Generation Interconnection
Feasibility Study Report
Queue Position X2-037

The Interconnection Customer (IC) has proposed a 350 MWE (45.5 MWC; 350 MW MFO) wind powered generating facility to be located in the Atlantic Ocean approximately 20 miles east of Atlantic City, New Jersey. PJM studied X2-037 as a 350 MW injection into the Atlantic City Electric Company (ACE) system and evaluated the project for compliance with reliability criteria for summer peak conditions in 2015. The planned in-service date is November 1, 2015.

Point(s) of Interconnection

The Interconnection Customer requested a Primary and Secondary Point of Interconnection (POI) be evaluated for the X2-037 project. The Primary POI selected was a direct connection into ACE's Cedar 230kV substation. The Secondary POI selected was a direct connection into ACE's Lewis 138kV substation. The results are provided in the Transmission Network Impacts section below.

Direct Connection Requirements

Primary Option

X2-037 will interconnect with the ACE system at the Cedar 230kV substation via a new line terminal.

Transmission Owner Scope of Direct Connection Work

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

Substation Engineering Estimate:

Scope: Construct a new 230kV terminal at the Cedar Substation. This will require running underground 230kV cable from the existing ring bus to a new 230kV yard at the same location.

Estimate: $7,800,000

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 an underground cable to a new, self-supporting 230kV steel pole with a concrete foundation with motor operated disconnects.

Estimate: $1,750,000

Construction Time: 24 – 30 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 required.

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 PHI 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 request)*

None

Multiple Facility Contingency

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

1. The (JCPL) Manchester-Van 230 kV line (from bus 206720 to bus 206318 ckt 1) loads from 80.70% to 100.86% (DC power flow) of its emergency rating (805 MVA) for the tower contingency 'C5_CNJ-DCT-#12'. This project contributes approximately 163.02 MW to the thermal violation.

2. The (JCPL) Whitings-Manchester 230 kV line (from bus 206319 to bus 206720 ckt 1) loads from 82.37% to 102.54% (DC power flow) of its emergency rating (805 MVA) for the tower contingency 'C5_CNJ-DCT-#12'. This project contributes approximately 163.02 MW to the thermal violation.

3. The (JCPL) Manitou-Whitings 230 kV line (from bus 206297 to bus 206319 ckt 1) loads from 95.07% to 115.29% (DC power flow) of its emergency rating (805 MVA) for the tower contingency 'C5_CNJ-DCT-#12'. This project contributes approximately 163.47 MW to the thermal violation.

Contribution to Previously Identified Overloads

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

1. The (JCPL) Van-Larrabee 230 kV line (from bus 206318 to bus 206294 ckt 1) loads from 110.08% to 125.12% (DC power flow) of its emergency rating (805 MVA) for the tower contingency 'C5_CNJ-DCT-#12'. This project contributes approximately 121.60 MW to the thermal violation.

2. The (PJM) Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 123.12% to 123.68% (DC power flow) of its emergency rating (2901 MVA) for the tower contingency 'CNSTN_NWESTA'. This project contributes approximately 101.34 MW to the thermal violation.

3. The Oystercreek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 1) loads from 110.03% to 128.75% (DC power flow) of its emergency rating (805 MVA) for the tower contingency 'C5_CNJ-DCT-#12'. This project contributes approximately 19.67 MW to the thermal violation.

4. The (PJM/AP) EMORY GR500-Kemptown 500 kV line (from bus 200101 to bus 235632 ckt 1) loads from 106.88% to 107.09% (DC power flow) of its emergency rating (2901 MVA) for the tower contingency 'CNSTN_NWESTB'. This project contributes approximately 99.68 MW to the thermal violation.

Short Circuit

No overstressed breakers were identified.

System Protection

Costs determined by PHI System Protection as a result of the short circuit analysis will be provided in the System Impact Study Report.

Stability and Low Voltage Ride Through Analysis

The analysis will commence 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 (JCPL) Manchester-Van 230 kV line (from bus 206720 to bus 206318 ckt 1) overload will require reconductoring approximately 5.6 miles of the circuit with 1590 ACSS conductor. It will also require upgrading drop loops and limiting substation conductor. The estimated cost to perform this work is **$15.98M**.

2. To mitigate the (JCPL) Whitings-Manchester 230 kV line (from bus 206319 to bus 206720 ckt 1) overload will require reconductoring approximately 12.7 miles of the circuit with 1590 ACSS conductor. It will also require upgrading drop loops and limiting substation conductor. The estimated cost to perform this work is **$25.23M**.

3. To mitigate the (JCPL) Manitou-Whitings 230 kV line (from bus 206297 to bus 206319 ckt 1) overload will require reconductoring approximately 8.8 miles of the circuit with 1590 ACSS conductor. It will also require upgrading drop loops, limiting substation conductor, and replacement of a wave trap with one rated for 3000A. The estimated cost to perform this work is **$18.86M**.

