Generation Interconnection
Feasibility Study Report
W3-175

The Interconnection Customer (IC) has proposed a 371 MWE (371 MWC) natural gas fueled combined cycle generating facility. W3-175 consists of a single combustion turbine along with a steam turbine. When combined with the W3-174 project a 2x1 configuration exists. The project is to be located in Pennsville, New Jersey. PJM studied W3-175 as a 371 MW injection into the Atlantic City Electric system at the Churchtown 230kV substation. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2014. The proposed in-service date, as stated in Attachment N, is June 1, 2015.

Point of Interconnection

W3-175 will interconnect with the Atlantic City Electric transmission system at the Churchtown 230kV substation.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The scope of work and estimated costs for the direct connection facilities is as follows:

1) Add a second 230kV terminal at the Churchtown 230kV substation and convert the substation to a breaker and 1/2 scheme. The estimated cost to perform this work is **$5,200,000** and will take **24-36 months** to complete.

2) Construct a 0.6 mile 230 kV (overhead and underground) line from W3-175 to the Churchtown substation. The estimated cost to perform this work is **$2,000,000** and will take **30-36 months** to complete. The estimate does not include environmental or Rights Of Way costs.

Note: Additional costs upon further engineering review may result. Additionally, Contribution in Aid of Construction (CIAC) tax will be included upon further study.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer (IC) is responsible for all design and construction related to activities on their side of the point of Interconnection. IC will interconnect W3-175 with the ACE system via a 230kV circuit from their facility to the Churchtown 230kV substation. The above cost does not include construction of that line. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. At this time, route selection, line design, right-of-way acquisition, and construction of such lines will be entirely the responsibility of the Interconnection Customer.

Protective relaying and metering design and installation must comply with ACE's applicable

standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff. ACE will require the capability to remotely trip the generator from its System Operations facility. The interconnected customer will grant its permission for PJM to send ACE all telemetry that the Interconnection Customer sends to PJM. The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each ACE metering position to facilitate remote interrogation and data collection.

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

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

1. (AE) The Pedricktown-Bridgeport 230 kV line (from bus 228312 to bus 228313 ckt 1) loads from 67.37% to 120.93% (DC power flow) of its emergency rating (552 MVA) for the single contingency 'CHUR-ORCH'. This project contributes approximately 295.61 MW to the thermal violation.

2. (AE) The Bridgeport-Mickleton 230 kV line (from bus 228313 to bus 228401 ckt 1) loads from 72.90% to 109.57% (DC power flow) of its emergency rating (805 MVA) for the single contingency 'CHUR-ORCH'. This project contributes approximately 295.14 MW to the thermal violation.

3. (AE) The Bridgeport-Mickleton 230 kV line (from bus 228313 to bus 228401 ckt 1) loads from 75.70% to 102.18% (DC power flow) of its normal rating (650 MVA) for non contingency condition. This project contributes approximately 172.16 MW to the thermal violation.

4. (PSEG) The Gloucester-Gloucester 230/138 kV transformer (from bus 219110 to bus 219117 ckt 1) loads from 92.78% to 100.37% (DC power flow) of its normal rating (265 MVA) for non contingency condition. This project contributes approximately 20.12 MW to the thermal violation.

5. (AE) The Churchtown-Deepwater 69 kV line (from bus 228319 to bus 228323 ckt 1) loads from 96.23% to 124.54% (DC power flow) of its emergency rating (294 MVA) for the single contingency 'MICK-BRIDG'. This project contributes approximately 83.23 MW to the thermal violation.

6. (AE) The Chambers-Pedricktown 230 kV line (from bus 228311 to bus 228312 ckt 1) loads from 47.65% to 101.24% (DC power flow) of its emergency rating (552 MVA) for the single contingency 'CHUR-ORCH'. This project contributes approximately 295.84 MW to the thermal violation.

7. (PECO) The Ridley Tap-Macdade 230 kV line (from bus 213925 to bus 213775 ckt 1) loads from 99.83% to 100.06% (DC power flow) of its emergency rating (1432 MVA) for the single contingency '220-23'. This project contributes approximately 20.46 MW to the thermal violation.

8. (PSEG) The Gloucester-Cuthbert Blvd. 138 kV line (from bus 219117 to bus 219108 ckt 1) loads from 99.91% to 108.12% (DC power flow) of its normal rating (245 MVA) for non contingency condition. This project contributes approximately 20.12 MW to the thermal violation.

