

T83 Merion 138kV Generation Interconnection

General

The Interconnection Customer has proposed a 350 MW (70 MW of which is capacity) wind power generating facility to be located offshore in the Atlantic Ocean approximately 15.0 miles southeast of Atlantic City, Atlantic County, New Jersey. The IC will connect to the Atlantic City Electric's (ACE) transmission system near the Merion 138kV substation.

Queue Project #T83 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 in-service date for the project is December 31, 2012.

Point of Interconnection: T83 will interconnect with the Atlantic City Electric's transmission system near the Merion 138kV substation. Queue Project T83 was studied as a 350 MW (70 MW Capacity) injection into the Merion 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 new substation to be built near the Merion 138kV substation on the Interconnected Transmission Owner's side of the Point of Interconnection (POI). ACE's direct connection work will consist of dead-ending the BL England-Merion 138kV line to provide two (2) sources to feed into a new three (3) breaker 138kV ring bus to be built on land secured by the developer. Revenue metering will be located on the feed to the generator.

The estimated cost to perform the substation work is **\$5,100,000** and will require **24 to 36 months** to complete from the time "Notice to Proceed" is given after the ISA and CSA are executed.

The estimated cost to perform the transmission line work is **\$400,000** and will require **24 to 36 months** to complete.

Total estimated costs for the Transmission Owner direct connect work is **\$5,500,000** not including the cost of the land. Note: the costs do 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, via a submarine/underground or overhead cable, to the AEC system near the Merion 138kV substation. The developer has assumed full responsibility for design and construction of all facilities associated with the T83 generating station and the 138 kV direct connection line on the Interconnection Customer side of the POI. Site preparation including grading and an access road, 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 SCULL#2-MILL #2 138kV (AE) line loads from 93.4% to 102.5% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 19.6 MW to cause this thermal violation.
2. The BLE-SCULL#2 138kV (AE) line loads from 92.6% to 100.9% (DC power flow) of its normal rating (237 MVA) for non-contingency condition. This project contributes approximately 19.6 MW to cause this thermal violation.
3. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 100.0% to 101.5% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PJM63). This project contributes approximately 12.7 MW to cause this thermal violation.

Multiple Facility Contingency

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

4. The PEACHBTM-3 MILE I 500kV (PECO/METED) line loads from 98.14% to 100.69% (DC power flow) of its emergency rating (2596 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 66.2 MW to cause this thermal violation.

Short Circuit

The following breakers were found to be overstressed:

Lewis 138kV CB 'L' – 101.9%

Ontario 69kV CB 'B'; - 100.4%

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 MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 106.56% to 107.60% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 7.5 MW to the thermal violation. T82 contributes to the loading by 8 MW.

6. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 103.49% to 105.25% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PJM63). This project contributes approximately 12.7 MW to the thermal violation. T82 contributes to the loading by 12.4 MW.

7. The RL_230-KEEN_230 230kV (DP&L) line loads from 100.10% to 101.23% (DC power flow) of its emergency rating (932 MVA) for the single line contingency outage (PJM64). This project contributes approximately 10.6 MW to the thermal violation. T82 contributes to the loading by 10 MW.

8. The OXBOW-N.MESHNP 230kV (PENELEC) line loads from 181.92% to 184.47% (DC power flow) of its emergency rating (617 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 15.7 MW to the thermal violation. T82 contributes to the loading by 15.9 MW.

9. The 3 MILE I-TMI 500/230kV (METED) transformer loads from 148.00% to 151.22% (DC power flow) of its emergency rating (1077 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 34.7 MW to the thermal violation. T82 contributes to the loading by 34.4 MW.

10. The NOTTNGHM-NOTTREAC 230kV (PECO) line loads from 195.10% to 199.43% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 27.2 MW to the thermal violation. T82 contributes to the loading by 27.1 MW.

