PJM Generator Interconnection
V3-017 Kelson Ridge
725 MW Capacity & Energy
Feasibility Study

January 2010
DMS#430494

General

Queue V3-017 is a request to interconnect a 725 MW Capacity Resource consisting of a gas-fired, 2x1 combined cycle facility to be located approximately 5 miles southeast of U.S. Route 301 on Piney Church Road, in Waldorf, Charles County, Maryland. The proposed generating facility is located approximately five miles north of Potomac Electric Power Company's (PEPCO, Interconnected Transmission Owner (ITO)) 230kV Hawkins Gate substation and close to a right of way containing four Morgantown/Hawkins Gate - Talbert/Oak Grove 230 kV circuits. The Interconnection Customer is tentatively scheduling the generating facility to be commercially available by 2Q2013.

Queue V3-017 requested that the interconnecting substation be arranged as a breaker and a half / 4 breakers per bay design, rather than a more conventional 3 breaker per bay design.

Network Impacts

The queue V3-017 project was studied as a 725MW capacity injection into the ITO system. The Point of Interconnection (POI) was modeled at the same point as the R17 project and R17 remained active for modeling: a tap of both the 23086 and 23084 lines between Morgantown/Hawkins Gate and Talbert/Oak Grove. Project V3-017 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Generator Deliverability

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

1. The TALB066 – OAKGV230 230kV line (from bus 224125 to bus 223982 ckt 1) loads from 81.69% to 117.31% (DC power flow) of its normal rating (559MVA) for non-contingency conditions as a result of V3-017. This project contributes approximately 199.1MW to cause this thermal violation.

2. The OAKGV230 – BOWIE045 230kV line (from bus 223982 to bus 223978 ckt 1) loads from 89.25% to 104.78% (DC power flow) of its normal rating (608MVA) for non-contingency conditions as a result of V3-017. This project contributes approximately 94.4MW to cause this thermal violation.

3. The BOWIE045 – BURT2314 230kV line (from bus 223978 to bus 223961 ckt 1) loads from 89.00% to 104.54% (DC power flow) of its normal rating (608MVA) for non-contingency conditions as a result of V3-017. This project contributes approximately 94.4MW to cause this thermal violation.

4. The OAKGV230 – BOWIE042 230kV line (from bus 223982 to bus 223977 ckt 1) loads from 88.78% to 104.31% (DC power flow) of its normal rating (608MVA) for non-contingency conditions as a result of V3-017. This project contributes approximately 94.4MW to cause this thermal violation.

5. The BOWIE042 – BURT2334 230kV line (from bus 223977 to bus 223962 ckt 1) loads from 88.25% to 103.78% (DC power flow) of its normal rating (608MVA) for non-contingency conditions as a result of V3-017. This project contributes approximately 94.4MW to cause this thermal violation.

6. The SANDY14T – H.RDGE16 230kV line (from bus 220983 to bus 220941 ckt 1) loads from 95.06% to 102.16% (DC power flow) of its emergency rating (941MVA) for the single contingency (PP28) as a result of V3-017. This project contributes approximately 51.7MW to cause this thermal violation.

7. The SANDY34T – H.RDGE16 230kV line (from bus 220984 to bus 220941 ckt 1) loads from 94.67% to 101.79% (DC power flow) of its emergency rating (941MVA) for the single contingency (PP27) as a result of V3-017. This project contributes approximately 51.8MW 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 for the Impact Study)

No problems identified.

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)

8. The TALB066 – OAKGV230 230kV line (from bus 224125 to bus 223982 ckt 1) loads from 100.36% to 147.25% (DC power flow) of its emergency rating (680MVA) for the tower contingency (12PEPCOA_A) as a result of V3-017. This project contributes approximately 318.9MW to cause this thermal violation.

9. The OAKGV230 – BOWIE045 230kV line (from bus 223982 to bus 223978 ckt 1) loads from 101.52% to 118.86% (DC power flow) of its emergency rating (730MVA) for the tower contingency (5PEPCO) as a result of V3-017. This project contributes approximately 126.6MW to cause this thermal violation.

10. The BOWIE045 – BURT2314 230kV line (from bus 223978 to bus 223961 ckt 1) loads from 101.32% to 118.66% (DC power flow) of its emergency rating (730MVA) for the tower contingency (5PEPCO) as a result of V3-017. This project contributes approximately 126.6MW to cause this thermal violation.

11. The OAKGV230 – BOWIE042 230kV line (from bus 223982 to bus 223977 ckt 1) loads from 100.63% to 117.81% (DC power flow) of its emergency rating (730MVA) for the tower contingency (7PEPCO_A) as a result of V3-017. This project contributes approximately 125.5MW to cause this thermal violation.

12. The BOWIE042 – BURT2334 230kV line (from bus 223977 to bus 223962 ckt 1) loads from 100.19% to 117.38% (DC power flow) of its emergency rating (730MVA) for the tower contingency (7PEPCO_A) as a result of V3-017. This project contributes approximately 125.5MW to cause this thermal violation.

