Generation Interconnection Feasibility Study Report Queue Position X1-096

The Interconnection Customer (IC) has proposed a 210 MWE (27.3 MWC; 210 MW MFO) wind powered generating facility to be located in Somerset County, Maryland. PJM studied X1-096 as a 210 MW injection into the Delmarva Power and Light (DPL) system and evaluated the project for compliance with reliability criteria for summer peak conditions in 2015. The planned in-service date, as stated in the Attachment N, is October 10, 2014.

Point(s) of Interconnection

The Interconnection Customer requested a Primary and Secondary Point of Interconnection (POI) be evaluated for the X1-096 project. The Primary POI selected was a cut in of the Kings Creek-Crisfield 69kV circuit. The Secondary POI selected was a direct connection into the Kings Creek 138kV substation. The results are provided in the Transmission Network Impacts section below.

Direct Connection Requirements

Primary Option

X1-096 will interconnect with the Delmarva Power and Light transmission system at a new 69kV three (3) breaker ring bus substation to be constructed adjacent to the Kings Creek-Crisfield 69kV circuit.

Transmission Owner Scope of Direct Connection Work

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

Substation Engineering Estimate:
Scope: Construct a 69kV three-breaker ring bus substation, inclusive of a terminal position for queue project
Estimate: $3,500,000
Construction Time: 24 – 36 months after receipt of a fully executed Interconnection Service Agreement (ISA) and Interconnection Construction Service Agreement (CSA).

Transmission Engineering Estimate:
Scope: Install a self-supporting 69kV steel pole with a concrete foundation, motor operated disconnects and a short span to PHI substation
Estimate: $150,000
Construction Time: 24 months after receipt of a fully executed Interconnection Service Agreement (ISA) and Interconnection Construction Service Agreement (CSA).

Note: If location of generator is greater than 500 feet from substation a circuit breaker will be necessary

Note: The above costs do not include the Contribution in Aid of Construction (CIAC) tax.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer (IC) is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC. The Interconnection Customer will be responsible for contributing to future O & M costs associated with the direct connect facilities.

The IC 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 PHI's Applicable Standards.

Special Operating Requirements

1. The Company will require the capability to remotely trip the generator from its System Operations facility. Such tripping may be facilitated by either a generator breaker, inverter (if so equipped), or a line recloser, depending upon the specific circumstances and the evaluation of the Company.

2. The Interconnection Customer will grant its permission to PJM for PJM to send the Company the following telemetry data that the Interconnection Customer sends to PJM: real time megawatts, megavars, volts, amperes and status, and interval megawatt-hours, and megavar-hours. For generation larger than 10 MW, a direct telemetry connection to PHI System Operations will be required via a radial connection to PHI's telecommunications system or a rented data circuit, at the Interconnection Customer's cost.

3. The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

4. A mutually acceptable means of interrupting and disconnecting the generator with a visible break, able to be tagged and locked out, shall be worked out with ACE Distribution Engineering.

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

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

1. The Westover-Kings Creek 69 kV (DP&L) line (from bus 232842 to bus 232276 ckt 1) loads from 10.57% to 124.32% (DC power flow) of its normal rating (24 MVA) for non contingency condition. This project contributes approximately 27.30 MW to the thermal violation.

Multiple Facility Contingency

*(Double Circuit Tower Line, Line with Failed Breaker and, Bus Fault contingencies for the **Full** energy output.*

None

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

1. The Darley-Citisteel Tap 69 kV (DP&L) line (from bus 231205 to bus 231213 ckt 1) loads from 101.31% to 102.28% (DC power flow) of its emergency rating (137 MVA) for the tower contingency 'DBL_5NC'. This project contributes approximately 8.23 MW to the thermal violation.

2. The Conastone-EMORY GR500 500 kV (PJM) line (from bus 200004 to bus 200101 ckt 1) loads from 110.07% to 110.43% (DC power flow) of its emergency rating (2901 MVA) for the tower contingency 'CNSTN_NWESTA'. This project contributes approximately 65.03 MW to the thermal violation.