11. The PCHBTMTP-GRACETON 230kV (PECO/BG&E) line loads from 195.07% to 199.40% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 27.2 MW to the thermal violation. T82 contributes to the loading by 27.1 MW.

12. The NOTTREAC-PCHBTMTP 230kV (PECO) line loads from 195.07% to 199.40% (DC power flow) of its emergency rating (627 MVA) for the tower line outage (CONAS_PB). This project contributes approximately 27.2 MW to the thermal violation. T82 contributes to the loading by 27.1 MW.

13. The CNASTONE-N-NWEST 500kV (BG&E) line loads from 166.74% to 169.79% (DC power flow) of its emergency rating (2901 MVA) for the tower line outage (CNSTN_NWEST_NNWEST_A). This project contributes approximately 88.3 MW to the thermal violation. T82 contributes to the loading by 87.9 MW.

Stability and Reactive Power Requirements

Will be performed during the Queue T83 System Impact Study.

Steady State Voltage Requirements

Will be performed during the Queue T83 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 SCULL #2-MILL #2 138kV (AE) line overload would require the reconductor of the line section 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. The costs include reconfiguring the Scull substation to facilitate the outage of the #2 Mill-Scull 138kV line section without causing a total outage to the substation. This is because the #1 and #2 lines will both need to be out of service at the same time, one for reconductoring and the other for clearance.

2. To mitigate the BLE-SCULL#2 138kV (AE) line overload would require the reconductor of the line section 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 DELCOTAP-TRAINER2 230kV (PECO) line overload would require reconductoring. The 220-53 and the PECO portion of 220-38 are scheduled to be reconducted in 2008 to a new anticipated rating of 720/840 MVA. The estimated cost to perform this work is **\$0**.

4. 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.

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)

5. To mitigate the MONROE-NEW FRDM 230kV (AE/PSEG) line 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.
6. To mitigate the MCKLTON-DELCOTAP 230kV (AE/PECO) overload would require upgrading the 220-53 and 220-38 circuit by reconductoring. These circuits are scheduled to be reconducted in 2008. The estimated cost to perform this work is **\$0 dollars**.
7. To mitigate the RL_230-KEEN_230 230kV (DP&L) line overload would require the replacement of the 2000A wave trap. The estimated cost to perform this work is **\$300,000** with a **12 month** lead time.
8. To mitigate the OXBOW-N.MESHNP 230kV (PENELEC) line overload would require the upgrade of approximately 10.16 miles of transmission line, a CT circuit, and substation conductor at the North Meshoppen substation. The estimated cost to perform this work is **\$5,345,000**.
9. To mitigate the 3 MILE I-TMI 500/230kV (METED) transformer overload would require the addition of a second 500/230kV transformer at TMI as well as transmission line upgrades between the 230kV and 500kV substations. The estimated cost to perform this work is **\$15,000,000** and will take **36 months** to complete.
10. To mitigate the NOTTINGHAM-NOTTREAC 230kV (PECO) 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.
11. To mitigate the PCHBTMTP-GRACETON 230kV (PECO & BGE) overload would require the replacement of existing lines with three (3) 230kV underground circuits. The estimate to perform this work is **\$90,000,000** and will take **48 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.
12. To mitigate the NOTTREAC-PCHBTMTP 230kV (PECO) overload would require a teardown and rebuild to 1243/1410 MVA along with replacement of terminal equipment. The estimate to perform this work is **\$42,500,000** and will take **48 months** to complete.

13. 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.

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 89.9% to 135.4% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 97.8 MW to the thermal congestion. To mitigate the overload would require the reconductor of the line section 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. The costs include reconfiguring the Scull substation to facilitate the outage of the #2 Mill-Scull 138kV line section without causing a total outage to the substation. This is because the #1 and #2 lines will both need to be out of service at the same time, one for reconductoring and the other for clearance.

