

T146 England **Generation Interconnection**

General

The Interconnection Customer (IC), has proposed a 346 MW (69.2 MW of which is capacity) wind power generating facility to be located off shore in the Atlantic Ocean approximately 20 miles east of Avalon, New Jersey. The IC will connect to either the Atlantic City Electric's (ACE) transmission system at either the BL England 138kV substation (Option 1) or the Dennis 138kV substation (Option 2).

Queue Project #T146 is in response to a Solicitation for Proposals to Develop Off-Shore Wind Renewable Energy Facilities Supplying Electricity to the Distribution System Serving New Jersey, New Jersey Board of Public Utilities, dated October 5, 2005. The proposed project will be installed in two phases. Phase one (1) is expected to be in-service on November 1, 2012, and phase two (2) on November 1, 2013. The project is expected to be commercial on January 1, 2014.

Option 1

Point of Interconnection: T146 Option 1 will interconnect with the Atlantic City Electric's transmission system at the BL England 138kV substation. Option 1 was studied as a 346 MW (69 MW capacity) injection into the BL England 138kV 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 BL England 138kV substation on the Interconnected Transmission Owner's side of the Point of Interconnection (POI). ACE's direct connection work at the BL England substation consists of creating two (2) 138kV terminal positions for the Interconnection Customer's 138 kV line to the T146 site.

The estimated cost to perform this work is **\$4,000,000** 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 Interconnection Customer's off-shore facility is comprised of an array of wind turbine generators and a collection substation. The collection substation will be connected to the ACE

BL England 138kV substation via a submarine/underground or overhead cable. The developer has assumed full responsibility for design and construction of all facilities associated with the T146 generating station and the 138 kV 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

Potential network impacts are as follows:

Generator Deliverability

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

1. The #2 MILL 138/69kV (AE) transformer will be loaded to 107% of its emergency rating (166 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 7 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 MERION-CORSON 1 138kV (AE) line loads from 78.68% to 108.14% (DC power flow) of its emergency rating (219 MVA) for the tower line outage (14AE). This project contributes approximately 64.5 MW to cause this thermal violation.

3. The BLE-MDLE TP 138kV (AE) line loads from 59.02% to 102.59% (DC power flow) of its emergency rating (219 MVA) for the tower line outage (14AE). This project contributes approximately 95.4 MW to cause this thermal violation.

4. The UNION-CLAYVILL 138kV (AE) line loads from 91.93% to 111.61% (DC power flow) of its emergency rating (292 MVA) for the tower line outage (13AE). This project contributes approximately 57.5 MW to cause this thermal violation.

5. The CLAYVILL-SHRMAN#3 138kV (AE) line loads from 82.57% to 102.26% (DC power flow) of its emergency rating (292 MVA) for the tower line outage (13AE). This project contributes approximately 57.5 MW to cause this thermal violation.

Short Circuit

There were no additional overstressed breakers identified as a result of this project.

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)

6. The SCULL#2-MILL #2 138kV (AE) line loads from 109.05% to 119.09% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 21.6 MW to the thermal violation.

7. The BLE-SCULL#2 138kV (AE) line loads from 106.84% to 115.95% (DC power flow) of its normal rating (237 MVA) for non-contingency condition. This project contributes approximately 21.6 MW to the thermal violation.

8. The BLE-SCULL#1 138kV (AE) line loads from 101.07% to 109.86% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 18.9 MW to the thermal violation.

9. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 163.16% to 164.19% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 7.4 MW to the thermal violation.

10. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 141.31% to 142.62% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.5 MW to the thermal violation.

11. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 133.75% to 134.91% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.5 MW to the thermal violation.

12. The TRAINER-CHIREACT 230kV (PECO) line loads from 127.12% to 128.28% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.5 MW to the thermal violation.

13. The CHIREACT-CHICHST2 230kV (PECO) line loads from 127.10% to 128.26% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.5 MW to the thermal violation.

14. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 127.72% to 128.99% (DC power flow) of its normal rating (605 MVA) for non-contingency condition. This project contributes approximately 7.7 MW to the thermal violation.

15. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 106.28% to 107.29% (DC power flow) of its normal rating (650 MVA) for non-contingency condition. This project contributes approximately 6.6 MW to the thermal violation.

16. The RL_230-KEEN_230 230kV (DPL) line loads from 121.92% to 123.03% (DC power flow) of its emergency rating (932 MVA) for the single line contingency outage (PJM64). This project contributes approximately 10.3 MW to the thermal violation.
17. The CORSON 1-CORSON 2 138kV (AE) line loads from 129.06% to 150.49% (DC power flow) of its emergency rating (282 MVA) for the tower line outage (14AE). This project contributes approximately 60.4 MW to the thermal violation.
18. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 160.02% to 164.65% (DC power flow) of its emergency rating (725 MVA) for the tower line outage (4AE_A19). This project contributes approximately 33.5 MW to the thermal violation.
19. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 150.15% to 154.23% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 33.4 MW to the thermal violation.
20. The TRAINER-CHIREACT 230kV (PECO) line loads from 143.52% to 147.59% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 33.4 MW to the thermal violation.
21. The CHIREACT-CHICHST2 230kV (PECO) line loads from 143.50% to 147.57% (DC power flow) of its emergency rating (819 MVA) for the tower line outage (4AE_A19). This project contributes approximately 33.4 MW to the thermal violation.
22. The 3 MILE I-TMI 500/230kV (ME) transformer loads from 180.59% to 183.77% (DC power flow) of its emergency rating (1077 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 34.2 MW to the thermal violation.
23. The NOTTNGHM-NOTTREAC 230kV (PECO) line loads from 240.63% to 244.90% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 26.8 MW to the thermal violation.
24. The NOTTREAC-PCHBTMTP 230kV (PECO) line loads from 240.59% to 244.87% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 26.8 MW to the thermal violation.
25. The PCHBTMTP-GRACETON 230kV (PECO/BGE) line loads from 240.59% to 244.87% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 26.8 MW to the thermal violation.
26. The PEACHBTM-3 MILE I 500kV (PECO/ME) line loads from 119.56% to 122.06% (DC power flow) of its emergency rating (2596 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 65.1 MW to the thermal violation.
27. The CNASTONE-N-NWEST 500kV (BGE) line loads from 200.10% to 203.11% (DC power flow) of its emergency rating (2901 MVA) for the tower line outage

(CNSTN_NWEST_NNWEST_A). This project contributes approximately 87.2 MW to the thermal violation.

