U1-029 Sherman Ave 138kV
Generation Interconnection

General

The Interconnection Customer (IC), has proposed a 110 MW oil and natural gas fueled simple cycle combustion turbine generating facility to be located in Vineland, New Jersey. The project will connect to the Atlantic City Electric's (ACE) transmission system at either the ORCHARD-CUMBERLAND 230kV line (Option 1) or the Sherman 69kV substation (Option 2). The projected in service date is May 1, 2012.

Option 1

Point of Interconnection: U1-029 Option 1 will interconnect with the Atlantic City Electric's transmission system via a new substation to be built on the ORCHARD-CUMBERLAND 230kV line. Option 1 was studied as a 110 MW injection into a tap of the ORCHARD-CUMBERLAND 230kV line. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2012.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owner's, (ACE), responsibility includes design and construction of all facilities associated with the new 230kV substation on the Interconnected Transmission Owner's side of the Point of Interconnection (POI). ACE's direct connection work at the new substation will consist of building a three (3) circuit breaker 230kV ring bus, including relay work on the 230kV source, on land acquired and prepared by the developer.

The estimated cost to perform this work is **$5,800,000** and can be completed in **24 to 36 months** from the time "Notice to Proceed" is given after the ISA and CSA are executed. Note: the cost does not include the Contribution in Aid of Construction (CIAC) tax or land acquisition.

Interconnection Customer Scope of Direct Connection Work

The developer has assumed full responsibility for design and construction of all facilities associated with the U1-029 generating station and the 230 kV direct connection line on the Interconnection Customer side of the POI. Site preparation on the developer's side of the POI including grading, right of way, and access roads if necessary is assumed to be by the developer.

The Interconnection Customer will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with Atlantic City Electric's Applicable Standards.

Network Impacts

Potential network impacts are as follows:

Generator Deliverability

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

1. The ORCHARD-S122 Tap 230 kV (AE) line will be loaded to 128% of emergency rating (805 MVA) for the outage of the Dennis-CORSON 138 kV line. This project contributes 84 MW to the contingency facility loading.

Multiple Facility Contingency

*(Double Circuit Tower Line contingencies only for the **full energy** output. Stuck breaker and bus fault contingencies will be performed for the System Impact Study)*

2. The CLAYVILL-SHRMAN#3 138kV (AE) line loads from 96.37% to 108.17% (DC power flow) of its emergency rating (292 MVA) for the tower line outage (13AE_WITH_U1_029OP1_A). This project contributes approximately 34.4 MW to cause this thermal violation.

3. The CHICHST1-EDDYSTN4 230kV (PECO) line loads from 99.74% to 100.20% (DC power flow) of its emergency rating (1235 MVA) for the tower line outage (4AE_A19). This project contributes approximately 5.7 MW to cause this thermal violation.

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)*

4. The SCULL#1-MILL #1 138kV line loads from 134.67% to 138.96% (DC power flow) of its emergency rating (268 MVA) for the single line contingency outage (U_queue_reinforcement_48). This project contributes approximately 11.5 MW to the thermal violation.

5. The SCULL#2-MILL #2 138kV line loads from 114.07% to 117.60% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 7.6 MW to the thermal violation.

6. The BLE-SCULL#1 138kV line loads from 105.91% to 109.10% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 8.4 MW to the thermal violation.

7. The BLE-SCULL#2 138kV line loads from 136.40% to 140.35% (DC power flow) of its emergency rating (307 MVA) for the single line contingency outage (U_queue_reinforcement_47). This project contributes approximately 12.1 MW to the thermal violation.

8. The BLE-SCULL#1 138kV line loads from 134.75% to 138.69% (DC power flow) of its emergency rating (292 MVA) for the single line contingency outage (U_queue_reinforcement_48). This project contributes approximately 11.5 MW to the thermal violation.

9. The SCULL#2-MILL #2 138kV line loads from 149.25% to 153.78% (DC power flow) of its emergency rating (268 MVA) for the single line contingency outage (U_queue_reinforcement_47). This project contributes approximately 12.1 MW to the thermal violation.

10. The UNION-CLAYVILL 138kV line loads from 105.73% to 117.52% (DC power flow) of its emergency rating (292 MVA) for the tower line outage (13AE_WITH_U1_029OP1_A). This project contributes approximately 34.4 MW to the thermal violation.