2. The BLE-SCULL#2 138kV (AE) line loads from 89.5% to 130.8% (DC power flow) of its normal rating (237 MVA) for non-contingency condition. This project contributes approximately 97.8 MW to the thermal congestion. To mitigate the overload would require the reconductor of the line section 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. The SCULL#2-MILL #2 138kV (AE) line loads from 83.8% to 117.6% (DC power flow) of its emergency rating (268 MVA) for the single line contingency outage (PS53). This project contributes approximately 90.6 MW to the thermal congestion. See item #1 above for reinforcement.
4. The BLE-SCULL#2 138kV (AE) line loads from 79.3% to 108.8% (DC power flow) of its emergency rating (307 MVA) for the single line contingency outage (PS53). This project contributes approximately 90.6 MW to the thermal congestion. See item # 2 above for reinforcement.
5. The SCULL#1-MILL #1 138kV (AE) line loads from 69.1% to 109.2% (DC power flow) of its normal rating (215MVA) for non-contingency condition. This project contributes approximately 86.3MW to the thermal congestion. To mitigate the overload would require the reconductor of the line section with an ACSS 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.
6. The MILL #1-LEWIS #1 138kV (AE) line loads from 68.9% to 109.1% (DC power flow) of its normal rating (215 MVA) for non-contingency condition. This project contributes approximately 86.3 MW to the thermal congestion. To mitigate the overload would require the reconductor of the line section with an ACSS conductor. The estimated cost to perform this work is **\$1,900,000** and will take **30 months** to complete from the time “Notice to Proceed” is given after the ISA and CSA are executed.
7. The OYSTER C-MANITOU 230kV (JCP&L) line loads from 103.2% to 108.8% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC14). This project contributes approximately 45.6 MW to the thermal congestion. T82 contributes to the loading by 56.4 MW. The mitigation of this overload is currently under development. It is expected to be available during the System Impact Study phase of T83.
8. The OYSTER C-MANITOU 230kV (JCP&L) line loads from 103.2% to 108.8% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC15). This project contributes approximately 45.6 MW to the thermal congestion. T82 contributes to the loading by 56.4 MW. The mitigation of this overload is currently under development. It is expected to be available during the System Impact Study phase of T83.
9. The GLOUCSTR-GLOUCSTR 230/138kV (PSEG) transformer loads from 115.4% to 119.8% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 15.0 MW to the thermal congestion. To mitigate the overload would require the replacement of the transformer with one rated at 409 MVA. The estimated cost to perform this work is **\$11,000,000**.
10. The GLOUCSTR-CUTHBERT 138kV (PSEG) line loads from 115.1% to 119.5% (DC power flow) of its emergency rating (341 MVA) for the single line contingency outage (PJM89A). This project contributes approximately 15.0 MW to the thermal congestion. To

mitigate the overload would require the reconductor of the circuit to provide a minimum emergency rating of 407 MVA. The estimated cost to perform this work is **\$16,000,000**.

11. The PRINTZ-RIDLEY 230kV (PECO) line loads from 118.5% to 119.7% (DC power flow) of its emergency rating (1432 MVA) for the single line contingency outage (PE4). This project contributes approximately 16.7 MW to the thermal congestion. T82 contributes to the loading by 16 MW. To mitigate this overload would require the replacement of terminal equipment. The estimated cost to perform this work is **\$5,000,000** and will require **30 months** to complete.

12. The R39OPT1-RED OAKA 230kV (JCP&L) line loads from 118.6% to 120.5% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC31B_Q08OP1B_Q11A). This project contributes approximately 15.8 MW to the thermal congestion. T82 contributes to the loading by 17.9 MW. 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**.

13. The Q11OP3-RED OAKB 230kV (JCP&L) line loads from 115.8% to 117.7% (DC power flow) of its emergency rating (805 MVA) for the single line contingency outage (JC30B_Q08OP1B_R39OP1A). This project contributes approximately 15.6 MW to the thermal congestion. T82 contributes to the loading by 17.6 MW. 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**.