3. The Citisteel Tap-Naamans 69 kV (DP&L) line (from bus 231213 to bus 231211 ckt 1) loads from 115.15% to 116.26% (DC power flow) of its emergency rating (119 MVA) for the tower contingency 'DBL_5NC'. This project contributes approximately 8.23 MW to the thermal violation.

Short Circuit

No overstressed breakers were identified.

System Protection

Relays at the Kings Creek and Loretto substations will require replacement. The estimated cost to perform this work is **$600,000**.

Stability and Low Voltage Ride Through Analysis

Will be performed during the System Impact Study phase of the project.

Other Charges

It is anticipated that the Interconnection Customer will be charged for ongoing operation and maintenance of the attachment facilities. The methodology of calculating this charge is still under development.

New System Reinforcements

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

1. To mitigate the Westover-Kings Creek 69 kV (DP&L) line overload will require a relay upgrade. The cost and time to perform this work is anticipated to be minimal and will be provided in the System Impact Study report.

Contribution to Previously Identified System Reinforcements

*(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. Costs provided in this section are the **total** costs of the reinforcement. Cost allocations will be provided in the System Impact Study report.)*

1. To mitigate the Darley-Citisteel Tap 69 kV (DP&L) line overload will require rebuilding the 0.23 mile section of single circuit steel poles, the 0.52 mile section of single circuit wood poles, the 0.11 mile section of wood pole H-Frames, and the 0.04 mile tap section with new steel poles and 954 ACSR "Rail". The estimated cost to perform this work is **$710,000** and will take **24-30 months** to complete.

2. To mitigate the Conastone-EMORY GR500 500 kV (PJM) line overload upgrading the Conastone bay with two (2) 4000A breakers, four 4000A breaker disconnects, and a 4000 A line switch. The estimated cost to perform this work is **$3M** and will take **24-36 months** to complete.

3. To mitigate the Citisteel Tap-Naamans 69 kV (DP&L) line overload will require rebuilding the 0.23 mile section of single circuit steel poles, the 0.52 mile section of single circuit wood poles, the 0.11 mile section of wood pole H-Frames, and the 0.04 mile tap section with new steel poles and 954 ACSR "Rail". The estimated cost to perform this work is **$240,000** and will take **24-30 months** to complete.

Potential Congestion due to Local Energy Deliverability

(PJM also studied the delivery of the energy portion of the surrounding generation. Any potential problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with Network Upgrades to eliminate the operational restriction at their discretion by submitting a Transmission Interconnection Request. Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full deliverability for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which analyzes all overload conditions associated with the

identified overloaded element(s). As a result of the aggregate energy resources in the area, the following violations were identified:

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

1. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 122.83% to 123.46% (DC power flow) of its emergency rating (983 MVA) for the operational contingency '220-39'. This project contributes approximately 38.48 MW to the thermal violation.

2. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 136.22% to 136.68% (DC power flow) of its emergency rating (2815 MVA) for the operational contingency 'PJM67'. This project contributes approximately 79.48 MW to the thermal violation.

3. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 138.01% to 138.56% (DC power flow) of its normal rating (2490 MVA) for non contingency condition. This project contributes approximately 85.78 MW to the thermal violation.

4. (DP&L) The Kings Creek-Kings Creek 69/138 kV transformer (from bus 232276 to bus 232129 ckt 1) loads from 151.70% to 507.61% (DC power flow) of its normal rating (59 MVA) for non contingency condition. This project contributes approximately 209.99 MW to the thermal violation.

5. (DP&L) The Oak Hall-Wattsville 69 kV line (from bus 232280 to bus 232281 ckt 1) loads from 140.09% to 142.71% (DC power flow) of its emergency rating (89 MVA) for the operational contingency 'CKT 137AC'. This project contributes approximately 14.45 MW to the thermal violation.