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 (JCPL) Van-Larrabee 230 kV line (from bus 206318 to bus 206294 ckt 1) overload will require reconductoring the circuit using 1590 ACSS conductor (7.5 miles). It

will also require upgrading drop loops and limiting substation conductor, replacement of wave trap with one rated at 3000A, and upgrading breaker relay and metering equipment. The estimated cost to perform this work is **$14.7M.**

2&4. To mitigate the Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) and the EMORY GR500-Kemptown 500 kV line (from bus 200101 to bus 235632 ckt 1) overloads will require upgrading the Conastone bay with two (2) 4000A breakers, four (4) 4000A breaker disconnects and one (1) 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 Oystercreek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 1) overload will require reconductoring the circuit using 1590 ACSS conductor (11.1 miles). It will also require upgrading drop loops and limiting substation conductors, breaker relay and metering equipment, replacement of disconnect switch with one rated for 3000 Amp, replacement of wave trap with one rated for 3000A. The estimated cost to perform this work is **$21.2M**.

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 North West 2311 & 2310-Granite 2311 & 2312 230 kV line (from bus 220962 to bus 220972 ckt 1) loads from 149.56% to 149.67% (DC power flow) of its emergency rating (621 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 23.94 MW to the thermal violation.

2. (PECO) The Richmond-Waneeta 3 230 kV line (from bus 213922 to bus 214012 ckt 1) loads from 160.94% to 161.64% (DC power flow) of its emergency rating (914 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 51.38 MW to the thermal violation.

3. (PECO) The Richmond-Waneeta 3 230 kV line (from bus 213922 to bus 214012 ckt 1) loads from 119.29% to 119.79% (DC power flow) of its normal rating (760 MVA) for non contingency condition. This project contributes approximately 48.72 MW to the thermal violation.

4. (JCPL) The Oyster Creek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 2) loads from 152.93% to 177.36% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'B_CNJ2-SX-#29'. This project contributes approximately 197.46 MW to the thermal violation.

5. (JCPL) The Oyster Creek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 2) loads from 98.60% to 114.87% (DC power flow) of its normal rating (650 MVA) for non contingency condition. This project contributes approximately 106.22 MW to the thermal violation.

6. (BG&E) The Conastone-EMORY GRV230 230 kV line (from bus 220963 to bus 220400 ckt 2) loads from 131.27% to 131.36% (DC power flow) of its emergency rating (941 MVA) for the operational contingency 'PP1EC'. This project contributes approximately 28.38 MW to the thermal violation.

7. (AE) The B L England-Merion 138 kV line (from bus 228110 to bus 228197 ckt 1) loads from 120.44% to 121.45% (DC power flow) of its emergency rating (219 MVA) for the operational contingency 'ENG-CORSON'. This project contributes approximately 13.73 MW to the thermal violation.

8. (PECO/BG&E) The Cooper-Graceton 230 kV line (from bus 214089 to bus 220964 ckt 1) loads from 186.02% to 186.75% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 31.43 MW to the thermal violation.

9. (PSEG/PECO) The Camden-Richmond 230 kV line (from bus 219125 to bus 213922 ckt 1) loads from 164.17% to 164.97% (DC power flow) of its emergency rating (1037 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 51.73 MW to the thermal violation.

10. (PSEG/PECO) The Camden-Richmond 230 kV line (from bus 219125 to bus 213922 ckt 1) loads from 132.67% to 133.61% (DC power flow) of its normal rating (836 MVA) for non contingency condition. This project contributes approximately 49.04 MW to the thermal violation.

11. (PL/METED) The Brunner Island Bus-Yorkana 230 kV line (from bus 207922 to bus 204515 ckt 1) loads from 146.78% to 147.0% (DC power flow) of its emergency rating (617 MVA) for the operational contingency 'PJM17'. This project contributes approximately 18.42 MW to the thermal violation.

12. (AE) The Motts #2-Chestnut Neck Alternate 69 kV line (from bus 228007 to bus 228026 ckt 1) loads from 112.92% to 154.02% (DC power flow) of its emergency rating (94 MVA) for the operational contingency 'B_CNJ2-SX-#34'. This project contributes approximately 38.63 MW to the thermal violation.

13. (PL/BG&E) The Otter Creek Switchyard-Conastone 230 kV line (from bus 208048 to bus 220963 ckt 1) loads from 148.56% to 148.67% (DC power flow) of its emergency rating (531

MVA) for the operational contingency 'PJM17'. This project contributes approximately 25.83 MW to the thermal violation.

14. (BG&E) The North West 2326 & 2322-Granite 2326 & 2332 230 kV line (from bus 220961 to bus 220973 ckt 1) loads from 123.67% to 123.77% (DC power flow) of its emergency rating (728 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 23.13 MW to the thermal violation.