28. The ROCKSPGS-PEACHBTM 500kV (PECO) line loads from 105.79% to 109.13% (DC power flow) of its emergency rating (3112 MVA) for the tower line outage (1PS). This project contributes approximately 104.0 MW to the thermal violation.

29. The #2 MILL-SCULL 138 kV (AE) line section will be loaded to 197.8% of its emergency rating (268 MVA) for the outage of the #1 BL England-Mill-Lewis 138 kV line. This project contributes 33 MW to the contingency facility loading.

30. The #2 BLE-SCULL 138 kV (AE) line section will be loaded to 189.2% of its emergency rating (307 MVA) for the outage of the #1 BL England-Mill-Lewis 138 kV line. This project contributes 34 MW to the contingency facility loading.

31. The #2 MILL-LEWIS 138 kV (AE) line section will be loaded to 161.5% of its emergency rating (225 MVA) for the outage of the #1 BL England-Mill-Lewis 138 kV line. This project contributes 24 MW to the contingency facility loading.

32. The #1 LEWIS-MILL 138 kV (AE) line section will be loaded to 187.7% of its emergency rating (268 MVA) for the outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes 30 MW to the contingency facility loading.

33. The #1 MILL-SCULL 138 kV (AE) line section will be loaded to 187.7% of its emergency rating (268 MVA) for the outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes 32 MW to the contingency facility loading.

34. The #1 BLE-SCULL 138 kV (AE) line section will be loaded to 174.2% of its emergency rating (307 MVA) for the outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes 33 MW to the contingency facility loading.

Stability and Reactive Power Requirements

Will be performed during the Queue T146 System Impact Study.

Steady State Voltage Requirements

Will be performed during the Queue T146 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 #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. This is also the reinforcement for item #40 under "Delivery of Energy Portion of Interconnection Request."

2. To mitigate the MERION-CORSON 1 138kV (AE) line overload would require the reconductor of a section of the line with an ACSS conductor. The estimated cost to perform this work is **\$2,400,000** and will take **30 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed. This is also the reinforcement for item #10 under "Delivery of Energy Portion of Interconnection Request."

3. To mitigate the BLE-MDLE TP 138kV (AE) line overload would require the circuit to be reconducted 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.

4. To mitigate the UNION-CLAYVILL 138kV (AE) line overload would require the circuit to be reconducted 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.

5. To mitigate the CLAYVILL-SHRMAN#3 138kV (AE) line overload would require the circuit to be reconducted 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.

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)

6. and 29. To mitigate the SCULL #2-MILL #2 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 **\$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. This is also the reinforcement for item #1 under "Delivery of Energy Portion of Interconnection Request."

7. and 30. 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. This is also the reinforcement for item #2 under "Delivery of Energy Portion of Interconnection Request."

8. and 34. 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. This is also the reinforcement for item #3 under “Delivery of Energy Portion of Interconnection Request.”

9. and 15. 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. This is also the reinforcement for items #25 and #31 under “Delivery of Energy Portion of Interconnection Request.”

10. 14 and 18. 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. This is also the reinforcement for item #30 under “Delivery of Energy Portion of Interconnection Request.”

11. and 19. 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. This is also the reinforcement for item #33 under “Delivery of Energy Portion of Interconnection Request.”

12. and 20. 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. This is also the reinforcement for item #36 under “Delivery of Energy Portion of Interconnection Request.”

13. and 21. 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. This is also the reinforcement for item #37 under “Delivery of Energy Portion of Interconnection Request.”

16. To mitigate the RL_230-KEEN_230 230kV (DP&L) line overload would require the replacement of the 2000A wave trap with one rated for 3000A. The estimated cost to perform this work is **\$400,000** and will take **12 to 18 months** to complete. This is also the reinforcement for item #39 under “Delivery of Energy Portion of Interconnection Request.”

17. To mitigate the CORSON 1-CORSON 2 138kV (AE) line overloads would require the upgrade of the Corson 138kV bus tie breaker. 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. This is also the reinforcement for item #8 under “Delivery of Energy Portion of Interconnection Request.”

22. To mitigate the 3 MILE I-TMI 500/230kV (METED) transformer would require the installation of a second 500/230kV transformer. The estimated cost to perform this work is **\$11,800,000** and will take **20 months** to complete.

23. To mitigate the NOTTINGHAM-NOTTREAC 230kV (PECO) line overload would require upgrading the circuit by replacing line reactors. The estimate to perform this work is **\$200,000** and will take **18 months** to complete.

24. To mitigate the NOTTREAC-PCHBTMTP 230kV (PECO) line overload would require the teardown and rebuild of the circuit to a 1243/1410 MVA rating in addition to building a second circuit on a new right of way. A new 230kV substation will also be required at Peach Bottom. The estimate to perform this work is **\$90,000,000** and will take **120 months** to complete.

25. To mitigate the PCHBTMTP-GRACETON 230kV (PECO/BG&E) line overload would require the replacement of existing circuits with three (3) 230kV underground circuits. The estimate to perform this work is **\$90,000,000** and will take **120 months** to complete. Note: a new right of way will be required if this line is to be replaced with an aerial transmission line. Assume 6 years to acquire land.

26. To mitigate the PEACHBTM-3 MILE I 500kV (PECO/METED) line overload would require the replacement of circuit breakers and wave trap. The estimated cost to perform this work is **\$3,000,000** and will take **30 months** to complete.

27. To mitigate the CNASTONE-N-NWEST 500kV (BG&E) overload would require:

1 new single circuit line with the following assumptions:

A new 200 ft. wide ROW paralleling the existing Conastone to Northwest ROW
Total ROW length = 19.6 miles
3 - bundle 1,590 kcm conductor
North Northwest substation is located 4 miles north of Northwest substation

The estimated cost to perform this work, which includes breakers and terminations, is **\$110,000,000** and will take **10 years** to complete.

