTONE-01CABOT 500 kV line (from bus 200011 to bus 235104 ckt 1) loads from 98.6% to 104.61% (**DC power flow**) of its emergency rating (2598 MVA) for the single line contingency outage of 'AP-P1-2-WP-500-008'. This project contributes approximately 159.08 MW to the thermal violation.

> **APS:**
> **Replace terminal equipment at Keystone and Cabot 500 kV buses. At Keystone, bus tubing and conductor, a wavetrap, and meter will be replaced. At Cabot, a wavetrap and bus conductor will be replaced. [PJM Upgrade Id: b3010]. The scheduled in-service date is 06/01/2021.**

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 1

Facility Location
PJM Queue Positions: AD2-113 and AD2-114

Appendix 2

Interconnection One-Line Diagram
PJM Queue Positions: AD2-113 and AD2-114

Appendix 3

Flowgate Information: Contingency – KEYSTONE-01CABOT 500 kV line
PJM Queue Position: AD2-113 and AD2-114

AD2-114 Units

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.

(PJM500 - AP) The KEYSTONE-01CABOT 500 kV line (from bus 200011 to bus 235104 ckt 1) loads from 98.6% to 104.61% (**DC power flow**) of its emergency rating (2598 MVA) for the single line contingency outage of 'AP-P1-2-WP-500-008'. This project contributes approximately 159.08 MW to the thermal violation.

```
CONTINGENCY 'AP-P1-2-WP-500-008'                    /* SOUTH BEND - YUKON 500KV
  DISCONNECT BRANCH FROM BUS 235116 TO BUS 235118 CKT 1          /* 01YUKON
500 01SOBEND 500
  END
```

Appendix 3 – Continued from previous page

Flowgate Information: Contingency – KEYSTONE-01CABOT 500 kV line
PJM Queue Position: AD2-113 and AD2-114

AD2-114 Units

Bus Number	*Gen. Bus Name*	*Full Contribution*
235619	*01SBEND1*	*11.78*
LTF	*AMIL*	*3.29*
LTF	*BAYOU*	*10.68*
LTF	*BIG_CAJUN1*	*16.31*
LTF	*BIG_CAJUN2*	*32.83*
LTF	*BLUEG*	*20.22*
LTF	*CALDERWOOD*	*5.21*
LTF	*CANNELTON*	*3.45*
LTF	*CATAWBA*	*2.78*
LTF	*CBM-N*	*2.28*
LTF	*CELEVELAND*	*8.14*
LTF	*CHEOAH*	*4.75*
LTF	*CHILHOWEE*	*1.71*
LTF	*CHOCTAW*	*10.77*
LTF	*CLIFTY*	*84.42*
LTF	*COTTONWOOD*	*42.53*
LTF	*DEARBORN*	*11.39*
LTF	*EDWARDS*	*6.11*
LTF	*ELMERSMITH*	*9.87*
LTF	*FARMERCITY*	*3.92*
LTF	*G-007A*	*41.1*
LTF	*GIBSON*	*6.81*
LTF	*HAMLET*	*8.27*
LTF	*MORGAN*	*17.45*
LTF	*NEWTON*	*15.22*
LTF	*NYISO*	*33.68*
LTF	*PRAIRIE*	*28.68*
LTF	*ROWAN*	*5.43*
LTF	*SANTEETLA*	*1.39*

Bus Number	*Gen. Bus Name*	*Full Contribution*
LTF	*SMITHLAND*	*2.22*
LTF	*TATANKA*	*7.16*
LTF	*TILTON*	*7.32*
LTF	*TRIMBLE*	*3.88*
LTF	*TVA*	*7.85*
LTF	*UNIONPOWER*	*6.95*
LTF	*VFT*	*111.33*
936901	*AD2-114 C*	*159.08*
936891	*AD2-113 C*	*24.1*
934711	*AD1-099*	*27.84*
926301	*AC1-108*	*29.58*
924291	*AB2-074 C*	*10.11*
920711	*AA2-182 C*	*197.58*
920651	*AA2-171 C*	*2.26*
918591	*AA1-076 C*	*54.99*
235622	*01SBEND4*	*11.8*
235621	*01SBEND3*	*11.91*
235620	*01SBEND2*	*11.78*
209018	*SUNBIPCT*	*0.82*
208933	*COROIPP8*	*14.32*
208932	*COROIPP5*	*7.82*
208931	*COROIPP7*	*8.53*
208930	*COROIPP6*	*7.82*
200833	*26SEWRDB34*	*19.17*
200033	*KEYS G2*	*63.11*
200032	*KEYS G1*	*63.92*
200031	*CONE G2*	*51.84*
200030	*CONE G1*	*51.22*