15. (JCPL) The Larrabee-Atlantic 230 kV line (from bus 206294 to bus 206286 ckt 1) loads from 103.65% to 104.55% (DC power flow) of its emergency rating (842 MVA) for the operational contingency 'B_CNJ2-SX-#7'. This project contributes approximately 46.46 MW to the thermal violation.

16. (BG&E) The Granite 2326 & 2332-Howard 2332 230 kV line (from bus 220973 to bus 220954 ckt 1) loads from 99.21% to 99.33% (DC power flow) of its emergency rating (728 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 23.26 MW to the thermal violation.

17. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 166.97% to 167.05% (DC power flow) of its emergency rating (2815 MVA) for the operational contingency 'PJM67'. This project contributes approximately 117.16 MW to the thermal violation.

18. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 173.79% to 173.89% (DC power flow) of its normal rating (2490 MVA) for non contingency condition. This project contributes approximately 124.98 MW to the thermal violation.

19. (AE) The Cedar-Cardiff 230 kV line (from bus 227955 to bus 227900 ckt 1) loads from 97.29% to 135.96% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'B_CNJ2-SX-#34'. This project contributes approximately 311.24 MW to the thermal violation.

20. (BG&E) The EMORY GRV230-North West 2326 & 2322 230 kV line (from bus 220400 to bus 220961 ckt 1) loads from 106.68% to 106.73% (DC power flow) of its emergency rating (1800 MVA) for the operational contingency 'BG_CKT2322A'. This project contributes approximately 20.45 MW to the thermal violation.

21. (PECO) The Nottingham-Nottingham Reactor 230 kV line (from bus 213844 to bus 213846 ckt 1) loads from 142.55% to 143.11% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 31.43 MW to the thermal violation.

22. (JCPL) The R11OP2-Red Oak B Bus 230 kV line (from bus 295950 to bus 206315 ckt 1) loads from 129.61% to 130.47% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'B_CNJ2-SX-#37'. This project contributes approximately 42.84 MW to the thermal violation.

23. (PJM) The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 119.05% to 119.35% (DC power flow) of its emergency rating (2901 MVA) for the operational contingency 'CNSTN__230-4'. This project contributes approximately 91.89 MW to the thermal violation.

24. (PJM) The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 136.74% to 137.09% (DC power flow) of its normal rating (2338 MVA) for non contingency condition. This project contributes approximately 89.13 MW to the thermal violation.

25. (AE) The Moss Moss-Lewis 69 kV line (from bus 228032 to bus 227948 ckt 1) loads from 103.25% to 145.7% (DC power flow) of its emergency rating (91 MVA) for the operational contingency 'B_CNJ2-SX-#34'. This project contributes approximately 38.63 MW to the thermal violation.

26. (PECO) The Nottingham Reactor-Peach Bottom 230 kV line (from bus 213846 to bus 213869 ckt 1) loads from 142.42% to 142.99% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 31.43 MW to the thermal violation.

27. (JCPL) The Red Oak B Bus-Raritan River 230 kV line (from bus 206315 to bus 206305 ckt 1) loads from 135.71% to 136.35% (DC power flow) of its emergency rating (1068 MVA) for the operational contingency 'B_CNJ2-SX-#37'. This project contributes approximately 42.06 MW to the thermal violation.

28. (JCPL) The Red Oak B Bus-Raritan River 230 kV line (from bus 206315 to bus 206305 ckt 1) loads from 109.35% to 109.81% (DC power flow) of its normal rating (869 MVA) for non contingency condition. This project contributes approximately 24.81 MW to the thermal violation.

29. (DP&L) The Red Lion-Keeney 230 kV line (from bus 231004 to bus 231003 ckt 1) loads from 102.10% to 102.69% (DC power flow) of its emergency rating (924 MVA) for the operational contingency 'PJM64'. This project contributes approximately 36.60 MW to the thermal violation.

30. (BG&E) The Conastone-EMORY GRV230 230 kV line (from bus 220963 to bus 220400 ckt 1) loads from 149.38% to 149.49% (DC power flow) of its emergency rating (819 MVA) for the operational contingency 'PP1EC'. This project contributes approximately 28.05 MW to the thermal violation.

31. (PL/BG&E) The Safe Harbor Units 3-4 Tap-Graceton 230 kV line (from bus 208071 to bus 220964 ckt 1) loads from 146.53% to 146.71% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 19.91 MW to the thermal violation.

32. (AE) The Chestnut Neck Alternate-Moss Moss 69 kV line (from bus 228026 to bus 228032 ckt 1) loads from 116.64% to 159.1% (DC power flow) of its emergency rating (91 MVA) for the operational contingency 'B_CNJ2-SX-#34'. This project contributes approximately 38.63 MW to the thermal violation.

33. (METED) The Three Mile Island-Jackson 1 230 kV line (from bus 204514 to bus 204502 ckt 1) loads from 104.40% to 104.88% (DC power flow) of its emergency rating (591 MVA) for the operational contingency 'PJM17'. This project contributes approximately 17.66 MW to the thermal violation.