6. (PECO) The Nottingham Reactor-Peach Bottom 230 kV line (from bus 213846 to bus 213869 ckt 1) loads from 121.48% to 121.82% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

7. (DP&L) The Kings Creek-Loretto 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 86.88% to 137.96% (DC power flow) of its emergency rating (351 MVA) for the operational contingency 'CKT 23002'. This project contributes approximately 179.29 MW to the thermal violation.

8. (DP&L) The Kings Creek-Loretto 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 78.26% to 136.54% (DC power flow) of its normal rating (275 MVA) for non contingency condition. This project contributes approximately 160.27 MW to the thermal violation.

9. (DP&L) The Wattsville-Stockton 69 kV line (from bus 232281 to bus 232278 ckt 1) loads from 101.65% to 103.4% (DC power flow) of its emergency rating (58 MVA) for the operational

contingency 'PINEY GR AT1'. This project contributes approximately 6.28 MW to the thermal violation.

10. (DP&L) The Westover-Kings Creek 69 kV line (from bus 232842 to bus 232276 ckt 1) loads from 373.05% to 1248.0% (DC power flow) of its normal rating (24 MVA) for non contingency condition. This project contributes approximately 209.99 MW to the thermal violation.

11. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 123.26% to 123.89% (DC power flow) of its emergency rating (983 MVA) for the operational contingency '220-43'. This project contributes approximately 38.61 MW to the thermal violation.

12. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 100.78% to 101.18% (DC power flow) of its normal rating (831 MVA) for non contingency condition. This project contributes approximately 20.49 MW to the thermal violation.

13. (PECO) The Richmond-Waneeta 3 230 kV line (from bus 213922 to bus 214012 ckt 1) loads from 152.42% to 152.71% (DC power flow) of its emergency rating (914 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 19.00 MW to the thermal violation.

14. (DP&L) The Piney Grove-Piney Grove 138/230 kV transformer (from bus 232128 to bus 232007 ckt 1) loads from 81.50% to 123.08% (DC power flow) of its emergency rating (424 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 176.27 MW to the thermal violation.

15. (DP&L) The X1-096 TAP-Westover 69 kV line (from bus 907780 to bus 232842 ckt 1) loads from 239.56% to 792.16% (DC power flow) of its normal rating (38 MVA) for non contingency condition. This project contributes approximately 209.99 MW to the thermal violation.

16. (DP&L) The New Church-Piney Grove 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 122.31% to 171.01% (DC power flow) of its emergency rating (226 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 110.07 MW to the thermal violation.

17. (DP&L) The New Church-Piney Grove 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 94.91% to 109.92% (DC power flow) of its normal rating (172 MVA) for non contingency condition. This project contributes approximately 25.82 MW to the thermal violation.

18. (PECO/BG&E) The Cooper-Graceton 230 kV line (from bus 214089 to bus 220964 ckt 1) loads from 158.91% to 159.35% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

19. (PSEG/PECO) The Camden-Richmond 230 kV line (from bus 219125 to bus 213922 ckt 1) loads from 164.55% to 164.86% (DC power flow) of its emergency rating (1037 MVA) for the

operational contingency 'CHIC125'. This project contributes approximately 20.48 MW to the thermal violation.

20. (DP&L) The Costen-T-144 TAP 138 kV line (from bus 232807 to bus 886230 ckt 1) loads from 24.22% to 109.23% (DC power flow) of its emergency rating (247 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 209.99 MW to the thermal violation.

21. (PECO) The Peach Bottom-Cooper 230 kV line (from bus 213869 to bus 214089 ckt 1) loads from 158.30% to 158.73% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

22. (PJM) The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 107.90% to 108.3% (DC power flow) of its normal rating (2338 MVA) for non contingency condition. This project contributes approximately 57.57 MW to the thermal violation.

23. (DP&L/PECO) The Edge Moor 5-Linwood 230 kV line (from bus 231001 to bus 213750 ckt 1) loads from 102.63% to 103.3% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'CKT 23015'. This project contributes approximately 33.21 MW to the thermal violation.