Multiple Facility Contingency

*(Double Circuit Tower Line, Line with Failed 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. (PSEG) The Thorofare-Deptford 230 kV line (from bus 219121 to bus 219109 ckt 1) loads from 102.87% to 104.38% (DC power flow) of its emergency rating (740 MVA) for the tower contingency 'AE1TOWER'. This project contributes approximately 71.05 MW to the thermal violation.

2. (PECO/BG&E) The Cooper-Graceton 230 kV line (from bus 214089 to bus 220964 ckt 1) loads from 152.79% to 153.93% (DC power flow) of its emergency rating (485 MVA) for the single contingency 'PJM17'. This project contributes approximately 35.40 MW to the thermal violation.

3. (BG&E) The BAGLEY13-Raphael Road 230 kV line (from bus 220999 to bus 220980 ckt 1) loads from 152.98% to 153.38% (DC power flow) of its emergency rating (674 MVA) for the tower contingency 'CNSTN_NWEST'. This project contributes approximately 23.47 MW to the thermal violation.

4. (AE) The Mickleton-Monrow 230 kV line (from bus 228401 to bus 228402 ckt 2) loads from 115.55% to 124.61% (DC power flow) of its emergency rating (446 MVA) for the single contingency 'PS18'. This project contributes approximately 40.39 MW to the thermal violation.

5. (PJM/METED) The Three Mile Island-Three Mile Island 500/230 kV transformer (from bus 200016 to bus 204514 ckt 2) loads from 128.74% to 129.38% (DC power flow) of its emergency rating (1072 MVA) for the single contingency 'PJM17'. This project contributes approximately 42.08 MW to the thermal violation.

6. (PL/BG&E) The Otter Creek Switchyard-Conastone 230 kV line (from bus 208048 to bus 220963 ckt 1) loads from 131.90% to 132.61% (DC power flow) of its emergency rating (531 MVA) for

the single contingency 'PJM17'. This project contributes approximately 23.22 MW to the thermal violation.

7. (PSEG) The Eagle Point-Cloucester 230 kV line (from bus 219120 to bus 219110 ckt 1) loads from 115.12% to 116.55% (DC power flow) of its emergency rating (740 MVA) for the tower contingency 'AE1TOWER'. This project contributes approximately 70.65 MW to the thermal violation.

8. (DP&L) The Glasgow-Cecil 138 kV line (from bus 231124 to bus 231130 ckt 1) loads from 117.39% to 118.26% (DC power flow) of its emergency rating (234 MVA) for the single contingency 'CHIC125'. This project contributes approximately 12.59 MW to the thermal violation.

9. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 144.06% to 144.22% (DC power flow) of its emergency rating (2815 MVA) for the single contingency 'PJM67'. This project contributes approximately 129.10 MW to the thermal violation.

10. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 146.11% to 146.34% (DC power flow) of its normal rating (2490 MVA) for non contingency condition. This project contributes approximately 138.76 MW to the thermal violation.

11. (AE/PSEG) The Mickleton-Thorofare 230 kV line (from bus 228401 to bus 219121 ckt 1) loads from 144.14% to 146.11% (DC power flow) of its emergency rating (566 MVA) for the tower contingency 'AE1TOWER'. This project contributes approximately 71.05 MW to the thermal violation.

12. (AE/PSEG) The Mickleton-Thorofare 230 kV line (from bus 228401 to bus 219121 ckt 1) loads from 125.58% to 136.24% (DC power flow) of its normal rating (451 MVA) for non contingency condition. This project contributes approximately 48.07 MW to the thermal violation.

13. (PECO) The Nottingham-Nottingham Reactor 230 kV line (from bus 213844 to bus 213846 ckt 1) loads from 120.57% to 121.45% (DC power flow) of its emergency rating (627 MVA) for the single contingency 'PJM17'. This project contributes approximately 35.40 MW to the thermal violation.

14. (JCP&L) The Larrabee-U2-049 TAP 230 kV line (from bus 206294 to bus 292970 ckt 1) loads from 116.01% to 116.47% (DC power flow) of its emergency rating (805 MVA) for the single contingency 'PJM_NEWFREEDM_WINDSOR'. This project contributes approximately 22.98 MW to the thermal violation.

15. (PECO) The Nottingham Reactor-Peach Bottom 230 kV line (from bus 213846 to bus 213869 ckt 1) loads from 120.55% to 121.43% (DC power flow) of its emergency rating (627 MVA) for the single contingency 'PJM17'. This project contributes approximately 35.40 MW to the thermal violation.