34. (PECO) The Peach Bottom-Cooper 230 kV line (from bus 213869 to bus 214089 ckt 1) loads from 185.38% to 186.11% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 31.43 MW to the thermal violation.

35. (AE) The B L England-Middle Tap 138 kV line (from bus 228110 to bus 228111 ckt 1) loads from 123.72% to 124.89% (DC power flow) of its emergency rating (219 MVA) for the operational contingency 'ENG-MERION'. This project contributes approximately 15.88 MW to the thermal violation.

36. (JCPL) The Oyster Creek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 1) loads from 152.90% to 177.33% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'B_CNJ2-SX-#30'. This project contributes approximately 197.42 MW to the thermal violation.

37. (JCPL) The Oyster Creek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 1) loads from 98.48% to 114.73% (DC power flow) of its normal rating (650 MVA) for non contingency condition. This project contributes approximately 106.08 MW to the thermal violation.

38. (BG&E) The EMORY GRV230-North West 2311 & 2310 230 kV line (from bus 220400 to bus 220962 ckt 1) loads from 106.73% to 106.79% (DC power flow) of its emergency rating (1800 MVA) for the operational contingency 'BG_CKT2310A'. This project contributes approximately 20.52 MW to the thermal violation.

39. (PJM/METED) The Three Mile Island-Three Mile Island 500/230 kV transformer (from bus 200016 to bus 204514 ckt 2) loads from 134.18% to 135.04% (DC power flow) of its emergency rating (1072 MVA) for the operational contingency 'PJM17'. This project contributes approximately 39.19 MW to the thermal violation.

40. (AE/JCPL) The Cedar-Oyster Creek 230 kV line (from bus 227955 to bus 206302 ckt 1) loads from 126.29% to 151.99% (DC power flow) of its emergency rating (800 MVA) for the operational contingency 'PJM89_A'. This project contributes approximately 215.53 MW to the thermal violation.

41. (AE/JCPL) The Cedar-Oyster Creek 230 kV line (from bus 227955 to bus 206302 ckt 1) loads from 129.15% to 160.94% (DC power flow) of its normal rating (650 MVA) for non contingency condition. This project contributes approximately 215.97 MW to the thermal violation.

Secondary Option

X2-037 was studied as a 350 MW injection into the Lewis 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.*

1. The (AE) Deepwater-Deepwater 138/69 kV transformer (from bus 228318 to bus 228323 ckt 1) loads from 78.92% to 99.28% (DC power flow) of its emergency rating (190 MVA) for the tower contingency 'AE9TOWER'. This project contributes approximately 38.69 MW to the thermal violation.

Contribution to Previously Identified Overloads

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

1. The (AE) Mill #2-Mill 138/69 kV transformer (from bus 227904 to bus 227946 ckt 1) loads from 128.42% to 131.65% (DC power flow) of its emergency rating (166 MVA) for the tower contingency 'AE5TOWER'. This project contributes approximately 33.29 MW to the thermal violation.

2. The (PECO) Richmond-Waneeta 3 230 kV line (from bus 213922 to bus 214012 ckt 1) loads from 124.53% to 124.69% (DC power flow) of its emergency rating (914 MVA) for the single contingency 'CHIC125'. This project contributes approximately 9.24 MW to the thermal violation.

3. The (JCPL) Van-Larrabee 230 kV line (from bus 206318 to bus 206294 ckt 1) loads from 110.07% to 111.01% (DC power flow) of its emergency rating (805 MVA) for the tower contingency 'C5_CNJ-DCT-#12'. This project contributes approximately 49.41 MW to the thermal violation.

4. The (PSEG/PECO) Camden-Richmond 230 kV line (from bus 219125 to bus 213922 ckt 1) loads from 101.52% to 101.69% (DC power flow) of its normal rating (836 MVA) for non contingency condition. This project contributes approximately 8.81 MW to the thermal violation.

5. The (AE) Union-Lincoln 138 kV line (from bus 228210 to bus 228709 ckt 1) loads from 107.94% to 110.11% (DC power flow) of its emergency rating (292 MVA) for the tower contingency 'AE2TOWER'. This project contributes approximately 39.23 MW to the thermal violation.

6. The (PJM) Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 123.12% to 123.7% (DC power flow) of its emergency rating (2901 MVA) for the tower contingency 'CNSTN_NWESTA'. This project contributes approximately 103.58 MW to the thermal violation.

7. The (AE) Central North-Shieldalloy Tap 69 kV line (from bus 228714 to bus 228504 ckt 1) loads from 100.08% to 100.86% (DC power flow) of its emergency rating (143 MVA) for the tower contingency 'AE7TOWER'. This project contributes approximately 7.58 MW to the thermal violation.

8. The (PJM/AP) EMORY GR500-Kemptown 500 kV line (from bus 200101 to bus 235632 ckt 1) loads from 106.88% to 107.1% (DC power flow) of its emergency rating (2901 MVA) for the tower contingency 'CNSTN_NWESTB'. This project contributes approximately 101.80 MW to the thermal violation.