13. The H.RDGE16 – HOWARD32 230kV line (from bus 220941 to bus 220954 ckt 1) loads from 113.93% to 115.26% (DC power flow) of its emergency rating (728MVA) for the tower contingency (WCHPL_BRNDN) as a result of V3-017. This project contributes approximately 9.7MW to cause this thermal violation.

Short Circuit

Our analysis found 13 new breakers, to be over-duty at the Morgantown Substation F. The new over-duty breaker at Morgantown Substation F is listed below:

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With v3-017 PEPCO	Duty Percent Without v3-017 PEPCO	Duty Percent Difference	Note
7054	GSF 230kV	WEST OCB	T	100.40%	96.50%	3.90%	New Overduty

The project also contributes to 13 Oak Grove breakers over duty. The project that initially over duty the breakers is R17. Allocation to these breakers will be determined at the System Impact Study. The 13 overduty breakers at Morgantown Substation F are estimated at $17.2M and 48 months to complete. The same cost and construction estimate applies to the 13 Oak Grove breakers.

Attachment Facilities

IC has responsibility for design and construction of all generating and Attachment Facilities on IC side of the Point of Interconnection (POI). In addition, under the PJM Tariff "Option to Build" provisions, IC will assume all responsibility to construct all Attachment Facilities including the new 230-kV substation. All construction must meet ITO technical specifications. Prior to commercial operation of Queue R17 generation, IC will transfer ownership of the Attachment Facilities from the POI into the new 230-kV Interconnection substation to ITO.

Direct Connection Requirements

Queue V3-017 generation can be connected to the two Morgantown/Hawkins Gate - Talbert/Oak Grove 230 kV circuits as depicted below.

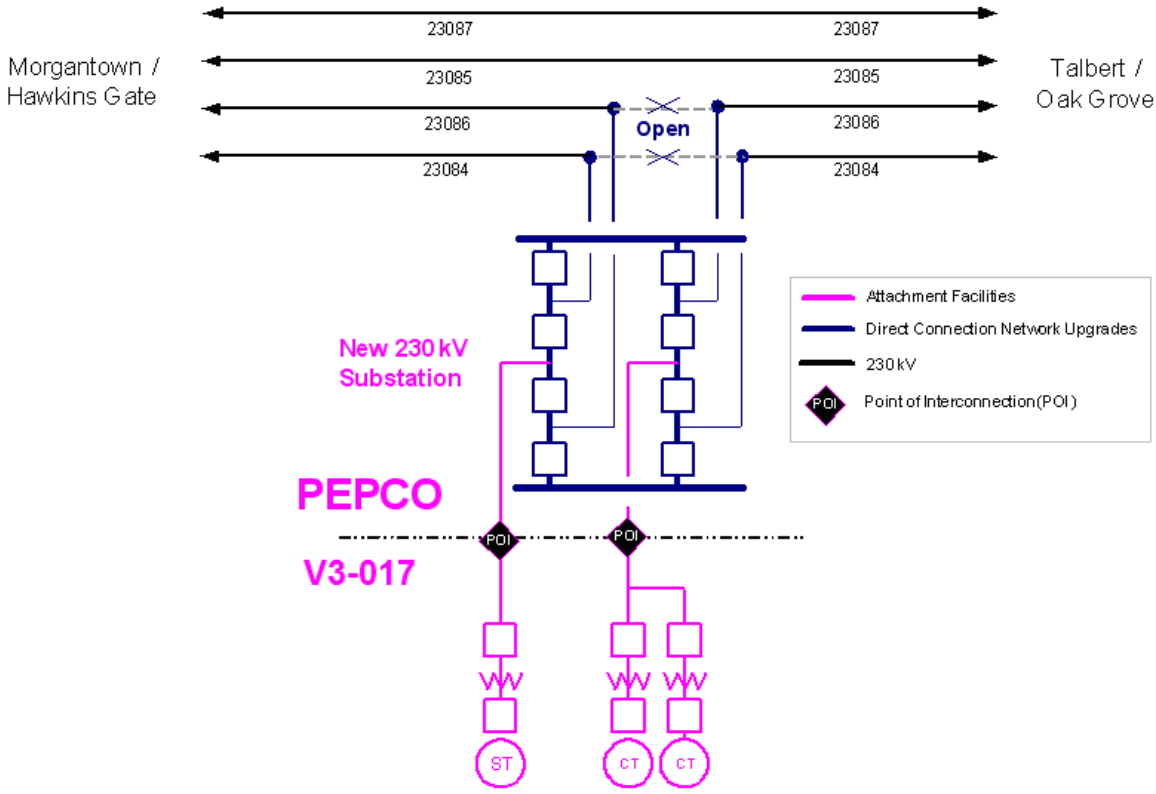
Under the PJM Tariff "Option to Build" provisions, IC will assume all responsibility to construct the new 230-kV substation. All construction must

meet ITO technical standard specifications. Prior to commercial operation of generation, IC will transfer ownership of the new 230-kV Interconnection substation to TIO.