11. The MCKLTON-THOROFAR 230kV line loads from 210.31% to 211.76% (DC power flow) of its emergency rating (566 MVA) for the single line contingency outage (U_queue_reinforcement_45). This project contributes approximately 8.2 MW to the thermal violation.

12. The MCKLTON-DELCOTAP 230kV line loads from 164.24% to 165.99% (DC power flow) of its emergency rating (725 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.7 MW to the thermal violation.

13. The DELCOTAP-TRAINER2 230kV line loads from 153.88% to 155.42% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.7 MW to the thermal violation.

14. The TRAINER-CHIREACT 230kV line loads from 147.24% to 148.79% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.7 MW to the thermal violation.

15. The CHIREACT-CHICHST2 230kV line loads from 147.22% to 148.77% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.7 MW to the thermal violation.

16. The MONROE-NEW FRDM 230kV line loads from 165.74% to 167.05% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 9.5 MW to the thermal violation. Previous project(s) U13 contribute(s) to the loading by 32.8 MW (4.52%).

17. The PEACHBTM-CNASTONE 500kV line loads from 243.54% to 244.81% (DC power flow) of its emergency rating (2598 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 32.9 MW to the thermal violation.

18. The ROCKSPGS-PEACHBTM 500kV line loads from 110.16% to 111.33% (DC power flow) of its emergency rating (3112 MVA) for the tower line outage (1PS). This project contributes approximately 36.3 MW to the thermal violation.

19. The MILL #1-LEWIS #1 138kV line loads from 134.54% to 138.84% (DC power flow) of its emergency rating (268 MVA) for the single line contingency outage (U_queue_reinforcement_48). This project contributes approximately 11.5 MW to the thermal violation.

20. The MILL #2-LEWIS #2 138kV line loads from 122.23% to 126.78% (DC power flow) of its emergency rating (215 MVA) for the single line contingency outage (U_queue_reinforcement_47). This project contributes approximately 9.8 MW to the thermal violation.

21. The DEPTFORD-EAGLE PT 230kV line loads from 135.66% to 136.75% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (U_queue_reinforcement_45). This project contributes approximately 8.2 MW to the thermal violation.

22. The EAGLE PT-GLOUCSTR 230kV line loads from 159.97% to 161.04% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (U_queue_reinforcement_45). This project contributes approximately 8.1 MW to the thermal violation.

23. The THOROFAR-DEPTFORD 230kV line loads from 163.96% to 165.17% (DC power flow) of its emergency rating (676 MVA) for the single line contingency outage (U_queue_reinforcement_45). This project contributes approximately 8.2 MW to the thermal violation.

24. The BLE-MERION 138 kV line loads to 218% of its emergency rating (219 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 29 MW to the contingency facility loading.

25. The CORSON-MIDDLE TAP 138 kV line section loads to 167% of its emergency rating (292 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 39 MW to the contingency facility loading.

26. The BLE-MIDDLE TAP 138 kV line section loads to 180% of its emergency rating (219 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 38 MW to the contingency facility loading.

27. The #2 MILL 138/69 kV transformer loads to 120% of its emergency rating (166 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 7 MVA to the contingency facility loading.

28. The MILL 69 kV bus tie loads to 126% of its emergency rating (239 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 17 MVA to the contingency facility loading.

29. The MILL-TUCKAHOE-CORSON 69 kV line loads to 125% of its emergency rating (146 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 12 MVA to the contingency facility loading.

30. The #2 MILL-SCULL 138 kV line section loads to 230% of its emergency rating (268 MVA) for the outage of the #1 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 15 MW to the contingency facility loading.

31. The #2 BLE-SCULL 138 kV line section loads to 221% of its emergency rating (307 MVA) for the outage of the #1 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 16 MW to the contingency facility loading.

32. The #2 MILL-LEWIS 138 kV line section loads to 193% of its emergency rating (225 MVA) for the outage of the #1 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 12 MW to the contingency facility loading.

33. The #1 LEWIS-MILL 138 kV line section loads to 209% of its emergency rating (268 MVA) for the outage of the #2 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 13 MW to the contingency facility loading.