9. The (AE) Lewis-Moss Moss 69 kV line (from bus 227948 to bus 228032 ckt 1) loads from 105.78% to 110.37% (DC power flow) of its emergency rating (91 MVA) for the tower contingency 'AE3TOWER'. This project contributes approximately 25.85 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. (AE) The Bridgeport-Mickleton 230 kV line (from bus 228313 to bus 228401 ckt 1) loads from 131.50% to 132.04% (DC power flow) of its normal rating (650 MVA) for non contingency condition. This project contributes approximately 21.56 MW to the thermal violation.

2. (AE) The Mill #2-Mill 138/69 kV transformer (from bus 227904 to bus 227946 ckt 1) loads from 108.23% to 129.34% (DC power flow) of its emergency rating (166 MVA) for the operational contingency 'CARD-LEW'. This project contributes approximately 35.05 MW to the thermal violation.

3. (BG&E) The North West 2311 & 2310-Granite 2311 & 2312 230 kV line (from bus 220962 to bus 220972 ckt 1) loads from 149.56% to 149.68% (DC power flow) of its emergency rating (621 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 24.41 MW to the thermal violation.

4. (PECO) The Richmond-Waneeta 3 230 kV line (from bus 213922 to bus 214012 ckt 1) loads from 160.95% to 161.94% (DC power flow) of its emergency rating (914 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 71.08 MW to the thermal violation.

5. (PECO) The Richmond-Waneeta 3 230 kV line (from bus 213922 to bus 214012 ckt 1) loads from 119.30% to 120.09% (DC power flow) of its normal rating (760 MVA) for non contingency condition. This project contributes approximately 64.91 MW to the thermal violation.

6. (JCPL) The Oyster Creek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 2) loads from 152.93% to 154.14% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'B_CNJ2-SX-#29'. This project contributes approximately 65.19 MW to the thermal violation.

7. (BG&E) The Conastone-EMORY GRV230 230 kV line (from bus 220963 to bus 220400 ckt 2) loads from 131.27% to 131.37% (DC power flow) of its emergency rating (941 MVA) for the operational contingency 'PP1EC'. This project contributes approximately 28.89 MW to the thermal violation.

8. (AE) The B L England-Merion 138 kV line (from bus 228110 to bus 228197 ckt 1) loads from 120.44% to 142.7% (DC power flow) of its emergency rating (219 MVA) for the operational contingency 'ENG-CORSON'. This project contributes approximately 48.74 MW to the thermal violation.

9. (PECO/BG&E) The Cooper-Graceton 230 kV line (from bus 214089 to bus 220964 ckt 1) loads from 186.01% to 186.78% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 33.37 MW to the thermal violation.

10. (PSEG/PECO) The Camden-Richmond 230 kV line (from bus 219125 to bus 213922 ckt 1) loads from 164.17% to 165.32% (DC power flow) of its emergency rating (1037 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 73.98 MW to the thermal violation.

11. (PSEG/PECO) The Camden-Richmond 230 kV line (from bus 219125 to bus 213922 ckt 1) loads from 132.67% to 133.98% (DC power flow) of its normal rating (836 MVA) for non contingency condition. This project contributes approximately 67.75 MW to the thermal violation.

12. (PL/METED) The Brunner Island Bus-Yorkana 230 kV line (from bus 207922 to bus 204515 ckt 1) loads from 146.77% to 146.99% (DC power flow) of its emergency rating (617 MVA) for the operational contingency 'PJM17'. This project contributes approximately 18.25 MW to the thermal violation.

13. (AE) The Deepwater-Beckett 69 kV line (from bus 228323 to bus 228321 ckt 1) loads from 105.65% to 106.54% (DC power flow) of its emergency rating (97 MVA) for the operational contingency 'MICK-BRIDG'. This project contributes approximately 5.38 MW to the thermal violation.

14. (PL/BG&E) The Otter Creek Switchyard-Conastone 230 kV line (from bus 208048 to bus 220963 ckt 1) loads from 148.56% to 148.67% (DC power flow) of its emergency rating (531 MVA) for the operational contingency 'PJM17'. This project contributes approximately 25.62 MW to the thermal violation.

15. (PSEG) The Cloucester-Cuthbert Blvd. 230 kV line (from bus 219110 to bus 219108 ckt 2) loads from 195.43% to 196.51% (DC power flow) of its emergency rating (500 MVA) for the operational contingency 'GLO_CUTH'. This project contributes approximately 33.33 MW to the thermal violation.

16. (PSEG) The Cloucester-Cuthbert Blvd. 230 kV line (from bus 219110 to bus 219108 ckt 2) loads from 157.85% to 158.72% (DC power flow) of its normal rating (380 MVA) for non contingency condition. This project contributes approximately 20.38 MW to the thermal violation.