24. (DP&L) The Edge Moor 5-Claymont 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 103.41% to 104.07% (DC power flow) of its emergency rating (805 MVA) for the operational contingency '220-85'. This project contributes approximately 33.26 MW to the thermal violation.

25. (DP&L) The Piney Grove-Mount Hermon 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 131.79% to 152.96% (DC power flow) of its emergency rating (143 MVA) for the operational contingency 'CKT 23002'. This project contributes approximately 30.27 MW to the thermal violation.

26. (DP&L) The Mount Hermon-North Salisbury 69 kV line (from bus 232272 to bus 232271 ckt 1) loads from 87.87% to 109.49% (DC power flow) of its emergency rating (140 MVA) for the operational contingency 'CKT 23002'. This project contributes approximately 30.27 MW to the thermal violation.

27. (DP&L) The Stockton-Kenney 69 kV line (from bus 232278 to bus 232277 ckt 1) loads from 101.44% to 103.19% (DC power flow) of its emergency rating (58 MVA) for the operational contingency 'PINEY GR AT1'. This project contributes approximately 6.28 MW to the thermal violation.

28. (PECO/AE) The Delco Tap-Mickleton 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 114.67% to 115.09% (DC power flow) of its emergency rating (725 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 18.99 MW to the thermal violation.

29. (BG&E) The North West 2326 & 2322-Granite 2326 & 2332 230 kV line (from bus 220961 to bus 220973 ckt 1) loads from 107.01% to 107.06% (DC power flow) of its emergency rating (728 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 14.74 MW to the thermal violation.

30. (PJM/METED) The Three Mile Island-Three Mile Island 500/230 kV transformer (from bus 200016 to bus 204514 ckt 2) loads from 125.65% to 126.05% (DC power flow) of its emergency rating (1072 MVA) for the operational contingency 'PJM17'. This project contributes approximately 26.56 MW to the thermal violation.

31. (PECO) The Nottingham-Nottingham Reactor 230 kV line (from bus 213844 to bus 213846 ckt 1) loads from 121.66% to 121.99% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

32. (BG&E) The North West 2311 & 2310-Granite 2311 & 2312 230 kV line (from bus 220962 to bus 220972 ckt 1) loads from 128.89% to 129.01% (DC power flow) of its emergency rating (621 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 15.25 MW to the thermal violation.

33. (DP&L) The T-144 TAP-Pocomoke 138 kV line (from bus 886230 to bus 232130 ckt 1) loads from 32.22% to 117.24% (DC power flow) of its emergency rating (247 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 209.99 MW to the thermal violation.

Secondary Option

X1-096 was studied as a 210 MW injection into the Kings Creek 138kV substation.

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

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

None

Multiple Facility Contingency

*(Double Circuit Tower Line, Line with Failed Breaker and, Bus Fault contingencies for the **Full** energy output.*

None

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

1. (DP&L) The Darley-Citisteel Tap 69 kV line (from bus 231205 to bus 231213 ckt 1) loads from 101.30% to 102.27% (DC power flow) of its emergency rating (137 MVA) for the tower contingency 'DBL_5NC'. This project contributes approximately 8.23 MW to the thermal violation.

2. (PJM) The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 108.57% to 108.93% (DC power flow) of its emergency rating (2901 MVA) for the tower contingency 'CNSTN_NWESTA'. This project contributes approximately 65.03 MW to the thermal violation.

3. (DP&L) The Citisteel Tap-Naamans 69 kV line (from bus 231213 to bus 231211 ckt 1) loads from 115.13% to 116.25% (DC power flow) of its emergency rating (119 MVA) for the tower contingency 'DBL_5NC'. This project contributes approximately 8.23 MW to the thermal violation.