14. The EAGLE PT-GLOUCSTR 230kV (PSEG) line loads from 117.2% to 119.7% (DC power flow) of its emergency rating (752 MVA) for the single line contingency outage (PS4A). This project contributes approximately 18.9 MW to the thermal congestion. T82 contributes to the loading by 17.3 MW. 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 **\$6,750,000**.

15. The CHICHST1-EDDYSTN4 230kV (PECO) line loads from 130.9% to 133.0% (DC power flow) of its emergency rating (1235 MVA) for the single line contingency outage (PE4). This project contributes approximately 26.8 MW to the thermal congestion. T82 contributes to the loading by 25.4 MW. To mitigate this overload would require the replacement of terminal equipment. The estimated cost to perform this work is **\$5,000,000** and will require **30 months** to complete.

16. The THOROFAR-DEPTFORD 230kV (PSEG) line loads from 116.4% to 119.3% (DC power flow) of its emergency rating (676 MVA) for the single line contingency outage (PS4A). This project contributes approximately 19.3 MW to the thermal congestion. T82 contributes to the loading by 17.7 MW. To mitigate this overload would require the replacement of one load-break disconnect and one wave trap for a new rating of A=734 MVA, B=870 MVA. The estimated cost to perform this work is **\$500,000**.

17. The GRAYSF71-TUNNEL2 230kV (PECO) line loads from 112.3% to 113.6% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE69). This project contributes approximately 18.5 MW to the thermal congestion. T82 contributes to the loading by 17.3 MW. To mitigate this overload would require the teardown and rebuild to 1700 MVA emergency rating along with the replacement of terminal equipment. The estimated cost to perform this work is **\$5,800,000** and will require **42 months** to complete.

18. The MONROE-NEW FRDM 230kV (AE/PSEG) line loads from 108.4% to 113.6% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PS18). This project contributes approximately 37.5 MW to the thermal congestion. T82 contributes to the loading by 39.9 MW. To mitigate the overload would require a rebuild and reconductor of the 6.91 mile Monroe-New Frdm 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. The TUNNEL-PARRISH9 230kV (PECO) line loads from 110.1% to 111.4% (DC power flow) of its emergency rating (1395 MVA) for the single line contingency outage (PE69). This project contributes approximately 18.5 MW to the thermal congestion. T82 contributes to the loading by 17.3 MW. To mitigate this overload would require the teardown and rebuild to 1700 MVA emergency rating along with the replacement of terminal equipment. The estimated cost to perform this work is **\$11,500,000** and will require **48 months** to complete.

20. The FOULK-CONCORD6 230kV (PECO) line loads from 116.6% to 118.6% (DC power flow) of its emergency rating (1335 MVA) for the single line contingency outage (PE36). This project contributes approximately 26.6 MW to the thermal congestion. T82 contributes to the loading by 25.5 MW. To mitigate this overload would require the replacement of terminal equipment. The estimated cost to perform this work is **\$5,000,000** and will require **30 months** to complete.

21. The MCKLTON-DELCOTAP 230kV (AE/PECO) line loads from 113.2% to 121.9% (DC power flow) of its emergency rating (725 MVA) for the single line contingency outage (PJM63). This project contributes approximately 63.7 MW to the thermal congestion. T82 contributes to the loading by 62.1 MW. To mitigate this overload would require the 220-38 river crossing circuit to be rebuilt to a new rating of 1243/1410 MVA along with the replacement of associated terminal equipment. The estimated cost to perform this work is **\$22,500,000** and will require **48 months** to complete.

22. The DELCOTAP-TRAINER2 230kV (PECO) line loads from 108.6% to 116.4% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PJM63). This project contributes approximately 63.5 MW to the thermal congestion. T82 contributes to the loading by 62 MW. To mitigate this overload would require the teardown and rebuild to 1243/1410 MVA rating along with the replacement of terminal equipment. The estimated cost to perform this work is **\$7,100,000** and will require **42 months** to complete.