Additional substation work to include:

At the Conastone 500kV substation – install a 1 breaker bay
At the NNW 500kV substation – install a 3 breaker bay.

The estimated cost to perform this work is **\$9,200,000** with a **10 year** lead time to complete.

28. To mitigate the ROCKSPGS-PEACHBTM 500kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform his work is **\$2,000,000** and will take **30 months** to complete.

31. 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. This is also the reinforcement for items #9 and #11 under “Delivery of Energy Portion of Interconnection Request.”

32. To mitigate the #1 LEWIS-MILL 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 **\$4,700,000** and will take **30 months** to complete from the time “Notice to Proceed” is given after the ISA and CSA are executed. This is also the reinforcement for item #5 under “Delivery of Energy Portion of Interconnection Request.”

33. 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. This is also the reinforcement for item #4 under “Delivery of Energy Portion of Interconnection Request.”

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 Transmission Interconnection Request). **These are not required reinforcements.***

As a result of the aggregate energy resources in the area, the following violations were identified:

1. The SCULL#2-MILL #2 138kV (AE) line loads from 168.5% to 218.7% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 108.0 MW to the thermal congestion. See items #6 and #29 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.
2. The BLE-SCULL#2 138kV (AE) line loads from 160.8% to 206.3% (DC power flow) of its normal rating (237 MVA) for non-contingency condition. This project contributes approximately 108.0MW to the thermal congestion. See items #7 and #30 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.
3. The BLE-SCULL#1 138kV (AE) line loads from 154.4% to 198.3% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 94.5 MW to the thermal congestion. See items #8 and #34 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.
4. The SCULL#1-MILL #1 138kV (AE) line loads from 139.3% to 183.3% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes

approximately 94.5 MW to the thermal congestion. See item #33 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

5. The MILL #1-LEWIS #1 138kV (AE) line loads from 139.2% to 183.1% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 94.5 MW to the thermal congestion. See item #32 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

6. The OYSTER C-MANITOU 230kV (JCPL) line loads from 118.6% to 124.5% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC15). This project contributes approximately 47.5 MW to the thermal congestion.

7. The OYSTER C-MANITOU 230kV (JCPL) line loads from 118.6% to 124.5% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC14). This project contributes approximately 47.5 MW to the thermal congestion.

The reinforcement necessary to mitigate the overloads in items 6 and 7 is currently under development and is expected to be available during the System Impact Study phase of T146.

8. The CORSON 1-CORSON 2 138kV (AE) line loads from 118.2% to 137.1% (DC power flow) of its normal rating (282 MVA) for non-contingency condition. This project contributes approximately 53.3 MW to the thermal congestion. See item #17 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

9. The MILL #2-LEWIS #2 138kV (AE) line loads from 108.0% to 143.1% (DC power flow) of its emergency rating (215 MVA) for the single line contingency outage (AE1). This project contributes approximately 75.4 MW to the thermal congestion. See item #31 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

10. The MERION-CORSON 1 138kV (AE) line loads from 75.8% to 104.7% (DC power flow) of its normal rating (199 MVA) for non-contingency condition. This project contributes approximately 57.6 MW to the thermal congestion. See item #2 in “New System Reinforcements” above for reinforcement.

11. The MILL #2-LEWIS #2 138kV (AE) line loads from 100.1% to 134.8% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 74.6 MW to the thermal congestion. See item #31 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

12. The GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer loads from 144.6% to 148.9% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 14.8 MW to the thermal congestion. To mitigate the overload would require the replacement of the transformer. The estimated cost to perform this work is **\$3,975,000**.

13. The GLOUCSTR-CUTHBERT 138kV (PSEG) line loads from 144.3% to 148.7% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 14.8 MW to the thermal congestion. To mitigate the overload would require reconductoring approximately 5 miles of line and upgrading terminal equipment. The estimated cost to perform this work is **\$20,800,000**.

14. The PRINTZ-RIDLEY 230kV (PECO) line loads from 130.6% to 131.8% (DC power flow) of its emergency rating (1432 MVA) for the single line contingency outage (PE4). This project contributes approximately 16.3 MW to the thermal congestion. To mitigate the overload would require the reconductor 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 is to perform this work is **\$7,800,000** and it will take **36 months** to complete.

15. The R39OPT1-RED OAKA 230kV (JCPL) line loads from 108.3% to 110.3% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC31B_Q08OP1B_Q11A). This project contributes approximately 16.1 MW to the thermal congestion. To mitigate this overload would require rebuilding the double circuit tower line (0.2 miles) with bundled 1590 kcmil 54/19 ACSS/AW and adding bundled drop loop conductors at Red Oak A and R39. The estimated cost is to perform this work is **\$200,000**.

16. The Q11OP3-RED OAKB 230kV (JCPL) line loads from 105.6% to 107.6% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC30B_Q08OP1B_R39OP1A). This project contributes approximately 15.9 MW to the thermal congestion. To mitigate this overload would require rebuilding the double circuit tower line (0.2 miles) with bundled 1590 kcmil 54/19 ACSS/AW and adding bundled drop loop conductors at Red Oak B. The estimated cost to perform this work is **\$160,000**.

17. The PEDRKTWN-BRIDGPRT 230kV (AE) line loads from 106.6% to 118.5% (DC power flow) of its emergency rating (552 MVA) for the single line contingency outage (PJM90). This project contributes approximately 65.9 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

18. The BRIDGPRT-MCKLTON 230kV (AE) line loads from 99.7% to 107.9% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (PJM90). This project contributes approximately 65.5 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

19. The EAGLE PT-GLOUCSTR 230kV (PSEG) line loads from 165.8% to 168.2% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (PS4A). This project contributes approximately 18.2 MW to the thermal congestion. To mitigate this 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**.

20. The CHICHST1-EDDYSTN4 230kV (PECO) line loads from 153.0% to 155.1% (DC power flow) of its emergency rating (1235 MVA) for the single line contingency outage (PE4). This project contributes approximately 26.2 MW to the thermal congestion. To mitigate this 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 **\$19,500,000** and will take **48 months** to complete.