17. (PSEG) The Eagle Point-Cloucester 230 kV line (from bus 219120 to bus 219110 ckt 1) loads from 108.96% to 109.31% (DC power flow) of its emergency rating (1000 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 23.10 MW to the thermal violation.

18. (PSEG) The Eagle Point-Cloucester 230 kV line (from bus 219120 to bus 219110 ckt 1) loads from 103.05% to 103.42% (DC power flow) of its normal rating (850 MVA) for non contingency condition. This project contributes approximately 20.33 MW to the thermal violation.

19. (AE) The Butler-Vineland Cogeneration Llp 69 kV line (from bus 228703 to bus 228713 ckt 1) loads from 106.16% to 107.26% (DC power flow) of its emergency rating (133 MVA) for the operational contingency 'CENT-G10'. This project contributes approximately 9.66 MW to the thermal violation.

20. (BG&E) The North West 2326 & 2322-Granite 2326 & 2332 230 kV line (from bus 220961 to bus 220973 ckt 1) loads from 123.67% to 123.77% (DC power flow) of its emergency rating (728 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 23.59 MW to the thermal violation.

21. (JCPL) The Larrabee-Atlantic 230 kV line (from bus 206294 to bus 206286 ckt 1) loads from 103.65% to 104.06% (DC power flow) of its emergency rating (842 MVA) for the operational contingency 'B_CNJ2-SX-#7'. This project contributes approximately 21.12 MW to the thermal violation.

22. (BG&E) The Granite 2326 & 2332-Howard 2332 230 kV line (from bus 220973 to bus 220954 ckt 1) loads from 99.20% to 99.33% (DC power flow) of its emergency rating (728 MVA) for the operational contingency 'PP1EB'. This project contributes approximately 23.71 MW to the thermal violation.

23. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 166.97% to 167.06% (DC power flow) of its emergency rating (2815 MVA) for the operational contingency 'PJM67'. This project contributes approximately 121.75 MW to the thermal violation.

24. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 173.79% to 173.89% (DC power flow) of its normal rating (2490 MVA) for non contingency condition. This project contributes approximately 130.45 MW to the thermal violation.

25. (AE/PSEG) The Mickleton-Deptford 230 kV line (from bus 228401 to bus 219109 ckt 2) loads from 143.97% to 144.51% (DC power flow) of its emergency rating (1000 MVA) for the operational contingency 'PS6A'. This project contributes approximately 33.20 MW to the thermal violation.

26. (AE/PSEG) The Mickleton-Thorofare 230 kV line (from bus 228401 to bus 219121 ckt 1) loads from 134.24% to 134.73% (DC power flow) of its emergency rating (1000 MVA) for the operational contingency 'PS17B'. This project contributes approximately 31.57 MW to the thermal violation.

27. (PSEG) The Cuthbert Blvd.-Camden 230 kV line (from bus 219108 to bus 219125 ckt 1) loads from 134.44% to 135.29% (DC power flow) of its emergency rating (700 MVA) for the operational contingency 'CAM_CUTH_NEW'. This project contributes approximately 36.79 MW to the thermal violation.

28. (PSEG) The Cuthbert Blvd.-Camden 230 kV line (from bus 219108 to bus 219125 ckt 1) loads from 116.81% to 117.55% (DC power flow) of its normal rating (500 MVA) for non contingency condition. This project contributes approximately 22.82 MW to the thermal violation.

29. (BG&E) The EMORY GRV230-North West 2326 & 2322 230 kV line (from bus 220400 to bus 220961 ckt 1) loads from 106.68% to 106.73% (DC power flow) of its emergency rating (1800 MVA) for the operational contingency 'BG_CKT2322A'. This project contributes approximately 20.79 MW to the thermal violation.

30. (PECO) The Nottingham-Nottingham Reactor 230 kV line (from bus 213844 to bus 213846 ckt 1) loads from 142.55% to 143.15% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 33.37 MW to the thermal violation.

31. (AE) The Lewis-Lewis 138/69 kV transformer (from bus 227949 to bus 227948 ckt 1) loads from 94.80% to 114.4% (DC power flow) of its emergency rating (179 MVA) for the operational contingency 'CARD 3 XFR'. This project contributes approximately 35.08 MW to the thermal violation.

32. (JCPL) The R11OP2-Red Oak B Bus 230 kV line (from bus 295950 to bus 206315 ckt 1) loads from 129.61% to 130.0% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'B_CNJ2-SX-#37'. This project contributes approximately 19.64 MW to the thermal violation.

33. (AE) The Sherman-Sherman #1 69 kV line (from bus 228226 to bus 228256 ckt 1) loads from 100.61% to 102.23% (DC power flow) of its emergency rating (108 MVA) for the operational contingency 'SHERM 1 XFR'. This project contributes approximately 10.83 MW to the thermal violation.