23. The TRAINER-CHIREACT 230kV (PECO) line loads from 102.0% to 109.8% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PJM63). This

project contributes approximately 63.5 MW to the thermal congestion. T82 contributes to the loading by 62.0 MW. To mitigate this overload would require the teardown and rebuild to 1243/1410 MVA rating along with the replacement of terminal equipment. The estimated cost to perform this work is **\$9,200,000** and will require **48 months** to complete.

24. The CHIREACT-CHICHST2 230kV (PECO) line loads from 102.0% to 109.7% (DC power flow) of its emergency rating (819 MVA) for the single line contingency outage (PJM63). This project contributes approximately 63.5 MW to the thermal congestion. T82 contributes to the loading by 62.0 MW. To mitigate this overload would require upgrading the circuit by replacing line reactors. The estimate to perform this work is **\$100,000** and will take **18 months** to complete.

25. The NEW FREE-WINDSOR 500kV (PSEG) line loads from 100.7% to 104.0% (DC power flow) of its emergency rating (3040 MVA) for the single line contingency outage (PJM27B). This project contributes approximately 101.4 MW to the thermal congestion. The mitigation of this overload is currently under development. It is expected to be available during the System Impact Study phase of T83.

26. The EDDYSTN4-PRINTZ 230kV (PECO) line loads from 101.7% to 103.2% (DC power flow) of its emergency rating (1193 MVA) for the single line contingency outage (PE4). This project contributes approximately 17.6 MW to the thermal congestion. T82 contributes to the loading by 16.9 MW. To mitigate this overload would require the replacement of terminal equipment. The estimated cost to perform this work is **\$5,000,000** and will require **30 months** to complete.

27. The CHICHST1-FOULK8 230kV (PECO) line loads from 100.1% to 101.8% (DC power flow) of its normal rating (1036 MVA) for non-contingency condition. This project contributes approximately 17.5 MW to the thermal congestion. T82 contributes to the loading by 16.9 MW. To mitigate this overload would require the replacement of terminal equipment. The estimated cost to perform this work is **\$2,000,000** and will require **30 months** to complete. **Note: this is also the reinforcement for item #29.**

28. The RL_230-KEEN_230 230kV (DP&L) line loads from 111.6% to 117.3% (DC power flow) of its emergency rating (932 MVA) for the single line contingency outage (PJM64). This project contributes approximately 53.0 MW to the thermal congestion. T82 contributes to the loading by 49.9 MW. To mitigate the overload would require the replacement of the 2000A wave trap. The estimated cost to perform this work is **\$300,000** and will require **12 months** to complete.

29. The CHICHST1-FOULK8 230kV (PECO) line loads from 99.3% to 101.9% (DC power flow) of its emergency rating (1335 MVA) for the single line contingency outage (PJM27B). This project contributes approximately 35.0 MW to the thermal congestion. **See item #27 for reinforcement.**

30. The RAPHAEL-NEAST339 230kV (BG&E) line loads from 148.9% to 151.0% (DC power flow) of its emergency rating (758 MVA) for the single line contingency outage (BG8). This

project contributes approximately 15.8 MW to the thermal congestion. T82 contributes to the loading by 15.8 MW.

31. The RAPHAEL-NEAST317 230kV (BG&E) line loads from 146.1% to 148.1% (DC power flow) of its emergency rating (758 MVA) for the single line contingency outage (BG18). This project contributes approximately 15.5 MW to the thermal congestion. T82 contributes to the loading by 15.6 MW.

To mitigate the overloads in items #30 and #31 would require increasing the rated conductor temp to 160°C, which attains 1153 MVA. The existing conductor is 2,167 ACSR @ 125°C. The transmission line is 3.9 miles long. Approximately 7 spans have ground clearance of less than 35 feet. Assume replacement of 5 double circuit steel poles to increase ground clearance. The estimated cost to perform the line and substation work is **\$6,000,000** and will require **5 years** to complete.