21. The THOROFAR-DEPTFORD 230kV (PSEG) line loads from 170.8% to 173.5% (DC power flow) of its emergency rating (676 MVA) for the single line contingency outage (PS4A). This project contributes approximately 18.6 MW to the thermal congestion. To mitigate this 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**.

22. The GRAYSF71-TUNNEL2 230kV (PECO) line loads from 127.8% to 129.0% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE69). This project contributes approximately 18.0 MW to the thermal congestion. To mitigate this 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 **\$5,800,000** and will take **42 months** to complete.

23. The CHAMBERS-PEDRKTWN 230kV (AE) line loads from 89.0% to 101.0% (DC power flow) of its emergency rating (552 MVA) for the single line contingency outage (PJM90). This project contributes approximately 66.1 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

24. The CEDAR-OYSTER C 230kV (AE/JCPL) line loads from 98.6% to 106.1% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 59.8 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

25. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 173.1% to 178.3% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 37.2 MW to the thermal congestion. See items #9 and #15 under “Contribution to Previously Identified System Reinforcements” for reinforcement.

26. The TUNNEL-PARRISH9 230kV (PECO) line loads from 125.5% to 126.8% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE69). This project contributes approximately 18.0 MW to the thermal congestion. To mitigate this 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 **\$11,500,000** and will take **48 months** to complete.

27. The DEPTFORD-EAGLE PT 230kV (PSEG) line loads from 141.8% to 144.3% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (PS4A). This

project contributes approximately 18.6 MW to the thermal congestion. To mitigate this 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**.

28. The CHICHST1-FOULK8 230kV (PECO) line loads from 139.1% to 141.0% (DC power flow) of its emergency rating (1335 MVA) for the single line contingency outage (PE36). This project contributes approximately 26.0 MW to the thermal congestion. To mitigate this 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 **\$13,000,000** and will take **48 months** to complete.

29. The FOULK-CONCORD6 230kV (PECO) line loads from 136.3% to 138.2% (DC power flow) of its emergency rating (1335 MVA) for the single line contingency outage (PE36). This project contributes approximately 26.0 MW to the thermal congestion. To mitigate this 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 **\$13,000,000** and will take **48 months** to complete. This is also the reinforcement for # 38 below.

30. The MCKLTON-DELCOTAP 230kV (PECO/AE) line loads from 144.7% to 151.1% (DC power flow) of its normal rating (605 MVA) for non-contingency condition. This project contributes approximately 38.6 MW to the thermal congestion. See items #10, #14 and #18 under “Contribution to Previously Identified System Reinforcements” for reinforcement.

31. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 116.1% to 121.2% (DC power flow) of its normal rating (650 MVA) for non-contingency condition. This project contributes approximately 32.9 MW to the thermal congestion. See items #9 and #15 under “Contribution to Previously Identified System Reinforcements” for reinforcement.

32. The E WINDSR-WINDSOR 230kV (JCPL) line loads from 106.4% to 109.8% (DC power flow) of its emergency rating (737 MVA) for the single line contingency outage (PJM68). This project contributes approximately 25.0 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

33. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 115.4% to 120.1% (DC power flow) of its normal rating (819 MVA) for non-contingency condition. This project contributes approximately 38.5 MW to the thermal congestion. See items #11 and #19 under “Contribution to Previously Identified System Reinforcements” for reinforcement.

34. The EDDYSTN4-PRINTZ 230kV (PECO) line loads from 116.2% to 117.6% (DC power flow) of its emergency rating (1193 MVA) for the single line contingency outage (PE4). This project contributes approximately 17.2 MW to the thermal congestion. To mitigate this overload would require the replacement of terminal equipment. The estimated cost to perform this work is **\$5,000,000** and will take **30 months** to complete.

35. The NEW FREE-WINDSOR 500kV (JCPL/PSEG) line loads from 123.5% to 126.7% (DC power flow) of its emergency rating (3040 MVA) for the single line contingency outage (PJM27B). This project contributes approximately 98.7 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is currently under development and is expected to be available during the System Impact Study phase of the T146 project.

36. The TRAINER-CHIREACT 230kV (PECO) line loads from 108.7% to 113.4% (DC power flow) of its normal rating (819 MVA) for non-contingency condition. This project contributes approximately 38.5 MW to the thermal congestion. See items #12 and #20 under “Contribution to Previously Identified System Reinforcements” for reinforcement.

37. The CHIREACT-CHICHST2 230kV (PECO) line loads from 108.7% to 113.4% (DC power flow) of its normal rating (819 MVA) for non-contingency condition. This project contributes approximately 38.5 MW to the thermal congestion. See items #13 and #21 under “Contribution to Previously Identified System Reinforcements” for reinforcement.

38. The FOULK-CONCORD6 230kV (PECO) line loads from 112.4% to 114.1% (DC power flow) of its normal rating (1036 MVA) for non-contingency condition. This project contributes approximately 17.1 MW to the thermal congestion. See item #29 above for reinforcement.

39. The RL_230-KEEN_230 230kV (DPL) line loads from 150.1% to 155.7% (DC power flow) of its emergency rating (932 MVA) for the single line contingency outage (PJM64). This project contributes approximately 51.7 MW to the thermal congestion. See item #16 under “Contribution to Previously Identified System Reinforcements” for reinforcement.

40. The #2 Mill 138/69 kV (AE) transformer loads to 125% of its emergency rating (166 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 38 MVA to the contingency facility loading. See item #1 under “New System Reinforcements” for reinforcement.

41. The Mill 69 kV bus tie (AE) loads to 120% of its emergency rating (239 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 55 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 the T146 project.

42. The Mill-Tuckahoe-Corson 69 kV (AE) line loads to 105% of its emergency rating (146 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 21 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 the T146 project.

Option 2

Point of Interconnection: T146 Option 2 will interconnect with the Atlantic City Electric’s transmission system at the Dennis 138kV substation. Option 2 was studied as a 346 MW (69

MW Capacity) injection into the Dennis 138kV 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 Dennis 138kV substation on their side of the Point of Interconnection (POI). ACE's direct connection work at the Dennis substation consists of creating two (2) 138kV terminal positions for the Interconnection Customer's 138kV line to the T146 site. Revenue metering will be located on the feed to the generator.