Potential Congestion due to Local Energy Deliverability

(PJM also studied the delivery of the energy portion of the surrounding generation. Any potential problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with Network Upgrades to eliminate the operational restriction at their discretion by submitting a Transmission Interconnection Request. Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full deliverability for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which analyzes all overload conditions associated with the identified overloaded element(s). As a result of the aggregate energy resources in the area, the following violations were identified:

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

1. (BG&E) The Conastone-EMORY GRV230 230 kV line (from bus 220963 to bus 220400 ckt 2) loads from 114.81% to 114.84% (DC power flow) of its emergency rating (941 MVA) for the operational contingency 'PP1EC'. This project contributes approximately 17.95 MW to the thermal violation.

2. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 136.28% to 136.74% (DC power flow) of its emergency rating (2815 MVA) for the operational contingency 'PJM67'. This project contributes approximately 79.48 MW to the thermal violation.

3. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 138.10% to 138.65% (DC power flow) of its normal rating (2490 MVA) for non

contingency condition. This project contributes approximately 85.78 MW to the thermal violation.

4. (DP&L) The Oak Hall-Wattsville 69 kV line (from bus 232280 to bus 232281 ckt 1) loads from 140.09% to 142.71% (DC power flow) of its emergency rating (89 MVA) for the operational contingency 'CKT 137AC'. This project contributes approximately 14.45 MW to the thermal violation.

5. (BG&E) The Conastone-EMORY GRV230 230 kV line (from bus 220963 to bus 220400 ckt 1) loads from 130.22% to 130.24% (DC power flow) of its emergency rating (819 MVA) for the operational contingency 'PP1EC'. This project contributes approximately 17.74 MW to the thermal violation.

6. (PECO) The Nottingham Reactor-Peach Bottom 230 kV line (from bus 213846 to bus 213869 ckt 1) loads from 121.59% to 121.93% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

7. (DP&L) The Kings Creek-Loretto 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 86.88% to 137.96% (DC power flow) of its emergency rating (351 MVA) for the operational contingency 'CKT 23002'. This project contributes approximately 179.29 MW to the thermal violation.

8. (DP&L) The Kings Creek-Loretto 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 78.26% to 136.54% (DC power flow) of its normal rating (275 MVA) for non contingency condition. This project contributes approximately 160.27 MW to the thermal violation.

9. (DP&L) The Wattsville-Stockton 69 kV line (from bus 232281 to bus 232278 ckt 1) loads from 101.65% to 103.4% (DC power flow) of its emergency rating (58 MVA) for the operational contingency 'PINEY GR AT1'. This project contributes approximately 6.28 MW to the thermal violation.

10. (BG&E) The North West 2311 & 2310-Granite 2311 & 2312 230 kV line (from bus 220962 to bus 220972 ckt 1) loads from 128.44% to 128.57% (DC power flow) of its emergency rating (621 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 15.25 MW to the thermal violation.

11. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 123.25% to 123.88% (DC power flow) of its emergency rating (983 MVA) for the operational contingency '220-43'. This project contributes approximately 38.61 MW to the thermal violation.

12. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 100.78% to 101.17% (DC power flow) of its normal rating (831 MVA) for non

contingency condition. This project contributes approximately 20.49 MW to the thermal violation.

13. (PECO) The Richmond-Waneeta 3 230 kV line (from bus 213922 to bus 214012 ckt 1) loads from 152.99% to 153.29% (DC power flow) of its emergency rating (914 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 19.00 MW to the thermal violation.

14. (DP&L) The Piney Grove-Piney Grove 138/230 kV transformer (from bus 232128 to bus 232007 ckt 1) loads from 81.50% to 123.08% (DC power flow) of its emergency rating (424 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 176.27 MW to the thermal violation.

15. (PECO) The Nottingham-Nottingham Reactor 230 kV line (from bus 213844 to bus 213846 ckt 1) loads from 121.76% to 122.1% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

16. (DP&L) The New Church-Piney Grove 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 122.31% to 171.01% (DC power flow) of its emergency rating (226 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 110.07 MW to the thermal violation.