16. (AE) The Carneys Point Tap-Pennsgrove 69 kV line (from bus 228320 to bus 228328 ckt 1) loads from 111.70% to 113.12% (DC power flow) of its emergency rating (77 MVA) for the tower contingency 'AE12TOWER'. This project contributes approximately 6.76 MW to the thermal violation.

17. (BG&E) The Graceton-BAGLEY13 230 kV line (from bus 220964 to bus 220999 ckt 1) loads from 135.89% to 136.22% (DC power flow) of its emergency rating (802 MVA) for the tower contingency 'CNSTN_NWEST'. This project contributes approximately 23.47 MW to the thermal violation.

18. (PSEG) The Gloucester-Gloucester 230/138 kV transformer (from bus 219110 to bus 219117 ckt 1) loads from 104.40% to 111.56% (DC power flow) of its emergency rating (341 MVA) for the single contingency 'PJM_NEWFREEDM_WINDSOR'. This project contributes approximately 24.41 MW to the thermal violation.

19. (AE) The Woodstown #1-Clayton 69 kV line (from bus 228332 to bus 228405 ckt 1) loads from 168.25% to 170.57% (DC power flow) of its emergency rating (54 MVA) for the tower contingency 'AE12TOWER'. This project contributes approximately 7.77 MW to the thermal violation.

20. (PECO) The Printz-Ridley Tap 230 kV line (from bus 213912 to bus 213925 ckt 1) loads from 106.87% to 107.11% (DC power flow) of its emergency rating (1505 MVA) for the single contingency '220-23'. This project contributes approximately 22.11 MW to the thermal violation.

21. (AE) The Mickleton-Monroe 230 kV line (from bus 228401 to bus 228402 ckt 1) loads from 115.55% to 124.61% (DC power flow) of its emergency rating (446 MVA) for the single contingency 'PS18'. This project contributes approximately 40.39 MW to the thermal violation.

22. (AE) The W3-016TAP1-Beckett 69 kV line (from bus 903350 to bus 228321 ckt 1) loads from 111.53% to 112.8% (DC power flow) of its emergency rating (97 MVA) for the tower contingency 'AE12TOWER'. This project contributes approximately 7.63 MW to the thermal violation.

23. (PL/BG&E) The Safe Harbor Units 3-4 Tap-Graceton 230 kV line (from bus 208071 to bus 220964 ckt 1) loads from 106.22% to 106.88% (DC power flow) of its emergency rating (485 MVA) for the single contingency 'PJM17'. This project contributes approximately 19.92 MW to the thermal violation.

24. (PECO) The Peach Bottom-Cooper 230 kV line (from bus 213869 to bus 214089 ckt 1) loads from 155.87% to 157.0% (DC power flow) of its emergency rating (485 MVA) for the single contingency 'PJM17'. This project contributes approximately 35.40 MW to the thermal violation.

25. (AE) The Pennsgrove-Oldman 69 kV line (from bus 228328 to bus 228327 ckt 1) loads from 108.60% to 110.06% (DC power flow) of its emergency rating (75 MVA) for the tower

contingency 'AE12TOWER'. This project contributes approximately 6.76 MW to the thermal violation.

26. (PSEG) The Gloucester-Cuthbert Blvd. 138 kV line (from bus 219117 to bus 219108 ckt 1) loads from 105.03% to 112.25% (DC power flow) of its emergency rating (338 MVA) for the single contingency 'PJM89_A'. This project contributes approximately 24.41 MW to the thermal violation.

27. (AE) The Churchtown-Churchtown 230/69 kV transformer (from bus 228310 to bus 228319 ckt 1) loads from 101.12% to 128.86% (DC power flow) of its emergency rating (300 MVA) for the single contingency 'MICK-BRIDG'. This project contributes approximately 83.23 MW to the thermal violation.

Transmission Owner Identified Overloads

28. W3-175 contributes 10 MWs to the overload (from bus 228110 to bus 227906) of the emergency rating (307 MVA) of the (ACE) BLE-Scull#2 138kV line.

29. W3-175 contributes 9 MWs to the overload (from bus 228110 to bus 227906) of the emergency rating (307 MVA) of the (ACE) BLE-Scull#1 138kV line.

Short Circuit

The following breakers were found overstressed as a result of the addition of the W3-175 project:

Deepwater: CB 6614 @ 100.0%, CB 6622 @ 102.2%, CB 6632 @ 102.9%

The estimated cost to replace these breakers is **$2,500,000** and will take **24-36 months** to complete.