34. The #1 MILL-SCULL 138 kV line section loads to 212% of its emergency rating (268 MVA) for the outage of the #2 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 14 MW to the contingency facility loading.

35 The #1 BLE-SCULL 138 kV line section loads to 205% of its emergency rating (307 MVA) for the outage of the #2 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 15 MW to the contingency facility loading.

Short Circuit

No new breakers were found to be over-duty.

Stability and Reactive Power Requirements

Will be performed during the Queue U1-029 System Impact Study.

Steady State Voltage Requirements

Will be performed during the Queue U1-029 System Impact Study.

New System Reinforcements

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

1. To mitigate to ORCHARD-S122 230kV (AE) line overload would require the reconductor of the line with an ACSS conductor. The estimated cost to perform this work is **$4,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

2. To mitigate the CLAYVILL-SHRMAN#3 138kV (AE) line overload would require the circuit to be reconductored with an ACSS conductor. The estimated cost to perform this work is **$800,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

3. To mitigate the CHICHST1-EDDYSTN4 230kV (PECO) line overload would require the tear down and rebuild of the circuit to an adequate rating, along with the replacement of terminal equipment. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete.

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 System Impact Study)

4. and 34. To mitigate the #1 MILL-SCULL 138 kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$4,800,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

5. 9.and 30. To mitigate the SCULL #2-MILL #2 138kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$4,800,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

6. 8.and 35. To mitigate the BLE-SCULL#1 138kV (AE) line overloads would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

7. and 31. To mitigate the BLE-SCULL#2 138kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

10. To mitigate the UNION-CLAYVILL 138kV (AE) line overload would require the circuit to be reconductored with an ACSS conductor. The estimated cost to perform this work is **$1,500,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

11. To mitigate the MCKLTON-THOROFAR 230 kV (AE/PSEG) line overloads would require rebuilding and reconductoring the line with an ACSS/TW conductor and upgrading terminal equipment. The estimated cost to perform this work is **$1,500,000** and will take **30 months** to complete from the time "Notice to Proceed is given after the ISA and CSA are executed.

12. To mitigate the MCKLTON-DELCOTAP 230kV (AE/PECO) line overloads would require the rebuild and reconductor of the line section with bundled conductor. The Delaware River crossing section of this line will also require a rebuild and reconductor. The estimated cost to perform this work is **$108,100,000** and will take **36 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

13. To mitigate the DELCOTAP-TRAINER2 230kV (PECO) overload would require a teardown and rebuild to 1243/1410 MVA along with replacement of terminal equipment. The estimated cost to perform this work is **$7,100,000** and will take **42 months** to complete.

14. To mitigate the TRAINER-CHIREACT 230kV (PECO) overload would require a teardown and rebuild of the circuit to a new 1243/1410 MVA rating along with replacement of the terminal equipment. The estimated cost to perform this work is **$9,200,000** and will take **48 months** to complete.

15. To mitigate the CHIREACT-CHICHST2 230kV (PECO) line overload would require removal of the line reactor. The estimated cost to perform this work is **$100,000** and will take **6 months** to complete.

16. To mitigate the MONROE-NEW FRDM 230kV (AE/PSEG) line overloads will require a rebuild and reconductor of the 6.91 mile Monroe-New Freedom 230 kV line with a bundled conductor. The estimated cost to perform this work is $**16,600,000** and will take **36 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

17. To mitigate the PEACHBTM-CNASTONE 500kV (PECO/BGE) line overload would require the following:

BG&E portion of the Conastone – Peach Bottom line:

Conastone Substation - 3 - 4 years to complete – total estimate for this work is **$39,000,000**

- Rebuild 3 existing bays to 4000A (also add breaker in one of the existing bays)
- Build new 4000A bay and install 3 breakers
- Relocate Hunterstown 500kV line
- Replace 4 inch bus with 5 inch

Transmission Line Component - 7 years to build after notice to proceed - total estimate for this work is **$320,200,000**

- 2 - Double Circuit 500 kV OH lines from Conastone - Graceton - MD line
- 2 - UG 230 kV circuits from Conastone - Graceton *
- 3 - UG 230 kV circuits from Graceton - MD line
- 1 - UG 115 kV circuit from Graceton - Five Forks
- Acquire additional 50 ft. wide R/W Graceton - MD line
- Remove existing OH lines/structures

* assumes RTEP project b0497 Install a second Conastone - Graceton 230 kV circuit

PECO portion of the Conastone – Peach Bottom line:

Assumes 500 kV lines with ratings equal to the rating of the 4 inch diameter aluminum bus work at Peach Bottom, i.e. 3366 MVA normal and 4183 MVA emergency are able to be built.