32. The CNASTONE-N-NWEST 500kV (BG&E) line loads from 199.4% to 203.1% (DC power flow) of its normal rating (2078MVA) for non-contingency condition. This project contributes approximately 77.4 MW to the thermal congestion. T82 contributes to the loading by 77 MW.

To mitigate the 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.

This reinforcement also mitigates the overloads in items #36 through #41 below.

33. The PEACHBTM-CNASTONE 500kV (PECO/BG&E) line loads from 192.3% to 196.6% (DC power flow) of its emergency rating (2598 MVA) for the single line contingency outage (PJM17_2). This project contributes approximately 111.3 MW to the thermal congestion. T82 contributes to the loading by 110.3 MW.

34. The PEACHBTM-CNASTONE 500kV (PECO/BG&E) line loads from 192.3% to 196.6% (DC power flow) of its emergency rating (2598 MVA) for the single line contingency outage

(PJM17). This project contributes approximately 111.3 MW to the thermal congestion. T82 contributes to the loading by 110.3 MW.

To mitigate the overloads in #33 and #34 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.

35. The NWEST311-GRANITE1 230kV (BG&E) line loads from 195.3% to 198.7% (DC power flow) of its emergency rating (641MVA) for the single line contingency outage (PJM13B_NNWEST_B). This project contributes approximately 21.6MW to the thermal congestion. T82 contributes to the loading by 21.5 MW. To mitigate the overload would require the building of a double circuit transmission line to attain two (2) 1033 ACSR @ 125 °C, attaining 1240 MVA SE. The existing conductor is 1590 45/7 ACSR which is rated at 160°C. The line is 8.7 miles long. The estimated cost to perform the substation and transmission line work is **\$27,000,000** and will require **6 years** to complete.

36. The CNASTONE-CONASTON 500/230kV (BG&E) transformer circuit #1 loads from 110.9% to 113.1% (DC power flow) of its emergency rating (1500 MVA) for the single line contingency outage (PJM13B_NNWEST_A). This project contributes approximately 32.8 MW to the thermal congestion. T82 contributes to the loading by 32.5 MW.

37. The CNASTONE-CONASTON 500/230kV (BG&E) transformer circuit #2 loads from 110.9% to 113.1% (DC power flow) of its emergency rating (1500 MVA) for the single line contingency outage (PJM13B_NNWEST_A). This project contributes approximately 32.8MW to the thermal congestion. T82 contributes to the loading by 32.5 MW.

38. The CONASTON-MT CAR10 230kV (BG&E) line loads from 165.9% to 168.7% (DC power flow) of its emergency rating (923 MVA) for the single line contingency outage (PJM13B_NNWEST_A). This project contributes approximately 25.5 MW to the thermal congestion. T82 contributes to the loading by 25.4 MW.

39. The CONASTON-MT CAR22 230kV (BG&E) line loads from 165.9% to 168.7% (DC power flow) of its emergency rating (923 MVA) for the single line contingency outage (PJM13B_NNWEST_A). This project contributes approximately 25.5 MW to the thermal congestion. T82 contributes to the loading by 25.4 MW.

40. The MT CAR10-N-NWEST 230kV (BG&E) line loads from 163.6% to 166.4% (DC power flow) of its emergency rating (923 MVA) for the single line contingency outage (PJM13B_NNWEST_A). This project contributes approximately 25.5 MW to the thermal congestion. T82 contributes to the loading by 25.4 MW.

41. The MT CAR22-N-NWEST 230kV (BG&E) line loads from 163.6% to 166.4% (DC power flow) of its emergency rating (923 MVA) for the single line contingency outage (PJM13B_NNWEST_A). This project contributes approximately 25.5 MW to the thermal congestion. T82 contributes to the loading by 25.4 MW.

The reinforcement for #32 also mitigates the overloads in items #36 through 41.

T83 – Interconnection