Stability Analysis

Will be performed during the System Impact Study phase of W3-175.

New System Reinforcements

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

1. To mitigate the (AE) Pedricktown-Bridgeport 230 kV line (from bus 228312 to bus 228313 ckt 1) overload will require at Pedricktown substation the upgrade of the Bridgeport 230 kV 1590 AL strand bus to 2-1590 AL. The estimated cost to perform this work is $20,000 and will take 18 to 24 months to complete.

2. To mitigate the (AE) Bridgeport-Mickleton 230 kV line (from bus 228313 to bus 228401 ckt 1) overload will require the installation of a second 230/69kV transformer at Churchtown and convert the 69kV system to a ring bus. The estimated cost to perform this work is $8,600,000 and will take 24 to 36 months to complete.

3. To mitigate the (AE) Bridgeport-Mickleton 230 kV line (from bus 228313 to bus 228401 ckt 1) overload will require the installation of a second 230/69kV transformer at Churchtown and convert the 69kV system to a ring bus. The estimated cost to perform this work is $8,600,000 and will take 24 to 36 months to complete.

4. To mitigate the (PSEG) Gloucester-Gloucester 230/138 kV transformer (from bus 219110 to bus 219117 ckt 1) overload will require an upgrade to the transformer. The estimated cost to perform this work is $13,400,000 and will take 36 months to complete.

5. To mitigate the (AE) Churchtown-Deepwater 69 kV line (from bus 228319 to bus 228323 ckt 1) overload will require the upgrade of the circuit to 3500 amps minimum. The estimated cost to perform this work is $1,600,000 and will take 30-36 months to complete not including environmental or Rights Of Way costs.

6. To mitigate the (AE) Chambers-Pedricktown 230 kV line (from bus 228311 to bus 228312 ckt 1) overload will require the installation of a second 230/69kV transformer at Churchtown and convert the 69kV system to a ring bus. The estimated cost to perform this work is $8,600,000 and will take 24 to 36 months to complete.

7. To mitigate the (PECO) Ridley Tap-Macdade 230 kV line (from bus 213925 to bus 213775 ckt 1) overload will require the replacement of the terminal equipment. The estimated cost to perform this work is $5,000,000 and will take 30 months to complete.

8. To mitigate the (PSEG) Gloucester-Cuthbert Blvd. 138 kV line (from bus 219117 to bus 219108 ckt 1) overload will require reconductoring the existing circuit. The estimated cost to perform this work is **$20,000,000** and will take **24 months** to complete.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.

1. To mitigate the (PSEG) Thorofare-Deptford 230 kV line (from bus 219121 to bus 219109 ckt 1) overload will require reconductoring the existing circuit. The estimated cost to perform this work is **$2,000,000** and will take **24 months** to complete.

2. To mitigate the (PECO/BG&E) Cooper-Graceton 230 kV line (from bus 214089 to bus 220964 ckt 1) overloads will require the following:

   PECO portion: Reconductor Line 220-93 from Cooper Substation to Graceton Substation to get a minimum summer emergency rating of 725 MVA. The line is approximately 4 miles long. This

cost is for the PECO portion only. The estimated cost to perform this work is **$2,800,000** and will require **24 months** to complete.

BGE Portion: Rebuild Cooper to Graceton 230 kV line 1.85 miles to PA border. New rating is 648N/802E MVA. The estimated cost to perform this work is **$7,500,000** and will require **54 months** to complete.

3. To mitigate the (BG&E) BAGLEY13-Raphael Road 230 kV line (from bus 220999 to bus 220980 ckt 1) overload will require the Graceton station to add 6-230kV breakers with an estimated cost of $**10,000,000** and Raphael Road station to add 6-230kV breakers at an estimated cost of **$10,000,000**. It also requires rebuilding Graceton to Raphael Rd to double circuit 2-conductor bundled with an estimated cost of **$30,000,000**. This work would take an estimate of 2-3 years for the substation work concurrently with 5-6 years for the line work.

4. To mitigate the (AE) Mickleton-Monroe 230 kV line (from bus 228401 to bus 228402 ckt 2) overload will require the reconductoring of the #2 Mickleton-Monroe 230kV line with an ACSS/TW conductor. The estimated cost to perform this work is **$7,000,000** and will take **30 months** to complete following the receipt of a fully executed ISA and CSA.