- Relocate Peach Bottom to Graceton 220-08 line to underground to facilitate construction of additional 500kV lines in the Conastone to Peach Bottom right of way. The estimated cost to perform this work is **$29,600,000**

- The underground line will require parallel pipe type cables to achieve a rating of 800MVA. The estimated cost to perform this work is **$61,000,000** and **36 months** to complete.

Note: the 220-08 line is an offsite source for the Peach Bottom Atomic Power Station and its integrity must be maintained.

- Remove existing 220-08 line towers to clear the north side of the right of way for 500kV construction. The estimated cost to perform this work is **$1,500,000** and **6 months** to complete.

- Construct new double circuit 500kV line on the north side of the 300 foot wide Peach Bottom to Maryland state line right of way. The estimated cost to perform this work is **$17,000,000** and **30 months** to complete after the removal of the existing 230 kV tower line.

- Remove existing 5012 line towers to clear the south side of the right of way for new higher capacity 500kV lines. The estimated cost to perform this work is **$1,500,000** and **6 months** to complete.

- Construct second new double circuit 500kV line on the south side of the Peach Bottom to Maryland state line right of way. The estimated cost to perform this work is **$17,000,000** and **30 months** to complete after the removal of the existing 500 kV tower line.

- Upgrade 5012 line substation equipment to achieve the new higher rating. The estimated cost to perform this work is **$3,000,000** and **18 months** to complete.

- Expand the 500kV substations (North and South) at Peach Bottom to accommodate three additional 500kV lines. The estimated cost to perform this work is **$18,000,000** ($6M per new line) and **30 months** to complete.

Note: The substation work may have to be coordinated with refueling outages at the Peach Bottom Atomic Power Station and that the overall project may overstress several 500 kV circuit breakers.

18. To mitigate the ROCKSPGS-PEACHBTM 500kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform his work is **$8,000,000** and will take **36 months** to complete.

19. and 33. To mitigate the #1 LEWIS-MILL 138 kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$4,700,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

20. and 32. To mitigate the #2 MILL-LEWIS 138 kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$4,800,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

21. To mitigate the DEPTFORD-EAGLE PT 230kV (PSEG) line overload would require the reconductoring of approximately 1 mile of line and upgrading of terminal equipment. The estimated cost to perform this work is **$1,200,000.**

22. To mitigate the EAGLE PT-GLOUCSTR 230kV (PSEG) line overload would require reconductoring 3 miles of line and the replacement of two wave traps and two line disconnects for a new rating of A=800 MVA, B=1000 MVA. The estimated cost to perform this work is **$3,800,000**.

23. To mitigate the THOROFAR-DEPTFORD 230kV (PSEG) line overload would require the reconductoring of approximately 4 miles of line and upgrading of terminal equipment. The estimated cost to perform this work is **$4,700,000.**

24. To mitigate the BLE-MERION 138 kV (AE) line overload would require the reconductor of the circuit with an ACSS conductor. The estimated cost to perform this work is **$600,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

25. To mitigate the CORSON-MIDDLE TAP 138 kV (AE) line overload would require the circuit to be reconductored with an ACSS conductor. The estimated cost to perform this work is **$200,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

26. To mitigate the BLE-MIDDLE TAP 138kV (AE) line overload would require the circuit to be reconductored with an ACSS conductor. The estimated cost to perform this work is **$3,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

27. To mitigate the #2 MILL 138/69kV (AE) transformer overload would require an upgrade of the transformer strand bus. The estimated cost to perform this work is **$200,000** and will take **24 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

28. The MILL 69 kV (AE) bus tie will be loaded to 126% of emergency rating (239 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 17 MVA to the contingency facility loading. The reinforcement necessary to mitigate this overload is currently under development and is expected to be available during the System Impact Study phase of U1-029.

