#M01 Morgantown – Oak Grove 230 kV

Transmission Interconnection

This analysis was completed to assess the reliability impact for a new generator interconnecting to the PJM system as a Capacity resource.

Network Impacts

The system, as planned, was evaluated for compliance with reliability criteria. **The Queue M01 project was studied as a 1800 MW Capacity Resource connected to the four Morgantown – Oak Grove 230kV lines** during summer peak 2008**.** The results are summarized below.

Generator Deliverability and MAAC Criteria IIA

1. The Oak Grove – Bowie – Burtonsville 230kV circuit # 23045 is normally loaded at **113%** of the normal rating (608 MVA). The Oak Grove – Bowie – Burtonsville 230kV circuit # 23045 is also contingency overloaded at **115%** of the emergency rating (730 MVA) for the outage of the Bowie – Burtonsville 230kV circuit # 23042. The M01 project contributes approximately 267 MW to the normal facility loading and 333MW to the contingency facility loading.

2. The Oak Grove – Bowie – Burtonsville 230kV circuit # 23042 is normally loaded at **105%** of the normal rating (608 MVA). The Oak Grove – Bowie – Burtonsville 230kV circuit # 23045 is also contingency overloaded at **110%** of the emergency rating (730 MVA) for the outage of the Bowie – Burtonsville 230kV circuit # 23045. The M01 project contributes approximately 269 MW to the normal facility loading and 334MW to the contingency facility loading.

3. The Talbert Tap – M01 230kV circuit 23085 is contingency overloaded at **113%** of the emergency rating (692 MVA) for the outage of the Oak Grove – Talbert Tap – Burches Hill 230kV circuit # 23068/23081. The M01 project contributes approximately 477MW to the facility loading.

4. The Talbert Tap – M01 230kV circuit 23086 is contingency overloaded at **113%** of the emergency rating (692 MVA) for the outage of the Oak Grove – Talbert Tap – Burches Hill 230kV circuit # 23067/23082. The M01 project contributes approximately 477MW to the facility loading.

5. The Oak Grove – Talbert Tap – M01 230kV circuit 23066/23084 is normally loaded at **101%** of the normal rating (559 MVA). The Oak Grove – Talbert Tap – M01 230kV circuit 23066/23084 is also contingency overloaded at **107%** of the emergency rating (680 MVA) for the outage of the Oak Grove – Talbert Tap – M01 230kV circuit # 23069/23087. The M01 project contributes approximately 301 MW to the normal loading facility and 388 MW to the contingency facility loading.

6. The Oak Grove – Talbert Tap – M01 230kV circuit 23069/23087 is normally loaded at **101%** of the normal rating (559 MVA). The Oak Grove – Talbert Tap – M01 230kV circuit 23069/23087 is also contingency overloaded at **107%** of the emergency rating (680 MVA) for the outage of the Oak Grove – Talbert Tap – M01 230kV circuit # 23066/23084. The M01 project contributes approximately 301 MW to the normal loading facility and 388 MW to the contingency facility loading.

Multiple Facility Contingency – Tower Line Outages (MAAC Criteria IIC)

7. The Talbert Tap – M01 230kV circuit 23085 is contingency overloaded at **139%** of the emergency rating (692 MVA) for the Oak Grove –Talbert Tap – M01 circuit # 23068/23086 and Oak Grove – Talbert Tap – M01 circuit # 23066/23084 tower line outage. The M01 Project contributes approximately 511 MW to the facility loading.

8. The Talbert Tap – M01 230kV circuit 23086 is contingency overloaded at **144%** of the emergency rating (692 MVA) for the Oak Grove –Talbert Tap – M01 circuit # 23069/23087 and Oak Grove – Talbert Tap – M01 circuit # 23067/23085 tower line outage. The M01 Project contributes approximately 596 MW to the facility loading.

9. The Oak Grove – Talbert Tap – M01 230kV circuit 23066/23084 is contingency overloaded at **144%** of the emergency rating (680 MVA) for the Oak Grove –Talbert Tap – M01 circuit # 23069/23087 and Oak Grove – Talbert Tap – M01 circuit # 23067/23085 tower line outage. The M01 Project contributes approximately 596 MW to the facility loading.

10. The Oak Grove – Talbert Tap – M01 230kV circuit 23069/23087 is contingency overloaded at **109%** of the emergency rating (680MVA) for the Oak Grove –Talbert Tap – M01 circuit # 23068/23086 and Oak Grove – Talbert Tap – M01 circuit # 23066/23084 tower line outage. The M01 Project contributes approximately 419 MW to the facility loading.

11. The Oak Grove – Bowie – Burtonsville 230kV circuit # 23045 is contingency overloaded at **117%** of the emergency rating (730 MVA) for the Oak Grove – Bowie – Burtonsville 230kV circuit # 23042 and the Chalk Point – Bowie 230kV circuit # 23054/23063 tower line outage. The M01 project contributes approximately 354 MW to the facility loading.

12. The Oak Grove – Bowie – Burtonsville 230kV circuit # 23042 is contingency overloaded at **112%** of the emergency rating (730 MVA) for the Oak Grove – Bowie – Burtonsville 230kV circuit # 23045 and the Chalk Point – Bowie 230kV circuit # 23065 tower line outage. The M01 project contributes approximately 356 MW to the facility loading.