The estimated cost to perform this work is **\$3,700,000** 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 Interconnection Customer's off-shore facility is comprised of an array of wind turbine generators and a collection substation. The collection substation will be connected to the ACE Dennis 138kV substation via a submarine/underground or overhead cable. The developer has assumed full responsibility for design and construction of all facilities associated with the T146 generating station and the 138kV 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 were as follows:

Generator Deliverability

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

1. The Corson-Middle Tap 138 kV (AE) line section loads to 115.6% of its emergency rating (292 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 27 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 MDLE TP-BLE 138kV (AE) line loads from 45.95% to 105.72% (DC power flow) of its emergency rating (219 MVA) for the tower line outage (13AE). This project contributes approximately 130.9 MW to cause this thermal violation.
3. The UNION-CLAYVILL 138kV (AE) line loads from 91.93% to 119.50% (DC power flow) of its emergency rating (292MVA) for the tower line outage (13AE). This project contributes approximately 80.5MW to cause this thermal violation.
4. The CLAYVILL-SHRMAN#3 138kV (AE) line loads from 82.57% to 110.15% (DC power flow) of its emergency rating (292MVA) for the tower line outage (13AE). This project contributes approximately 80.5MW to cause this thermal violation.

Short Circuit

There were no additional overstressed breakers identified as a result of this project.

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)

5. The SCULL#2-MILL #2 138kV (AE) line loads from 109.05% to 115.55% (DC power flow) of its normal rating (215MVA) for non-contingency condition. This project contributes approximately 14.0MW to the thermal violation.
6. The BLE-SCULL#2 138kV (AE) line loads from 106.84% to 112.73% (DC power flow) of its normal rating (237MVA) for non-contingency condition. This project contributes approximately 14.0MW to the thermal violation.
7. The BLE-SCULL#1 138kV (AE) line loads from 101.07% to 106.98% (DC power flow) of its normal rating (215MVA) for non-contingency condition. This project contributes approximately 12.7MW to the thermal violation.
8. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 141.31% to 142.65% (DC power flow) of its emergency rating (725MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.7MW to the thermal violation.

9. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 133.75% to 134.93% (DC power flow) of its emergency rating (819MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.7MW to the thermal violation.
10. The TRAINER-CHIREACT 230kV (PECO) line loads from 127.12% to 128.30% (DC power flow) of its emergency rating (819MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.7MW to the thermal violation.
11. The CHIREACT-CHICHST2 230kV (PECO) line loads from 127.10% to 128.28% (DC power flow) of its emergency rating (819MVA) for the single line contingency outage (PS6A). This project contributes approximately 9.7MW to the thermal violation.
12. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 127.72% to 129.00% (DC power flow) of its normal rating (605MVA) for non-contingency condition. This project contributes approximately 7.8MW to the thermal violation.
13. The RL_230-KEEN_230 230kV (DPL) line loads from 121.92% to 123.28% (DC power flow) of its emergency rating (932MVA) for the single line contingency outage (PJM64). This project contributes approximately 12.7MW to the thermal violation.
14. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 160.02% to 164.91% (DC power flow) of its emergency rating (725MVA) for the tower line outage (4AE_A19). This project contributes approximately 35.4MW to the thermal violation.
15. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 150.15% to 154.46% (DC power flow) of its emergency rating (819MVA) for the tower line outage (4AE_A19). This project contributes approximately 35.3MW to the thermal violation.
16. The TRAINER-CHIREACT 230kV (PECO) line loads from 143.52% to 147.83% (DC power flow) of its emergency rating (819MVA) for the tower line outage (4AE_A19). This project contributes approximately 35.3MW to the thermal violation.
17. The CHIREACT-CHICHST2 230kV (PECO) line loads from 143.50% to 147.81% (DC power flow) of its emergency rating (819MVA) for the tower line outage (4AE_A19). This project contributes approximately 35.3MW to the thermal violation.
18. The 3 MILE I-TMI 500/230kV (METED) transformer loads from 180.59% to 183.79% (DC power flow) of its emergency rating (1077MVA) for the tower line outage (CONAS_PB). This project contributes approximately 34.4MW to the thermal violation.
19. The NOTTNGHM-NOTTREAC 230kV (PECO) line loads from 240.63% to 244.92% (DC power flow) of its emergency rating (627MVA) for the tower line outage (CONAS_PB). This project contributes approximately 26.9MW to the thermal violation.

20. The NOTTREAC-PCHBTMTP 230kV (PECO) line loads from 240.59% to 244.88% (DC power flow) of its emergency rating (627MVA) for the tower line outage (CONAS_PB). This project contributes approximately 26.9MW to the thermal violation.
21. The PCHBTMTP-GRACETON 230kV (PECO/BGE) line loads from 240.59% to 244.88% (DC power flow) of its emergency rating (627MVA) for the tower line outage (CONAS_PB). This project contributes approximately 26.9MW to the thermal violation.
22. The PEACHBTM-3 MILE I 500kV (PECO/METED) line loads from 119.56% to 122.12% (DC power flow) of its emergency rating (2596MVA) for the tower line outage (CONAS_PB). This project contributes approximately 66.5MW to the thermal violation.
23. The CNASTONE-N-NWEST 500kV (BGE) line loads from 200.10% to 203.12% (DC power flow) of its emergency rating (2901MVA) for the tower line outage (CNSTN_NWEST). This project contributes approximately 87.5MW to the thermal violation.
24. The ROCKSPGS-PEACHBTM 500kV (PECO) line loads from 105.79% to 109.24% (DC power flow) of its emergency rating (3112MVA) for the tower line outage (1PS). This project contributes approximately 107.3MW to the thermal violation.
25. The #2 MILL-SCULL 138 kV (AE) line section will be loaded to 193.7% of its emergency rating (268 MVA) for the outage of the #1 BL England-Mill-Lewis 138 kV line. This project contributes 21 MW to the contingency facility loading.
26. The #2 BLE-SCULL 138 kV (AE) line section will be loaded to 185.6% of its emergency rating (307 MVA) for the outage of the #1 BL England-Mill-Lewis 138 kV line. This project contributes 22 MW to the contingency facility loading.
27. The #2 MILL-LEWIS 138 kV (AE) line section will be loaded to 158.2% of its emergency rating (225 MVA) for the outage of the #1 BL England-Mill 138 kV line. This project contributes 17 MW to the contingency facility loading.
28. The #1 LEWIS-MILL 138 kV (AE) line section will be loaded to 183.8% of its emergency rating (268 MVA) for the outage of the #2 BL England-Mill 138 kV line. This project contributes 19 MW to the contingency facility loading.
29. The #1 MILL-SCULL 138 kV (AE) line section will be loaded to 183.8% of its emergency rating (268 MVA) for the outage of the #2 BL England-Mill 138 kV line. This project contributes 21 MW to the contingency facility loading.
30. The #1 BLE-SCULL 138 kV (AE) line section will be loaded to 168.3% of its emergency rating (307 MVA) for the outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes 21 MW to the contingency facility loading.