29. The MILL-TUCKAHOE-CORSON 69 kV (AE) line will be loaded to 125% of emergency rating (146 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 12 MVA to the contingency facility loading. The reinforcement necessary to mitigate this overload is currently under development and is expected to be available during the System Impact Study phase of U1-029.

Option 2

Point of Interconnection: U1-029 Option 2 will interconnect with the Atlantic City Electric's transmission system at the Sherman 69kV substation. Option 2 was studied as a 110 MW injection into the Sherman 69kV substation. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2012.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owner's, (ACE), responsibility includes design and construction of all facilities associated with the Sherman 69kV substation on the ACE side of the Point of Interconnection (POI). ACE's direct connection work at the Sherman substation consists of creating a 69kV terminal for the Interconnection Customer's 69kV line to the U1-029 site.

The estimated cost to perform this work is **$800,000** and can be completed in **24 to 36 months** from the time "Notice to Proceed" is given after the ISA and CSA are executed. Note: the cost does not include the Contribution in Aid of Construction (CIAC) tax.

Interconnection Customer Scope of Direct Connection Work

The developer has assumed full responsibility for design and construction of all facilities associated with the U1-029 generating station and the 69kV direct connection line on the Interconnection Customer side of the POI. Site preparation including grading, right of way, and access roads if necessary is assumed to be by the developer.

The Interconnection Customer will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with Atlantic City Electric's Applicable Standards.

Network Impacts

The potential network impacts are as follows:

Generator Deliverability

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

1. The ORCHARD-S122 Tap 230 kV (AE) line will be loaded to 124% of emergency rating (805 MVA) for the outage of the Dennis-CORSON 138 kV line. This project contributes 48 MW to the contingency facility loading.

Multiple Facility Contingency

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

2. The CHICHST1-EDDYSTN4 230kV line loads from 99.74% to 100.16% (DC power flow) of its emergency rating (1235 MVA) for the tower line outage (4AE_A19). This project contributes approximately 5.2 MW to cause this thermal violation.

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)

3. The SCULL#2-MILL #2 138kV line loads from 114.06% to 118.43% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 9.4 MW to the thermal violation.

4. The BLE-SCULL#2 138kV line loads from 111.39% to 115.35% (DC power flow) of its normal rating (237 MVA) for non-contingency condition. This project contributes approximately 9.4 MW to the thermal violation.

5. The BLE-SCULL#1 138kV line loads from 105.91% to 109.82% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 8.4 MW to the thermal violation.

6. The SCULL#2-MILL #2 138kV line loads from 149.25% to 154.83% (DC power flow) of its emergency rating (268 MVA) for the single line contingency outage (U_queue_reinforcement_47). This project contributes approximately 14.9 MW to the thermal violation.

7. The GLOUCSTR-GLOUCSTR 230/138kV transformer loads from 148.17% to 149.68% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 5.2 MW to the thermal violation.

8. The GLOUCSTR-CUTHBERT 138kV line loads from 147.93% to 149.44% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 5.2 MW to the thermal violation.

9. The MCKLTON-THOROFAR 230kV line loads from 203.13% to 204.40% (DC power flow) of its normal rating (451 MVA) for non-contingency condition. This project contributes approximately 5.7 MW to the thermal violation.

10. The EAGLE PT-GLOUCSTR 230kV line loads from 161.58% to 163.10% (DC power flow) of its emergency rating (752 MVA) for the tower line outage (4PS). This project contributes approximately 11.4 MW to the thermal violation.

11. The THOROFAR-DEPTFORD 230kV line loads from 165.93% to 167.64% (DC power flow) of its emergency rating (676 MVA) for the tower line outage (4PS). This project contributes approximately 11.5 MW to the thermal violation.

12. The MCKLTON-DELCOTAP 230kV line loads from 164.24% to 166.00% (DC power flow) of its emergency rating (725 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.8 MW to the thermal violation.

13. The DELCOTAP-TRAINER2 230kV line loads from 153.88% to 155.43% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.8 MW to the thermal violation.

14. The DEPTFORD-EAGLE PT 230kV line loads from 137.43% to 138.96% (DC power flow) of its emergency rating (752 MVA) for the tower line outage (4PS). This project contributes approximately 11.5 MW to the thermal violation.

15. The TRAINER-CHIREACT 230kV line loads from 147.24% to 148.80% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.8 MW to the thermal violation.