5. To mitigate the (PJM/METED) Three Mile Island-Three Mile Island 500/230 kV transformer (from bus 200016 to bus 204514 ckt 2) overload will require the addition of a second 500/230kV transformer at TMI as well as transmission line upgrades between the 230kV and 500kV substations. The estimated cost to perform this work is **$15,000,000** and will take **36 months** to complete.

6. To mitigate the (PL/BG&E) Otter Creek Switchyard-Conastone 230 kV line (from bus 208048 to bus 220963 ckt 1) overload is as follows:

   PPL Portion: PPL has recently submitted plans to PJM to rebuild the Otter Creek - Conastone 230kV line as part of a modernization project (submitted to PJM as supplemental project S0233). This project is tentatively scheduled to be complete by May 2013 (prior to the IPP's 2014 requested in-service date). The magnitude cost estimate to rebuild PPL's portion of the Otter Creek - Conastone 230kV line is **$0**.

   BGE Portion: rebuild the Otter Creek to Conastone 230 kV 4.7 mile line (2302) to PA border. New rating is 648N/802E MVA. The estimated cost to perform this work is **$19,000,000** and will require **60 months** to complete.

7. To mitigate the (PSEG) Eagle Point-Gloucester 230 kV line (from bus 219120 to bus 219110 ckt 1) overload will require replacement of three (3) wavetraps and three (3) disconnect switches. The estimated cost to perform this work is **$500,000** and will take **24 months** to complete.

8. To mitigate the (DP&L) Glasgow-Cecil 138 kV line (from bus 231124 to bus 231130 ckt 1) overload will require the rerate of the conductor to 1214A. The estimated cost to perform this work is **$1,400,000** and will take **30-36 months** to complete.

9. To mitigate the Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) overload will require the following:

   PECO Portion: build a new 2nd PB-Conastone 500 kV line with a minimum normal and emergency rating of 2,920 / 3,707 MVA, respectively. The line is approximately 6 miles long. Replace the 5012 terminal equipment at PB substation to achieve the conductor normal and emergency rating of 2,920 / 3,707 MVA, respectively. This cost is for the PECO portion only, and does not include right-of-way costs for new line**.** The estimated cost to perform this work is **$25,000,000** and will require **60 months** to complete.

   BGE Portion: build a new 500 kV line adjacent to circuit 5012 from Conastone to PA line. The estimated cost to perform this work is **$56,700,000** and will require **7 years** to complete.

10. To mitigate the Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) overload will require (see item #9 above for reinforcement).

11. To mitigate the (AE/PSEG) Mickleton-Thorofare 230 kV line (from bus 228401 to bus 219121 ckt 1) overload will require the rebuild of 1.69 miles of circuit with a conductor that has capability of at least 2500 A emergency. The estimated cost to perform this work is **$3,500,000** and will take **24 – 36 months** to complete.

12. To mitigate the (AE/PSEG) Mickleton-Thorofare 230 kV line (from bus 228401 to bus 219121 ckt 1) overload will require the rebuild of 1.69 miles of circuit with a conductor that has capability of at least 2500 A emergency. The estimated cost to perform this work is **$3,500,000** and will take **24 – 36 months** to complete.

13. To mitigate the (PECO) Nottingham-Nottingham Reactor 230 kV line (from bus 213844 to bus 213846 ckt 1) overload will require the replacement of the line 220-08 reactor and by-pass circuit switcher at Nottingham substation to get a minimum summer emergency rating of 741 MVA. The estimated cost to perform this work is **$1,700,000** and will require **24 months** to complete.

14. To mitigate the (JCP&L) Larrabee-U2-049 TAP 230 kV line (from bus 206294 to bus 292970 ckt 1) overload will require the reconductoring of the Larrabee-Atlantic 230kV line. The estimated cost to perform this work is $7,420,000. Once reconductored, the rating of the line would be SN: 946 and SE: 1043 MVA.

15. To mitigate the (PECO) Nottingham Reactor-Peach Bottom 230 kV line (from bus 213846 to bus 213869 ckt 1) overload will require reconductoring line 220-08 from Nottingham Reactor to PB Tap to get a minimum summer emergency rating of 741 MVA. The line is approximately 14 miles long. The estimated cost to perform this work is **$10,000,000** and will require **48 months** to complete.

16. To mitigate the (AE) Carneys Point Tap-Pennsgrove 69 kV line (from bus 228320 to bus 228328 ckt 1) overload will require an upgrade of the Deepwater 477 Al strand bus at Pennsgrove to 1200 amp minimum. The estimated cost to perform this work is **$120,000** and will require **12 to 18 months** to complete.