Stability and Reactive Power Requirements

Will be performed during the Queue T146 System Impact Study.

Steady State Voltage Requirements

Will be performed during the Queue T146 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 CORSON-MIDDLE TAP 138 kV (AE) line overload would require the circuit to be reconducted 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. This is also the reinforcement for item #48 under “Delivery of Energy Portion of Interconnection Request.”
2. To mitigate the MDLE TP-BLE 138kV (AE) line overload would require the circuit to be reconducted 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. This is also the reinforcement for item #49 under “Delivery of Energy Portion of Interconnection Request.”
3. To mitigate the UNION-CLAYVILL 138kV (AE) line overload would require the circuit to be reconducted 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.
4. To mitigate the CLAYVILL-SHRMAN#3 138kV (AE) line overload would require the circuit to be reconducted 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.

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)

5. and 25. 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. This is also the reinforcement for items #1 and #40 under “Delivery of Energy Portion of Interconnection Request.”

6. and 26. 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. This is also the reinforcement for items #2 and #41 under "Delivery of Energy Portion of Interconnection Request."

7. and 30. 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. This is also the reinforcement for items #4 and #42 under "Delivery of Energy Portion of Interconnection Request."

8. 12. and 14. 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. This is also the reinforcement for item #28 under "Delivery of Energy Portion of Interconnection Request."

9. and 15. 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. This is also the reinforcement for item #32 under "Delivery of Energy Portion of Interconnection Request."

10. and 16. 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. This is also the reinforcement for item #35 under "Delivery of Energy Portion of Interconnection Request."

11. and 17. 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. This is also the reinforcement for item #36 under "Delivery of Energy Portion of Interconnection Request."

13. To mitigate the RL_230-KEEN_230 230kV (DP&L) line overload would require the replacement of the 2000A wave trap with one rated for 3000A. The estimated cost to perform this work is **\$400,000** and will take **12 to 18 months** to complete. This is also the reinforcement for item #39 under "Delivery of Energy Portion of Interconnection Request."

18. To mitigate the 3 MILE I-TMI 500/230kV (METED) transformer would require the installation of a second 500/230kV transformer. The estimated cost to perform this work is **\$11,800,000** and will take **20 months** to complete.

19. To mitigate the NOTTINGHAM-NOTTREAC 230kV (PECO) line overload would require upgrading the circuit by replacing line reactors. The estimate to perform this work is **\$200,000** and will take **18 months** to complete.

20. To mitigate the NOTTREAC-PCHBTMTP 230kV (PECO) line overload would require the teardown and rebuild of the circuit to a 1243/1410 MVA rating in addition to building a second circuit on a new right of way. A new 230kV substation will also be required at Peach Bottom. The estimate to perform this work is **\$90,000,000** and will take **120 months** to complete.

21. To mitigate the PCHBTMTP-GRACETON 230kV (PECO/BG&E) line overload would require the replacement of existing circuits with three (3) 230kV underground circuits. The estimate to perform this work is **\$90,000,000** and will take **120 months** to complete. Note: a new right of way will be required if this line is to be replaced with an aerial transmission line. Assume 6 years to acquire land.

22. To mitigate the PEACHBTM-3 MILE I 500kV (PECO/METED) line overload would require the replacement of circuit breakers and wave trap. The estimated cost to perform this work is **\$3,000,000** and will take **30 months** to complete.

23. To mitigate the CNASTONE-N-NWEST 500kV (BG&E) overload would require:

1 new single circuit line with the following assumptions:

A new 200 ft. wide ROW paralleling the existing Conastone to Northwest ROW
Total ROW length = 19.6 miles
3 - bundle 1,590 kcm conductor
North Northwest substation is located 4 miles north of Northwest substation

The estimated cost to perform this work, which includes breakers and terminations, is **\$110,000,000** and will take **10 years** to complete.

Additional substation work to include:

At the Conastone 500kV substation – install a 1 breaker bay
At the NNW 500kV substation – install a 3 breaker bay.

The estimated cost to perform this work is **\$9,200,000** with a **10 year** lead time to complete.

24. To mitigate the ROCKSPGS-PEACHBTM 500kV (PECO) line overload would require the replacement of terminal equipment. The estimated cost to perform his work is **\$2,000,000** and will take **30 months** to complete.

27. 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. This is also the reinforcement for items #10, #14, and #45 under “Delivery of Energy Portion of Interconnection Request.”

28. 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. This is also the reinforcement for items #6 and #44 under “Delivery of Energy Portion of Interconnection Request.”

29. 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. This is also the reinforcement for items #5 and #43 under “Delivery of Energy Portion of Interconnection Request.”