16. The CHIREACT-CHICHST2 230kV line loads from 147.22% to 148.78% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 12.8 MW to the thermal violation.

17. The MONROE-NEW FRDM 230kV line loads from 165.74% to 168.52% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 20.2 MW to the thermal violation.

18. The MONROE-NEW FRDM 230kV line loads from 104.23% to 106.90% (DC power flow) of its normal rating (650 MVA) for non-contingency condition. This project contributes approximately 17.3 MW to the thermal violation.

19. The PEACHBTM-CNASTONE 500kV line loads from 243.54% to 244.78% (DC power flow) of its emergency rating (2598 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 32.3 MW to the thermal violation.

20. The ROCKSPGS-PEACHBTM 500kV line loads from 110.16% to 111.26% (DC power flow) of its emergency rating (3112 MVA) for the tower line outage (1PS). This project contributes approximately 34.3 MW to the thermal violation.

21. The BLE-SCULL#2 138kV line loads from 136.40% to 141.26% (DC power flow) of its emergency rating (307 MVA) for the single line contingency outage (U_queue_reinforcement_47). This project contributes approximately 14.9 MW to the thermal violation.

22. The MILL #2-LEWIS #2 138kV line loads from 122.23% to 127.78% (DC power flow) of its emergency rating (215 MVA) for the single line contingency outage (U_queue_reinforcement_47). This project contributes approximately 11.9 MW to the thermal violation.

23. The BLE-SCULL#1 138kV line loads from 134.75% to 139.60% (DC power flow) of its emergency rating (292 MVA) for the single line contingency outage (U_queue_reinforcement_48). This project contributes approximately 14.1 MW to the thermal violation.

24. The SCULL#1-MILL #1 138kV line loads from 134.67% to 139.95% (DC power flow) of its emergency rating (268 MVA) for the single line contingency outage

(U_queue_reinforcement_48). This project contributes approximately 14.1 MW to the thermal violation.

25. The MILL #1-LEWIS #1 138kV line loads from 134.54% to 139.82% (DC power flow) of its emergency rating (268 MVA) for the single line contingency outage (U_queue_reinforcement_48). This project contributes approximately 14.1 MW to the thermal violation.

26. The MCKLTON-THOROFAR 230kV line loads from 210.37% to 212.41% (DC power flow) of its emergency rating (566 MVA) for the single line contingency outage (U_queue_reinforcement_45). This project contributes approximately 11.6 MW to the thermal violation.

27. The BLE-MERION 138 kV (AE) line loads to 174% of its emergency rating (219 MVA) for the outage of the BLE-CORSON 138 kV line. This project contributes 14 MW to the contingency facility loading.

28. The CORSON-MIDDLE TAP 138 kV (AE) line section loads to 162% of its emergency rating (292 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 25 MW to the contingency facility loading.

29. The BLE-MIDDLE TAP 138 kV line section load to 174% of its emergency rating (219 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 24 MW to the contingency facility loading.

30. The MILL 69 kV bus tie loads to 124% of its emergency rating (239 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 11 MVA to the contingency facility loading.

31. The MILL-TUCKAHOE-CORSON 69 kV line loads to 122% of its emergency rating (146 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 8 MVA to the contingency facility loading.

32. The #2 MILL-SCULL 138 kV line section loads to 230% of its emergency rating (268 MVA) for the outage of the #1 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 15 MW to the contingency facility loading.

33. The #2 BLE-SCULL 138 kV line section loads to 221% of its emergency rating (307 MVA) for the outage of the #1 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 16 MW to the contingency facility loading.

34. The #2 MILL-LEWIS 138 kV line section loads to 227% of its emergency rating (225 MVA) for the outage of the #1 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 11 MW to the contingency facility loading.

35. The #1 LEWIS-MILL 138 kV line section loads to 209% of its emergency rating (268 MVA)

for the outage of the #2 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 13 MW to the contingency facility loading.

36. The #1 MILL-SCULL 138 kV line section loads to 212% of its emergency rating (268 MVA) for the outage of the #2 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 14 MW to the contingency facility loading.