34. (PJM) The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 119.05% to 119.35% (DC power flow) of its emergency rating (2901 MVA) for the operational contingency 'CNSTN__230-4'. This project contributes approximately 94.24 MW to the thermal violation.

35. (PJM) The Conastone-EMORY GR500 500 kV line (from bus 200004 to bus 200101 ckt 1) loads from 136.73% to 137.1% (DC power flow) of its normal rating (2338 MVA) for non contingency condition. This project contributes approximately 91.27 MW to the thermal violation.

36. (PSEG) The Thorofare-Eagle Point 230 kV line (from bus 219121 to bus 219120 ckt 1) loads from 129.15% to 129.65% (DC power flow) of its emergency rating (1000 MVA) for the operational contingency 'PS17B'. This project contributes approximately 31.57 MW to the thermal violation.

37. (AE) The Vineland Cogeneration Llp-Central 69 kV line (from bus 228713 to bus 228704 ckt 1) loads from 106.16% to 107.26% (DC power flow) of its emergency rating (133 MVA) for the operational contingency 'CENT-G10'. This project contributes approximately 9.66 MW to the thermal violation.

38. (PECO) The Nottingham Reactor-Peach Bottom 230 kV line (from bus 213846 to bus 213869 ckt 1) loads from 142.42% to 143.02% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 33.37 MW to the thermal violation.

39. (AE) The Merion-Corson 138 kV line (from bus 228197 to bus 228106 ckt 1) loads from 83.54% to 105.79% (DC power flow) of its emergency rating (219 MVA) for the operational contingency 'ENG-CORSON'. This project contributes approximately 48.74 MW to the thermal violation.

40. (AE) The Lewis-Lewis 138 kV line (from bus 227902 to bus 227945 ckt 1) loads from 78.63% to 122.68% (DC power flow) of its emergency rating (286.799987793 MVA) for the operational contingency 'B_CNJ2-SX-#34'. This project contributes approximately 126.35 MW to the thermal violation.

41. (JCPL) The Red Oak B Bus-Raritan River 230 kV line (from bus 206315 to bus 206305 ckt 1) loads from 135.71% to 136.0% (DC power flow) of its emergency rating (1068 MVA) for the operational contingency 'B_CNJ2-SX-#37'. This project contributes approximately 18.86 MW to the thermal violation.

42. (DP&L) The Red Lion-Keeney 230 kV line (from bus 231004 to bus 231003 ckt 1) loads from 102.10% to 102.84% (DC power flow) of its emergency rating (924 MVA) for the operational contingency 'PJM64'. This project contributes approximately 46.29 MW to the thermal violation.

43. (PSEG) The Deptford-Eagle Point 230 kV line (from bus 219109 to bus 219120 ckt 2) loads from 132.42% to 132.95% (DC power flow) of its emergency rating (1000 MVA) for the operational contingency 'PS6A'. This project contributes approximately 33.20 MW to the thermal violation.

44. (BG&E) The Conastone-EMORY GRV230 230 kV line (from bus 220963 to bus 220400 ckt 1) loads from 149.38% to 149.49% (DC power flow) of its emergency rating (819 MVA) for the operational contingency 'PP1EC'. This project contributes approximately 28.55 MW to the thermal violation.

45. (AE) The Vineland G-10-Central North 69 kV line (from bus 228705 to bus 228714 ckt 1) loads from 119.77% to 120.97% (DC power flow) of its emergency rating (108 MVA) for the operational contingency 'SHERM-BUT'. This project contributes approximately 8.04 MW to the thermal violation.

46. (PSEG) The Cloucester-Cuthbert Blvd. 230 kV line (from bus 219110 to bus 219108 ckt 1) loads from 140.09% to 140.86% (DC power flow) of its emergency rating (700 MVA) for the operational contingency 'GLO_CUTH_NEW'. This project contributes approximately 33.33 MW to the thermal violation.

47. (PSEG) The Cloucester-Cuthbert Blvd. 230 kV line (from bus 219110 to bus 219108 ckt 1) loads from 119.94% to 120.6% (DC power flow) of its normal rating (500 MVA) for non contingency condition. This project contributes approximately 20.38 MW to the thermal violation.

48. (PL/BG&E) The Safe Harbor Units 3-4 Tap-Graceton 230 kV line (from bus 208071 to bus 220964 ckt 1) loads from 146.52% to 146.69% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 19.42 MW to the thermal violation.

49. (AE) The Lewis-Lewis #2 138/69 kV transformer (from bus 227945 to bus 227920 ckt 1) loads from 101.11% to 103.45% (DC power flow) of its emergency rating (188 MVA) for the operational contingency 'LEW 1 XFR'. This project contributes approximately 27.25 MW to the thermal violation.

50. (PSEG) The Eagle Point-Cloucester 230 kV line (from bus 219120 to bus 219110 ckt 2) loads from 157.08% to 157.64% (DC power flow) of its emergency rating (1000 MVA) for the operational contingency 'PS18'. This project contributes approximately 36.49 MW to the thermal violation.