17. (DP&L) The New Church-Piney Grove 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 94.91% to 109.92% (DC power flow) of its normal rating (172 MVA) for non contingency condition. This project contributes approximately 25.82 MW to the thermal violation.

18. (PECO/BG&E) The Cooper-Graceton 230 kV line (from bus 214089 to bus 220964 ckt 1) loads from 159.05% to 159.49% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

19. (PSEG/PECO) The Camden-Richmond 230 kV line (from bus 219125 to bus 213922 ckt 1) loads from 165.11% to 165.43% (DC power flow) of its emergency rating (1037 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 20.48 MW to the thermal violation.

20. (DP&L) The Costen-T-144 TAP 138 kV line (from bus 232807 to bus 886230 ckt 1) loads from 24.22% to 109.23% (DC power flow) of its emergency rating (247 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 209.99 MW to the thermal violation.

21. (PECO) The Peach Bottom-Cooper 230 kV line (from bus 213869 to bus 214089 ckt 1) loads from 158.43% to 158.87% (DC power flow) of its emergency rating (485 MVA) for the

operational contingency 'PJM17'. This project contributes approximately 22.90 MW to the thermal violation.

22. (PJM) The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 107.94% to 108.34% (DC power flow) of its normal rating (2338 MVA) for non contingency condition. This project contributes approximately 57.57 MW to the thermal violation.

23. (DP&L/PECO) The Edge Moor 5-Linwood 230 kV line (from bus 231001 to bus 213750 ckt 1) loads from 102.62% to 103.29% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'CKT 23015'. This project contributes approximately 33.21 MW to the thermal violation.

24. (DP&L) The Edge Moor 5-Claymont 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 103.40% to 104.07% (DC power flow) of its emergency rating (805 MVA) for the operational contingency '220-85'. This project contributes approximately 33.26 MW to the thermal violation.

25. (DP&L) The Piney Grove-Mount Hermon 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 131.79% to 152.96% (DC power flow) of its emergency rating (143 MVA) for the operational contingency 'CKT 23002'. This project contributes approximately 30.27 MW to the thermal violation.

26. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 122.82% to 123.45% (DC power flow) of its emergency rating (983 MVA) for the operational contingency '220-39'. This project contributes approximately 38.48 MW to the thermal violation.

27. (DP&L) The Mount Hermon-North Salisbury 69 kV line (from bus 232272 to bus 232271 ckt 1) loads from 87.87% to 109.49% (DC power flow) of its emergency rating (140 MVA) for the operational contingency 'CKT 23002'. This project contributes approximately 30.27 MW to the thermal violation.

28. (DP&L) The Stockton-Kenney 69 kV line (from bus 232278 to bus 232277 ckt 1) loads from 101.44% to 103.19% (DC power flow) of its emergency rating (58 MVA) for the operational contingency 'PINEY GR AT1'. This project contributes approximately 6.28 MW to the thermal violation.

29. (PECO/AE) The Delco Tap-Mickleton 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 114.66% to 115.08% (DC power flow) of its emergency rating (725 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 18.99 MW to the thermal violation.

30. (BG&E) The North West 2326 & 2322-Granite 2326 & 2332 230 kV line (from bus 220961 to bus 220973 ckt 1) loads from 106.69% to 106.73% (DC power flow) of its emergency

rating (728 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 14.74 MW to the thermal violation.

31. (PJM/METED) The Three Mile Island-Three Mile Island 500/230 kV transformer (from bus 200016 to bus 204514 ckt 2) loads from 127.29% to 127.69% (DC power flow) of its emergency rating (1072 MVA) for the operational contingency 'PJM17'. This project contributes approximately 26.56 MW to the thermal violation.

32. (DP&L) The T-144 TAP-Pocomoke 138 kV line (from bus 886230 to bus 232130 ckt 1) loads from 32.22% to 117.24% (DC power flow) of its emergency rating (247 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 209.99 MW to the thermal violation.