37. The #1 BLE-SCULL 138 kV line section loads to 205% of its emergency rating (307 MVA) for the outage of the #2 BL ENGLAND-MILL-LEWIS 138 kV line. This project contributes 15 MW to the contingency facility loading.

Short Circuit

No new breakers were found to be over-duty.

Stability and Reactive Power Requirements

Will be performed during the Queue U1-029 System Impact Study.

Steady State Voltage Requirements

Will be performed during the Queue U1-029 System Impact Study.

New System Reinforcements

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

1. To mitigate the ORCHARD-S122 Tap 230 kV (AE) line overload would require the reconductor of the ORCHARD-S122 230 kV line with an ACSS conductor. The estimated cost to perform this work is **$4,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

2. To mitigate the CHICHST1-EDDYSTN4 230kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete.

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) (Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

3. 6.and 32. To mitigate the SCULL #2-MILL #2 138kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to

perform this work is **$4,800,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

4. 21.and 33. To mitigate the BLE-SCULL#2 138kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

5. 23.and 37. To mitigate the BLE-SCULL#1 138kV (AE) line overloads would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$2,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

7. To mitigate the GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer overload would require the replacement of the transformer. The estimated cost to perform this work is **$3,975,000**.

8. To mitigate the GLOUCSTR-CUTHBERT 138kV (PSEG) line overload would require reconductoring approximately 5 miles of line and upgrading terminal equipment. The estimated cost to perform this work is **$20,800,000.**

9. and 26. To mitigate the MCKLTON-THOROFAR 230 kV (AE/PSEG) line overloads would require rebuilding and reconductoring the line with an ACSS/TW conductor and upgrading terminal equipment. The estimated cost to perform this work is **$1,500,000** and will take **30 months** to complete from the time "Notice to Proceed is given after the ISA and CSA are executed.

10. To mitigate the EAGLE PT-GLOUCSTR 230kV (PSEG) line overload would require reconductoring 3 miles of line and the replacement of two wave traps and two line disconnects for a new rating of A=800 MVA, B=1000 MVA. The estimated cost to perform this work is **$3,800,000**.

11. To mitigate the THOROFAR-DEPTFORD 230kV (PSEG) line overload would require the reconductoring of approximately 4 miles of line and upgrading of terminal equipment. The estimated cost to perform this work is **$4,700,000.**

12. To mitigate the MCKLTON-DELCOTAP 230kV (AE/PECO) line overloads would require the rebuild and reconductor of the line section with bundled conductor. The Delaware River crossing section of this line will also require a rebuild and reconductor. The estimated cost to perform this work is **$108,100,000** and will take **36 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

13. To mitigate the DELCOTAP-TRAINER2 230kV (PECO) overload would require a teardown and rebuild to 1243/1410 MVA along with replacement of terminal equipment. The estimated cost to perform this work is **$7,100,000** and will take **42 months** to complete.

14. To mitigate the DEPTFORD-EAGLE PT 230kV (PSEG) line overload would require the reconductoring of approximately 1 mile of line and upgrading of terminal equipment. The estimated cost to perform this work is **$1,200,000.**

15. To mitigate the TRAINER-CHIREACT 230kV (PECO) overload would require a teardown and rebuild of the circuit to a new 1243/1410 MVA rating along with replacement of the terminal equipment. The estimated cost to perform this work is **$9,200,000** and will take **48 months** to complete.

16. To mitigate the CHIREACT-CHICHST2 230kV (PECO) line overload would require removal of the line reactor. The estimated cost to perform this work is **$100,000** and will take **6 months** to complete.

17. and 18. To mitigate the MONROE-NEW FRDM 230kV (AE/PSEG) line overloads will require a rebuild and reconductor of the 6.91 mile Monroe-New Freedom 230 kV line with a bundled conductor. The estimated cost to perform this work is $**16,600,000** and will take **36 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

19. To mitigate the PEACHBTM-CNASTONE 500kV line overload would require the following:

BG&E portion of the Conastone – Peach Bottom line:

Conastone Substation - 3 - 4 years to complete – total estimate for this work is **$39,000,000**

- Rebuild 3 existing bays to 4000A (also add breaker in one of the existing bays)
- Build new 4000A bay and install 3 breakers
- Relocate Hunterstown 500kV line
- Replace 4 inch bus with 5 inch