17. To mitigate the (BG&E) BAGLEY13-Raphael Road 230 kV line (from bus 220999 to bus 220980 ckt 1) overload will require the Graceton station to add 6-230kV breakers with an estimated cost of $**10,000,000** and Raphael Road station to add 6-230kV breakers at an estimated cost of **$10,000,000**. It also requires rebuilding Graceton to Raphael Rd to double circuit 2-conductor bundled with an estimated cost of **$30,000,000**. This work would take an estimate of 2-3 years for the substation work concurrently with 5-6 years for the line work.

18. To mitigate the (PSEG) Gloucester-Gloucester 230/138 kV transformer (from bus 219110 to bus 219117 ckt 1) overload will require an upgrade to the transformer. The estimated cost to perform this work is **$13,400,000** and will take **36 months** to complete.

19. To mitigate the (AE) Woodstown #1-Clayton 69 kV line (from bus 228332 to bus 228405 ckt 1) overload will require the reconductoring the circuit from the intersection of route 77 and the Woodstown-Clayton 69kV line to the Clayton substation, a distance of 9.5 miles with 795 ACSR. The estimated cost to perform this work is **$3,300,000** and will take **18 to 24 months** to complete.

20. To mitigate the (PECO) Printz-Ridley Tap 230 kV line (from bus 213912 to bus 213925 ckt 1) overload will require the reconductoring of the Printz to Ridley portion of the 220-46 line (3.15 miles on railroad right of way) with ACSS/TW conductor and replace terminal equipment at Printz and Ridley. The estimated cost to perform this work is **$7,700,000** and it will take **36 months** to complete.

21. To mitigate the (AE) Mickleton-Monroe 230 kV line (from bus 228401 to bus 228402 ckt 1) overload will require the reconductoring of the #1 Mickleton-Monroe 230kV line with an ACSS/TW conductor. The estimated cost to perform this work is **$7,000,000** and will take **30 months** to complete.

22. To mitigate the (AE) W3-016TAP1-Beckett 69 kV line (from bus 903350 to bus 228321 ckt 1) overload will require either a relay change out or setting change. The cost and schedule to perform this work is under development and will be provided in the System Impact Study Report.

23. To mitigate the (PL/BG&E) Safe Harbor Units 3-4 Tap-Graceton 230 kV line (from bus 208071 to bus 220964 ckt 1) overload will require the following: There are substation limitations at Graceton that will be removed with project b0497.

24. To mitigate the (PECO) Peach Bottom-Cooper 230 kV line (from bus 213869 to bus 214089 ckt 1) overload will require reconductoring line 220-08 from PB Tap to Cooper Substation to get a minimum summer emergency rating of 741 MVA. The line is approximately 1.4 miles long. The estimated cost to perform this work is **$1,000,000** and will require **24 months** to complete.

25. To mitigate the (AE) Pennsgrove-Oldman 69 kV line (from bus 228328 to bus 228327 ckt 1) overload will require the upgrade of the Oldmans 477 Al strand bus at the Pennsgrove substation to 1200 amp minimum. The estimated cost to perform this work is **$120,000** and will require **12 to 18 months** to complete.

26. To mitigate the (PSEG) Gloucester-Cuthbert Blvd. 138 kV line (from bus 219117 to bus 219108 ckt 1) overload will require reconductoring the existing circuit. The estimated cost to perform this work is **$20,000,000** and will take **24 months** to complete.

27. To mitigate the (AE) Churchtown-Churchtown 230/69 kV transformer (from bus 228310 to bus 228319 ckt 1) overload will require the installation of a second 230/69kV transformer at Churchtown and convert the 69kV system to a ring bus. The estimated cost to perform this work is **$8,600,000** and will take **24 to 36 months** to complete.

28. To mitigate the #2 BLE-Scull 138 kV line section overload will require a rebuild and reconductor of the #2 BLE-Scull 138 kV line with a larger conductor. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete.

29. To mitigate the #1 BLE-Scull 138 kV line section overload will require a rebuild and reconductor of the #1 BLE-Scull 138 kV line with a larger conductor. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete.

Potential Congestion due to Local Energy Deliverability

(PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection Request. Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full deliverability for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which analyzes all overload conditions associated with the identified overloaded element(s). As a result of the aggregate energy resources in the area, the following violations were identified:

These are ***not*** required reliability upgrades.

None