Generation Interconnection
Feasibility Study Report
W4-017

The Interconnection Customer (IC) has proposed a 100 MWE (13 MWC) wind powered generating facility consisting of 40 GE 2.5xl wind turbines. The project is to be located in Marion Station, Somerset County, Maryland. PJM studied W4-017 as a 100 MW injection into the Delmarva Power and Light (DPL) system at a tap of the Kingston-Crisfield 69kV circuit. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2014. The proposed in-service date, as stated in Attachment N, is December 1, 2013.

Point of Interconnection

W4-017 will interconnect with the Delmarva Power and Light transmission system at a new 69kV three (3)-breaker ring bus substation adjacent to the Kings Creek-Crisfield 69kV circuit.

Direct Connection Requirements

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: $3,100,000
Construction Time: 24 – 36 months

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: $125,000
Construction Time: 24 months.

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

Additional costs upon further engineering review may result. Contribution in Aid of Construction (CIAC) tax will be included upon further study.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer (IC) is responsible for all design and construction related 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.

Protective relaying and metering design and installation must comply with PHI's applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff. PHI will require the capability to remotely trip the generator from its System Operations facility. The interconnected customer will grant its permission for PJM to send PHI all telemetry that the Interconnection Customer sends to PJM. The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each PHI metering position to facilitate remote interrogation and data collection.

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)

None

Short Circuit

None

Stability Analysis

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

New System Reinforcements

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

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.

None

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/BG&E) The Cooper-Graceton 230 kV line (from bus 214089 to bus 220964 ckt 1) loads from 174.09% to 174.4% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 10.58 MW to the thermal violation.

2. (DP&L) The Kenney-Mount Olive 1 69 kV line (from bus 232277 to bus 232839 ckt 1) loads from 121.09% to 122.62% (DC power flow) of its emergency rating (70 MVA) for the operational contingency 'CKT 13764'. This project contributes approximately 6.65 MW to the thermal violation.

3. (PJM/METED) The Three Mile Island-Three Mile Island 500/230 kV transformer (from bus 200016 to bus 204514 ckt 2) loads from 130.79% to 130.97% (DC power flow) of its emergency rating (1072 MVA) for the operational contingency 'PJM17'. This project contributes approximately 12.16 MW to the thermal violation.

4. (DP&L) The Piney Grove-Mount Hermon 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 130.73% to 140.3% (DC power flow) of its emergency rating (143 MVA) for the operational contingency 'CKT 23002'. This project contributes approximately 13.68 MW to the thermal violation.

5. (DP&L) The Glasgow-Cecil 138 kV line (from bus 231124 to bus 231130 ckt 1) loads from 125.00% to 125.54% (DC power flow) of its emergency rating (234 MVA) for the operational contingency 'CHIC125'. This project contributes approximately 8.16 MW to the thermal violation.

6. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 152.15% to 152.31% (DC power flow) of its emergency rating (2815 MVA) for the operational contingency 'PJM67'. This project contributes approximately 37.17 MW to the thermal violation.

7. (PJM) The Peach Bottom-Conastone 500 kV line (from bus 200013 to bus 200004 ckt 1) loads from 155.65% to 155.84% (DC power flow) of its normal rating (2490 MVA) for non contingency condition. This project contributes approximately 40.24 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 91.92% to 118.46% (DC power flow) of its emergency rating (351 MVA) for the operational contingency 'CKT 13764'. This project contributes approximately 93.14 MW to the thermal violation.

9. (DP&L) The Wattsville-Stockton 69 kV line (from bus 232281 to bus 232278 ckt 1) loads from 144.92% to 146.78% (DC power flow) of its emergency rating (58 MVA) for the operational contingency 'CKT 13764'. This project contributes approximately 6.65 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 46.54% to 370.14% (DC power flow) of its normal rating (24 MVA) for non contingency condition. This project contributes approximately 99.99 MW to the thermal violation.

11. (DP&L) The Westover-Kings Creek 69 kV line (from bus 232842 to bus 232276 ckt 1) loads from 85.17% to 331.54% (DC power flow) of its emergency rating (24 MVA) for the operational contingency 'CRISFLD1 _476'. This project contributes approximately 99.99 MW to the thermal violation.

12. (DP&L) The Kingston-Westover 69 kV line (from bus 232837 to bus 232842 ckt 1) loads from 25.26% to 237.9% (DC power flow) of its normal rating (38 MVA) for non contingency condition. This project contributes approximately 99.99 MW to the thermal violation.