51. (PSEG) The Cuthbert Blvd.-Camden 230 kV line (from bus 219108 to bus 219125 ckt 2) loads from 182.07% to 183.19% (DC power flow) of its emergency rating (500 MVA) for the operational contingency 'CAM_CUTH'. This project contributes approximately 34.70 MW to the thermal violation.

52. (PSEG) The Cuthbert Blvd.-Camden 230 kV line (from bus 219108 to bus 219125 ckt 2) loads from 120.13% to 120.9% (DC power flow) of its normal rating (380 MVA) for non contingency condition. This project contributes approximately 17.93 MW to the thermal violation.

53. (METED) The Three Mile Island-Jackson 1 230 kV line (from bus 204514 to bus 204502 ckt 1) loads from 104.40% to 104.88% (DC power flow) of its emergency rating (591 MVA) for the operational contingency 'PJM17'. This project contributes approximately 17.64 MW to the thermal violation.

54. (AE) The Lewis-Moss Moss 69 kV line (from bus 227948 to bus 228032 ckt 1) loads from 99.94% to 103.94% (DC power flow) of its emergency rating (91 MVA) for the operational contingency 'CARD-CEDAR'. This project contributes approximately 22.52 MW to the thermal violation.

55. (PECO) The Peach Bottom-Cooper 230 kV line (from bus 213869 to bus 214089 ckt 1) loads from 185.38% to 186.15% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 33.37 MW to the thermal violation.

56. (AE) The Lewis-Lewis #1 138/69 kV transformer (from bus 227902 to bus 227918 ckt 1) loads from 100.94% to 103.33% (DC power flow) of its emergency rating (189 MVA) for the operational contingency 'LEW 3 XFR'. This project contributes approximately 27.97 MW to the thermal violation.

57. (AE) The B L England-Middle Tap 138 kV line (from bus 228110 to bus 228111 ckt 1) loads from 123.72% to 149.46% (DC power flow) of its emergency rating (219 MVA) for the operational contingency 'ENG-MERION'. This project contributes approximately 56.37 MW to the thermal violation.

58. (AE) The B L England-Middle Tap 138 kV line (from bus 228110 to bus 228111 ckt 1) loads from 83.14% to 102.62% (DC power flow) of its normal rating (199 MVA) for non contingency condition. This project contributes approximately 38.78 MW to the thermal violation.

59. (JCPL) The Oyster Creek-Manitou 230 kV line (from bus 206302 to bus 206297 ckt 1) loads from 152.90% to 154.11% (DC power flow) of its emergency rating (805 MVA) for the operational contingency 'B_CNJ2-SX-#30'. This project contributes approximately 65.18 MW to the thermal violation.

60. (BG&E) The EMORY GRV230-North West 2311 & 2310 230 kV line (from bus 220400 to bus 220962 ckt 1) loads from 106.73% to 106.79% (DC power flow) of its emergency rating (1800 MVA) for the operational contingency 'BG_CKT2310A'. This project contributes approximately 20.87 MW to the thermal violation.

61. (PJM/METED) The Three Mile Island-Three Mile Island 500/230 kV transformer (from bus 200016 to bus 204514 ckt 2) loads from 134.18% to 135.07% (DC power flow) of its emergency rating (1072 MVA) for the operational contingency 'PJM17'. This project contributes approximately 40.63 MW to the thermal violation.

62. (PSEG) The Cloucester-Camden 230 kV line (from bus 219110 to bus 219125 ckt 1) loads from 104.20% to 104.79% (DC power flow) of its emergency rating (700 MVA) for the operational contingency 'GLO_CUTH'. This project contributes approximately 25.65 MW to the thermal violation.

63. (PSEG) The Cloucester-Camden 230 kV line (from bus 219110 to bus 219125 ckt 1) loads from 108.37% to 108.99% (DC power flow) of its normal rating (500 MVA) for non contingency condition. This project contributes approximately 19.37 MW to the thermal violation.

64. (AE) The Mill-Mill 69 kV line (from bus 227946 to bus 227922 ckt 1) loads from 84.07% to 101.15% (DC power flow) of its emergency rating (239 MVA) for the operational contingency 'CARD-LEW'. This project contributes approximately 40.82 MW to the thermal violation.

65. (AE/JCPL) The Cedar-Oyster Creek 230 kV line (from bus 227955 to bus 206302 ckt 1) loads from 126.29% to 134.56% (DC power flow) of its emergency rating (800 MVA) for the operational contingency 'PJM89_A'. This project contributes approximately 75.92 MW to the thermal violation.

66. (AE/JCPL) The Cedar-Oyster Creek 230 kV line (from bus 227955 to bus 206302 ckt 1) loads from 129.13% to 138.81% (DC power flow) of its normal rating (650 MVA) for non contingency condition. This project contributes approximately 72.12 MW to the thermal violation.