ITO will review IC design of the new 230-kV substation, and perform the necessary construction management, engineering review and commissioning testing associated with the attachment and substation facilities added for Queue R17; ITO estimates this work to cost $2,000,000. Additionally, ITO will be required to replace relays at the remote terminal ends of the new substation. The cost for this work is estimated to be approximately $1,750,000. Also new revenue metering will be required and will cost approximately $250,000.

ITO estimate for the 230-kV extensions from existing lines to the new substation is approximately $1,500,000. This estimate includes cutting 23084 and 23086 lines, installation of two heavy duty 90 degree double circuit poles and bringing the lines to the A-frame structures in the new 230-kV substation. This work will be coordinated with IC substation construction and availability for outages for 23084 and 23086. The duration of this work is expected to be twelve to twenty-four months, depending on outage availability.

The overall ITO work in support of the new interconnection substation will cost approximately $5,500,000. ITO work will be done concurrently with IC 230-kV substation work.



Non-Direct Connection Requirements

The number in the left column coincides with the network impact number from the Network Impacts section of this document. The "Rate" column represents the existing rating value for the impacted line. The "Rate Type" column indicates whether it is a normal or emergency rating. The column labeled "Cont" identifies the contingency type: -: non-contingency, S: single-contingency, and T: tower-contingency. The MW column shows the energy contribution from the queue project. The TO column identifies the affected Interconnected Transmission Owner. The Upgrade column identifies the recommend mitigation upgrade, estimated cost and construction schedule.[1]

#	Voltage	Source	Sink	Start	End	Rate	Rate Type	Cont	MW	TO	Upgrade
1	230k	TALB066	OAKGV230	81.69%	117.31%	559	N	-	199.1	PEPCO	The cost to upgrade Oak Grove- Talbert is approximately $24.0 M (10 miles). Use ACCR all four circuits.
2	230k	OAKGV230	BOWIE045	89.25%	104.78%	608	N	-	94.4	PEPCO	The estimated cost to upgrade the Oak Grove - Bowie 230 kV circuit (23045) is $14.4 M. This cost represents the addition of ACCR to circuit 23045 from Oak Grove to Bowie (approximately 12 miles). Must complete both circuits with ACCR.
3	230k	BOWIE045	BURT2314	89.00%	104.54%	608	N	-	94.4	PEPCO	The estimated cost to upgrade the Bowie - Burtonsville 230 kV circuit (23045) is $9.6 M. This cost represents the addition of ACCR conductor to circuit 23045 from Bowie to Burtonsville (approximately 8 miles). Must complete both circuits on a tower line.
4	230k	OAKGV230	BOWIE042	88.78%	104.31%	608	N	-	94.4	PEPCO	The estimated cost to upgrade the Oak Grove - Bowie 230 kV circuit (23042) is $14.4 M. This cost represents the addition of ACCR conductor to circuit 23042 from Oak Grove to Bowie (approximately 12 miles). Must complete both circuits on a tower line.
5	230k	BOWIE042	BURT2334	88.25%	103.78%	608	N	-	94.4	PEPCO	The estimated cost to upgrade the Bowie - Burtonsville 230 kV circuit (23042) is $9.6 M. This cost represents the addition of ACCR conductor to circuit 23042 from Bowie to Burtonsville (approximately 8 miles). Must complete both circuits on a tower line from Bowie to Burtonsville (approximately 8 miles).
6	230k	SANDY14T	H.RDGE16	95.06%	102.16%	941	E	S	51.7	BGE	High Ridge to Sandy Spring 230 kV double circuit 2314/2334
7	230k	SANDY34T	H.RDGE16	94.67%	101.79%	941	E	S	51.8	BGE	Existing circuits using 1590 ACSR @ 160 degC
8	230k	TALB066	OAKGV230	100.36%	147.25%	680	E	T	318.9	PEPCO	Same as 1 above.
9	230k	OAKGV230	BOWIE045	101.52%	118.86%	730	E	T	126.6	PEPCO	Same as 2 above.
10	230k	BOWIE045	BURT2314	101.32%	118.66%	730	E	T	126.6	PEPCO	Same as 3 above.
11	230k	OAKGV230	BOWIE042	100.63%	117.81%	730	E	T	125.5	PEPCO	Same as 4 above.
12	230k	BOWIE042	BURT2334	100.19%	117.38%	730	E	T	125.5	PEPCO	Same as 5 above.
13	230k	H.RDGE16	HOWARD32	113.93%	115.26%	728	E	T	9.7	BGE	High Ridge – Howard 230 kV Upgrade: The existing circuit 2332-A has 1590 Kcmil conductor which will need to be replaced. The estimated cost to rebuild the structures to accommodate new 2167 Kcmil ACSR conductor is $16,000,000 and it will take approximately 60 months. Assumptions: • Length of line 8.0 miles • 2+ year CPCN process at a cost of $500,000 • Existing tower removal at a cost of $1M included.

[1] Line upgrades may require additional terminal equipment and breakers to be replaced or upgraded to match the revised ampere rating.