Stability Analysis

Will be performed during the project Impact Study.

Short Circuit Analysis

The short circuit analysis results indicate that the following 230 kV circuit breakers are over dutied by the Kelson Ridge project and will need to be replaced:

- Chalk Point 230 kV Substation---twenty three 230 kV circuit breakers
- Morgantown 230 kV Substation--- sixteen 230 kV circuit breakers
- Oak Grove 230 kV substation --- fifteen 230 kV breakers

Of the above 54 breakers, 23 breakers are required to be upgraded to 80 kA rating and 31 are required to be upgraded to 63 kA rating. The following provides cost breakdown by each substation. The breakdown of the above breakers by substation is as follows:

- Twenty three 80 kA breakers at Chalk Point 230 kV substation-- $29.5M
- Sixteen 63 kA breakers at Morgantown 230 kV substation--- $14.5M
- Fifteen 63 kA breakers at Oak Grove 230 kV substation--- $13.5M

$57.5M

The **construction time for installation is approximately four to five years** due to the large number of breakers that need to be replaced and the time limits on the outages that can be taken to perform the construction work. Also, it should be noted that the above costs do not include CIAC tax gross-up cost which may be applicable.

Meter Requirement

This site will require a PJM compatible meter (one per interconnection point). A high-end advanced communication electronic meter with DNP 3.0 protocol is required. The meters must be electronically connected (totalized) to calculated net generation output and programmed to meet PJM specifications. All meters will be electronically connected through a Master meter that will directly connect to PJM using a dedicated PJM data line to the PJM E-meter system. The PJM meters will include a standard voice grade phone modem to allow Pepco access to the meter remotely to extract pertinent metering data over a customer provided conventional voice grade phone line.

The customer will be required to purchase and install the above equipment. An Optical Metering Unit and a PJM compatible meter is required for each interconnection point with Pepco. According to the initial documentation this will require a minimum of four units and up to eight depending on the number of interconnections points. The customer will be required to work with PJM to properly model their generation and to meet current PJM requirements for the metering. The customer will be required to build the required infrastructure to mount all the meters, optical sensors and other associated metering hardware devices. Pepco recommends that all PJM meters and the associated (Optical Metering Unit) electronic modules are located at a single central location. Fiber optic breakout cables will connect the (Optical Metering Unit) remote sensors to the (Optical Metering Unit) electronic modules. This will facilitate the interconnection of the meters to properly totalize net generation. The customer will be required to place the Optical Metering Unit sensors (on each interconnection point) to eliminate or minimize the measurement of station service load. The customer will be required to allow Pepco monitor and/or access to there load data information through direct communication to the PJM meters and/or through the PJM E-meter site. Pepco Meter Services will provide technical details or assistance as required.

New System Reinforcement Requirements

Network Impacts identified as numbers 1 through 12 above will require conductor bundling for the following 230 kV circuits:

(2, 12) Burtonsville-Oak Grove 230 kV circuit (23042)…… approximately 20 miles
(1, 11) Burtonsville-Oak Grove 230 kV circuit (23045)…… approximately 20 miles
(5, 9) Oak Grove – Talbert 230 kV circuit (23066) …… approximately 10 miles
(6, 10) Oak Grove – Talbert 230 kV circuit (23069) ……. approximately 10 miles
(3, 7) Talbert- Queue M01 230 kV circuit (23085/2387)… approximately 10 miles
(4, 8) Talbert- Queue M01 230 kV circuit (23086/23084)… approximately 10 miles

In order to bundle the above circuits, the existing lattice tower line structures are required to be replaced with new steel poles, foundations and new conductors. Appropriate engineering design work will need to be performed as well as the regulatory work related to obtain the necessary CPNC. The following provides the cost estimates for bundling the four circuits identified above. The cost estimates include material cost (steel poles, conductor, shield wire, insulators/hardware/grounding), construction costs (foundation, erecting poles, installation of conductors, shield wire, insulators, grounding, guard structures, removal of lattice towers and foundations, roads, wetland control etc) and engineering cost and CPCN development.h

(2, 12)	Burtonsville-Oak Grove 230 kV circuit (23042):	$24.3 million
(1, 11)	Burtonsville-Oak Grove 230 kV circuit (23045):	$24.3 million
(5, 9)	Oak Grove – Talbert 230 kV circuit (23066):	$12.6 million
(6, 10)	Oak Grove – Talbert 230 kV circuit (23069):	$12.6 million
(3, 7)	Talbert- Queue M01 230 kV circuit (23085/23087):	$13.6 million
(4, 8)	Talbert- Queue M01 230 kV circuit (23086/23084):	$13.6 million
		$101.0million

The **estimated construction time is approximately four years**. This schedule assumes that all the necessary engineering work and issuance of the CPNC can be completed within the first year. The scheduling of outages will be very critical in completing the work in four years. Also, it should be noted that the above costs do not reflect CIAC tax gross-up, if applicable.

Contribution to Previously Identified System Reinforcements

Queue M01 contributes to the need to replace and upgrade breakers at Dickerson Stations H and D. There may be a cost allocation associated with the Dickerson breakers.