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. **These are not required reinforcements.***

As a result of the aggregate energy resources in the area, the following violations were identified:

1. The SCULL#2-MILL #2 138kV (AE) line loads from 168.5% to 201.0% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 69.8 MW to the thermal congestion. See items #5 and #25 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.
2. The BLE-SCULL#2 138kV (AE) line loads from 160.8% to 190.3% (DC power flow) of its normal rating (237 MVA) for non-contingency condition. This project contributes approximately 69.8 MW to the thermal congestion. To mitigate the overload would require the rebuild and reconductor of the line section with a larger conductor. See items #6 and #26 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.
3. The DENNIS-CORSON 2 138kV (AE) line loads from 66.6% to 127.1% (DC power flow) of its normal rating (390 MVA) for non-contingency condition. This project contributes approximately 236.3 MW to the thermal congestion. The mitigation for this overload is under development and is expected to be available during the System Impact Study phase for T146.
4. The BLE-SCULL#1 138kV (AE) line loads from 154.4% to 183.9% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 63.5 MW to the thermal congestion. See items #7 and #30 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.
5. The SCULL#1-MILL #1 138kV (AE) line loads from 139.3% to 168.9% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes

approximately 63.5 MW to the thermal congestion. See item #29 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

6. The MILL #1-LEWIS #1 138kV (AE) line loads from 139.2% to 168.7% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 63.5 MW to the thermal congestion. See item #28 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

7. The OYSTER C-MANITOU 230kV (JCPL) line loads from 118.6% to 123.5% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC14). This project contributes approximately 39.3 MW to the thermal congestion.

8. The OYSTER C-MANITOU 230kV (JCPL) line loads from 118.6% to 123.5% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC15). This project contributes approximately 39.3 MW to the thermal congestion.

The reinforcement necessary to mitigate the overloads in items 7 and 8 is currently under development and is expected to be available during the System Impact Study phase of T146.

9. The MERION-BLE 138kV (AE) line loads from 126.5% to 153.6% (DC power flow) of its normal rating (199 MVA) for non-contingency condition. This project contributes approximately 54.0 MW to the thermal congestion. To mitigate the 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. This is also the reinforcement for item #47 below.

10. The MILL #2-LEWIS #2 138kV (AE) line loads from 108.0% to 133.7% (DC power flow) of its emergency rating (215 MVA) for the single line contingency outage (AE1). This project contributes approximately 55.3 MW to the thermal congestion. See item #27 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

11. The CORSON 2-MDLE TP 138kV (AE) line loads from 73.8% to 107.4% (DC power flow) of its normal rating (246 MVA) for non-contingency condition. This project contributes approximately 82.7 MW to the thermal congestion. To mitigate the overload would require the circuit to be reconducted 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.

12. The GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer loads from 144.6% to 149.0% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 15.1 MW to the thermal congestion. To mitigate the overload would require the replacement of the transformer. The estimated cost to perform this work is **\$3,975,000**.

13. The GLOUCSTR-CUTHBERT 138kV (PSEG) line loads from 144.3% to 148.8% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 15.1 MW to the thermal congestion. To mitigate the overload would require reconductoring approximately 5 miles of line and upgrading terminal equipment. The estimated cost to perform this work is **\$20,800,000**.

14. The MILL #2-LEWIS #2 138kV (AE) line loads from 100.1% to 125.3% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 54.2 MW to the thermal congestion. See item #27 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

15. The PRINTZ-RIDLEY 230kV (PECO) line loads from 130.6% to 131.8% (DC power flow) of its emergency rating (1432 MVA) for the single line contingency outage (PE4). This project contributes approximately 16.9 MW to the thermal congestion. To mitigate the overload would require the reconductor 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 is to perform this work is **\$7,800,000** and it will take **36 months** to complete.

16. The PEDRKTWN-BRIDGPRT 230kV (AE) line loads from 106.6% to 125.0% (DC power flow) of its emergency rating (552 MVA) for the single line contingency outage (PJM90). This project contributes approximately 101.8 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

17. The BRIDGPRT-MCKLTON 230kV (AE) line loads from 99.7% to 112.3% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (PJM90). This project contributes approximately 101.3 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

18. The EAGLE PT-GLOUCSTR 230kV (PSEG) line loads from 165.8% to 168.5% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (PS4A). This project contributes approximately 19.9 MW to the thermal congestion. To mitigate this 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**.

19. The CHICHST1-EDDYSTN4 230kV (PECO) line loads from 153.0% to 155.2% (DC power flow) of its emergency rating (1235 MVA) for the single line contingency outage (PE4). This project contributes approximately 27.2 MW to the thermal congestion. To mitigate this 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 **\$19,500,000** and will take **48 months** to complete.

20. The THOROFAR-DEPTFORD 230kV (PSEG) line loads from 170.8% to 173.8% (DC power flow) of its emergency rating (676 MVA) for the single line contingency outage (PS4A).

This project contributes approximately 20.2 MW to the thermal congestion. To mitigate this 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**.

21. The CHAMBERS-PEDRKTWN 230kV (AE) line loads from 89.0% to 107.5% (DC power flow) of its emergency rating (552MVA) for the single line contingency outage (PJM90). This project contributes approximately 102.0MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

22. The GRAYSF71-TUNNEL2 230kV (PECO) line loads from 127.8% to 129.1% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE69). This project contributes approximately 19.0 MW to the thermal congestion. To mitigate this 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 **\$5,800,000** and will take **42 months** to complete.

23. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 173.1% to 178.2% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 36.7 MW to the thermal congestion. To mitigate the overload 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. This is also the reinforcement for item #29 below.

24. The CEDAR-OYSTER C 230kV (AE/JCPL) line loads from 98.6% to 105.0% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 51.2 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

25. The TUNNEL-PARRISH9 230kV (PECO) line loads from 125.5% to 126.9% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE69). This project contributes approximately 19.0 MW to the thermal congestion. To mitigate this 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 **\$11,500,000** and will take **48 months** to complete.

26. The DEPTFORD-EAGLE PT 230kV (PSEG) line loads from 141.8% to 144.5% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (PS4A). This project contributes approximately 20.2 MW to the thermal congestion. To mitigate this 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**.

27. The FOULK-CONCORD6 230kV (PECO) line loads from 136.3% to 138.3% (DC power flow) of its emergency rating (1335 MVA) for the single line contingency outage (PE36). This

project contributes approximately 26.9 MW to the thermal congestion. To mitigate this 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 **\$13,000,000** and will take **48 months** to complete. This is also the reinforcement for item #38 below.

28. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 144.7% to 151.1% (DC power flow) of its normal rating (605 MVA) for non-contingency condition. This project contributes approximately 39.0 MW to the thermal congestion. See items 8, 12 and 14 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

29. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 116.1% to 120.9% (DC power flow) of its normal rating (650 MVA) for non-contingency condition. This project contributes approximately 31.4 MW to the thermal congestion. See item #23 above for reinforcement.