13. (DP&L) The Kingston-Westover 69 kV line (from bus 232837 to bus 232842 ckt 1) loads from 49.68% to 213.5% (DC power flow) of its emergency rating (38 MVA) for the operational contingency 'CRISFLD1 _476'. This project contributes approximately 99.99 MW to the thermal violation.

14. (PECO) The Nottingham-Nottingham Reactor 230 kV line (from bus 213844 to bus 213846 ckt 1) loads from 135.51% to 135.76% (DC power flow) of its emergency rating (627 MVA) for the

operational contingency 'PJM17'. This project contributes approximately 10.58 MW to the thermal violation.

15. (DP&L) The Mount Olive 1-Piney Grove 69 kV line (from bus 232839 to bus 232274 ckt 1) loads from 111.28% to 112.81% (DC power flow) of its emergency rating (70 MVA) for the operational contingency 'CKT 13764'. This project contributes approximately 6.65 MW to the thermal violation.

16. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 121.62% to 121.84% (DC power flow) of its emergency rating (904 MVA) for the operational contingency '220-39'. This project contributes approximately 18.80 MW to the thermal violation.

17. (PECO) The Nottingham Reactor-Peach Bottom 230 kV line (from bus 213846 to bus 213869 ckt 1) loads from 135.50% to 135.75% (DC power flow) of its emergency rating (627 MVA) for the operational contingency 'PJM17'. This project contributes approximately 10.58 MW to the thermal violation.

18. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 122.05% to 122.27% (DC power flow) of its emergency rating (904 MVA) for the operational contingency '220-43'. This project contributes approximately 18.87 MW to the thermal violation.

19. (PECO) The Linwood-Chichester 2 230 kV line (from bus 213750 to bus 213490 ckt 2) loads from 103.20% to 103.35% (DC power flow) of its normal rating (753 MVA) for non contingency condition. This project contributes approximately 10.01 MW to the thermal violation.

20. (DP&L) The Stockton-Kenney 69 kV line (from bus 232278 to bus 232277 ckt 1) loads from 144.61% to 146.47% (DC power flow) of its emergency rating (58 MVA) for the operational contingency 'CKT 13764'. This project contributes approximately 6.65 MW to the thermal violation.

21. (DP&L) The W4-017 TAP-Kingston 69 kV line (from bus 905160 to bus 232837 ckt 1) loads from 15.42% to 247.73% (DC power flow) of its normal rating (38 MVA) for non contingency condition. This project contributes approximately 99.99 MW to the thermal violation.

22. (DP&L) The W4-017 TAP-Kingston 69 kV line (from bus 905160 to bus 232837 ckt 1) loads from 39.84% to 223.33% (DC power flow) of its emergency rating (38 MVA) for the operational contingency 'CRISFLD1 _476'. This project contributes approximately 99.99 MW to the thermal violation.

23. (DP&L) The Kings Creek-Kings Creek 69/138 kV transformer (from bus 232276 to bus 232129 ckt 1) loads from 18.97% to 150.53% (DC power flow) of its normal rating (59 MVA) for non contingency condition. This project contributes approximately 99.99 MW to the thermal violation.

24. (DP&L) The Kings Creek-Kings Creek 69/138 kV transformer (from bus 232276 to bus 232129 ckt 1) loads from 29.67% to 115.28% (DC power flow) of its emergency rating (69 MVA) for the operational contingency 'CRISFLD1 _476'. This project contributes approximately 99.99 MW to the thermal violation.

25. (DP&L) The New Church-Piney Grove 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 150.06% to 187.36% (DC power flow) of its emergency rating (226 MVA) for the operational contingency 'CKT 13713'. This project contributes approximately 84.30 MW to the thermal violation.

26. (DP&L) The New Church-Piney Grove 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 118.71% to 128.62% (DC power flow) of its normal rating (172 MVA) for non contingency condition. This project contributes approximately 17.06 MW to the thermal violation.

27. (PECO) The Peach Bottom-Cooper 230 kV line (from bus 213869 to bus 214089 ckt 1) loads from 175.18% to 175.5% (DC power flow) of its emergency rating (485 MVA) for the operational contingency 'PJM17'. This project contributes approximately 10.58 MW to the thermal violation.

28. (PJM) The New Freedom-Windsor 500 kV line (from bus 200012 to bus 200028 ckt 1) loads from 108.66% to 108.84% (DC power flow) of its emergency rating (2982 MVA) for the operational contingency 'PJM27B_U2-74B'. This project contributes approximately 33.51 MW to the thermal violation.