Transmission Line Component - 7 years to build after notice to proceed - total estimate for this work is **$320,200,000**

- 2 - Double Circuit 500 kV OH lines from Conastone - Graceton - MD line
- 2 - UG 230 kV circuits from Conastone - Graceton *
- 3 - UG 230 kV circuits from Graceton - MD line
- 1 - UG 115 kV circuit from Graceton - Five Forks
- Acquire additional 50 ft. wide R/W Graceton - MD line
- Remove existing OH lines/structures

* assumes RTEP project b0497 Install a second Conastone - Graceton 230 kV circuit

PECO portion of the Conastone – Peach Bottom line:

Assumes 500 kV lines with ratings equal to the rating of the 4 inch diameter aluminum bus work at Peach Bottom, i.e. 3366 MVA normal and 4183 MVA emergency are able to be built.

- Relocate Peach Bottom to Graceton 220-08 line to underground to facilitate construction of additional 500kV lines in the Conastone to Peach Bottom right of way. The estimated cost to perform this work is **$29,600,000**

- The underground line will require parallel pipe type cables to achieve a rating of 800MVA. The estimated cost to perform this work is **$61,000,000** and **36 months** to complete.

Note: the 220-08 line is an offsite source for the Peach Bottom Atomic Power Station and its integrity must be maintained.

- Remove existing 220-08 line towers to clear the north side of the right of way for 500kV construction. The estimated cost to perform this work is **$1,500,000** and **6 months** to complete.

- Construct new double circuit 500kV line on the north side of the 300 foot wide Peach Bottom to Maryland state line right of way. The estimated cost to perform this work is **$17,000,000** and **30 months** to complete after the removal of the existing 230 kV tower line.

- Remove existing 5012 line towers to clear the south side of the right of way for new higher capacity 500kV lines. The estimated cost to perform this work is **$1,500,000** and **6 months** to complete.

- Construct second new double circuit 500kV line on the south side of the Peach Bottom to Maryland state line right of way. The estimated cost to perform this work is **$17,000,000** and **30 months** to complete after the removal of the existing 500 kV tower line.

- Upgrade 5012 line substation equipment to achieve the new higher rating. The estimated cost to perform this work is **$3,000,000** and **18 months** to complete.

- Expand the 500kV substations (North and South) at Peach Bottom to accommodate three additional 500kV lines. The estimated cost to perform this work is **$18,000,000** ($6M per new line) and **30 months** to complete.

Note: The substation work may have to be coordinated with refueling outages at the Peach Bottom Atomic Power Station and that the overall project may overstress several 500 kV circuit breakers.

20. To mitigate the ROCKSPGS-PEACHBTM 500kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform his work is **$8,000,000** and will take **36 months** to complete.

22. and 34. To mitigate the #2 MILL-LEWIS 138 kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to

perform this work is **$4,800,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

24. and 36. To mitigate the #1 MILL-SCULL 138 kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$4,800,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

25. and 35. To mitigate the #1 LEWIS-MILL 138 kV (AE) line overload would require the rebuild and reconductor of the line section with a larger conductor. The estimated cost to perform this work is **$4,700,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

27. To mitigate the BLE-MERION 138 kV (AE) line overload would require the reconductor of the circuit with an ACSS conductor. The estimated cost to perform this work is **$600,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

28. To mitigate the CORSON-MIDDLE TAP 138 kV (AE) line overload would require the circuit to be reconductored with an ACSS conductor. The estimated cost to perform this work is **$200,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

29. To mitigate the BLE-MIDDLE TAP 138kV (AE) line overload would require the circuit to be reconductored with an ACSS conductor. The estimated cost to perform this work is **$3,000,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

30. The MILL 69 kV (AE) bus tie will be loaded to 124% of emergency rating (239 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 11 MVA to the contingency facility loading. The reinforcement necessary to mitigate this overload is currently under development and is expected to be available during the System Impact Study phase of U1-029.

31. The MILL-TUCKAHOE-CORSON 69 kV (AE) line will be loaded to 122% of emergency rating (146 MVA) for the outage of the ORCHARD-S122 Tap 230 kV line. This project contributes 8 MVA to the contingency facility loading. The reinforcement necessary to mitigate this overload is currently under development and is expected to be available during the System Impact Study phase of U1-029.