30. The NEW FREE-WINDSOR 500kV (JCPL/PSEG) line loads from 107.3% to 109.6% (DC power flow) of its normal rating (2650 MVA) for non-contingency condition. This project contributes approximately 62.0 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is currently under development and is expected to be available during the System Impact Study phase of the T146 project.

31. The E WINDSR-WINDSOR 230kV (JCPL) line loads from 106.4% to 109.7% (DC power flow) of its emergency rating (737 MVA) for the single line contingency outage (PJM68). This project contributes approximately 24.3 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is under development and is expected to be available during the T146 System Impact Study.

32. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 115.4% to 120.1% (DC power flow) of its normal rating (819 MVA) for non-contingency condition. This project contributes approximately 38.8 MW to the thermal congestion. See items #9 and #15 under “Contributions to Previously Identified System Reinforcements” above for reinforcement.

33. The EDDYSTN4-PRINTZ 230kV (PECO) line loads from 116.2% to 117.7% (DC power flow) of its emergency rating (1193 MVA) for the single line contingency outage (PE4). This project contributes approximately 17.8 MW to the thermal congestion. This project contributes approximately 17.2 MW to the thermal congestion. To mitigate this overload would require the replacement of terminal equipment. The estimated cost to perform this work is **\$5,000,000** and will take **30 months** to complete.

34. The NEW FREE-WINDSOR 500kV (JCPL/PSEG) line loads from 123.5% to 126.9% (DC power flow) of its emergency rating (3040 MVA) for the single line contingency outage (PJM27B). This project contributes approximately 103.9 MW to the thermal congestion. The reinforcement necessary to mitigate this overload is currently under development and is expected to be available during the System Impact Study phase of the T146 project.

35. The TRAINER-CHIREACT 230kV (PECO) line loads from 108.7% to 113.5% (DC power flow) of its normal rating (819 MVA) for non-contingency condition. This project contributes approximately 38.8 MW to the thermal congestion. See items #10 and #16 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

36. The CHIREACT-CHICHST2 230kV (PECO) line loads from 108.7% to 113.5% (DC power flow) of its normal rating (819 MVA) for non-contingency condition. This project contributes approximately 38.8 MW to the thermal congestion. See items #11 and #17 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

37. The CHICHST1-FOULK8 230kV (PECO) line loads from 116.0% to 117.7% (DC power flow) of its normal rating (1036 MVA) for non-contingency condition. This project contributes approximately 17.6 MW to the thermal congestion. To mitigate this 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 **\$13,000,000** and will take **48 months** to complete.

38. The FOULK-CONCORD6 230kV (PECO) line loads from 112.4% to 114.1% (DC power flow) of its normal rating (1036 MVA) for non-contingency condition. This project contributes approximately 17.6 MW to the thermal congestion. See item #27 above for reinforcement.

39. The RL_230-KEEN_230 230kV (DPL) line loads from 150.1% to 155.9% (DC power flow) of its emergency rating (932 MVA) for the single line contingency outage (PJM64). This project contributes approximately 53.9 MW to the thermal congestion. See item #13 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

40. The SCULL#2-MILL #2 138kV (AE) line loads to 226.9 % of its emergency rating (268MVA) for the single line contingency outage of the #1 BL England-Mill-Lewis 138 kV line. This project contributes approximately 106 MW to the thermal congestion. See items #5 and #25 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

41. The BLE-SCULL#2 138kV (AE) line loads to 142.7 % of its emergency rating (307MVA) for the single line contingency outage of the #1 BL England-Mill-Lewis 138 kV line. This project contributes approximately 110 MW to the thermal congestion. See items #6 and #26 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

42. The BLE-SCULL#1 138kV (AE) line loads to 116.1 % of its emergency rating (307MVA) for the single line contingency outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes approximately 105 MW to the thermal congestion. See items #7 and #30 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

43. The SCULL#1-MILL #1 138kV (AE) line loads to 215.4 % of its emergency rating (268MVA) for the single line contingency outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes approximately 101 MW to the thermal congestion. See item #29 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

44. The MILL #1-LEWIS #1 138kV (AE) line loads to 215.4 % of its emergency rating (268MVA) for the single line contingency outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes approximately 97 MW to the thermal congestion. See item #28 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

45. The MILL #2-LEWIS #2 138kV (AE) line loads to 187.8 % of its emergency rating (225MVA) for the single line contingency outage of the #2 BL England-Mill-Lewis 138 kV line. This project contributes approximately 84 MW to the thermal congestion. See item #27 in “Contributions to Previously Identified System Reinforcements” above for reinforcement.

46. The ORCHARD-S122 TAP 230 kV (AE) line loads to 122% of its emergency rating (755 MVA) for the outage of the Dennis-Corson 138 kV line. This project contributes 243 MW 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 T146.

47. The BLE-MERION 138 kV (AE) line loads to 165% of its emergency rating (219 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 101 MW to the contingency facility loading. See item #9 above for reinforcement.

48. The CORSON-MIDDLE TAP 138 kV (AE) line loads to 152% of its emergency rating (292 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 135 MW to the contingency facility loading. See item #1 in “New System Reinforcements,” for reinforcement.

49. The BLE-MIDDLE TAP 138 kV (AE) line loads to 162% of its emergency rating (219 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 130 MW to the contingency facility loading. See item #2 in “New System Reinforcements,” for reinforcement.

50. The #2 MILL 138/69 kV (AE) transformer loads to 116% of its emergency rating (166 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 5 MVA to the contingency facility loading. To mitigate the 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.

51. The MILL 69 kV (AE) bus tie loads to 123% of its emergency rating (239 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 60 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 T146.

52. The MILL-TUCKAHOE-CORSON 69 kV (AE) line loads to 127% of its emergency rating (146 MVA) for the outage of the Orchard-S122 Tap 230 kV line. This project contributes 46

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 T146.

53. The LEWIS-ABSECON TAP 69 kV (AE) line loads to 106% of its emergency rating (90 MVA) for the outage of the Cardiff-Cedar 230 kV line. This project contributes 13 MW 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 T146.