#N28 Cambria Slope

Generation 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 #N28 project was studied as an addition of 40 MW capacity increase to the existing generation facility (M22) at Cambria Slope 115 kV. Project # N28 was evaluated for compliance with reliability criteria for summer peak conditions in 2008. Potential network impacts were as follows:

Generator Deliverability

1. The Summit-Wilmore Junction 115 kV circuit is overloaded to 103% of its emergency rating (263 MVA) for the outage of the Johnstown-N39 115 kV circuit. The #N28 contributes approximately 12 MW to the contingency overloaded facility.

2. The Cambria Slope-Wilmore Junction 115 kV circuit is overloaded to 106% of its normal rating (210) MVA. The #N28 contributes approximately 23 MW to the normally overloaded facility.

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

No problems were identified

Single Contingency

- Outage of the Jackson Road-Cambria Slope-Summit 115kV circuit causes the following overloads on the Penelec 46kV system.

▪ CAMB S -BETH 33	46kV ck 1	156% of its 63MVA rating.
▪ BETH 33 -LORETTO	46kV ck 1	164% of its 24MVA rating.
▪ LORETTO -SANK BYP	46kV ck 1	157% of its 24MVA rating.
▪ SUMMIT2 -SANK BYP	46kV ck 1	157% of its 24MVA rating.
▪ SUMMIT -LILLY	46kV ck 1	132% of its 24MVA rating.

  The percent loading is based on the most limiting conductor size within the line section described, and some of the sections contain multiple conductor types.

  Outage of the Altoona-Johnstown and Altoona Transformer #1 and outage of the Summit 115/46kV transformer also cause overloads to some of the facilities listed above, however, they are less severe than those described.

- Outage of the Jackson Road-Cambria Slope-Summit 115kV circuit causes an overload of the Cambria Slope 115/46kV transformer.

Short Circuit

The short circuit evaluation will be completed in the Impact Study

New System Reinforcements

Line Section	Mileage	Conductor Type	Upgrade Responsibility
SUMMIT – WILMORE JCT 115 KV	6.8	795 ACSR	Sun Coke
CAMBRIA – WILMORE JCT 115 KV	3.0	795 ACSR	Sun Coke

Total Miles 115 KV	9.8
FE Miles 115 kV	0.0
Sun Coke Miles 115 kV	9.8

The conceptual estimate for the needed 115 kV line reinforcements is **$2,475,000**, based upon a generic estimate of approximately $275k per mile. See Figure #2 for the 46 kV and 115 kV lines in the area of the project.

Contribution to Previously Identified System Reinforcements

- In some cases for the overloads on the 46kV system described above, FirstEnergy will be required to provide for an upgrade to the section prior to the proposed project for the same contingency considered. Below is a breakdown of the conductor types and circuit-miles for each of the above mentioned 46kV line sections, with an indication of upgrade responsibility.

Line Section	Mileage	Conductor Type	Upgrade Responsibility
CAMB S -BETH 33 46kV ck 1	0.3	636 ACSR	Sun Coke
BETH 33 -LORETTO 46kV ck 1	1.8	336 ACSR	Sun Coke
	3.7	1/0 CU	FE
LORETTO -SANK BYP 46kV ck 1	4.2	1/0 CU	FE
SUMMIT2 -SANK BYP 46kV ck 1	1.1	1/0 CU	FE
	0.5	636 ACSR	Sun Coke
SUMMIT -LILLY 46kV ck 1	3.2	1/0 CU	Sun Coke
	0.3	397.5 ACSR	Sun Coke

Total Miles	**15.1**
FE Miles	8.9
Sun Coke Miles	6.2

It is noted that line loadability calculations of FirstEnergy's 46kV transmission lines is currently being reviewed. It is possible that some of the above noted Sun Coke upgrade responsibilities may not be required following the completion of FirstEnergy's review. However, at this time a conservative estimate is that approximately 6.2 miles of the 46kV system will require an upgrade at the developer's expense. The conceptual estimate for the needed 46kV line reinforcements is **$600,000,** based on a generic estimate of approximately $100k per mile.

During the Impact Study phase precise upgrade requirements with refined cost estimates will be provided. Additionally, the 46kV reinforcement costs will be compared to the optional cost of establishing a new 115kV circuit exit at Cambria Slope, removing the three-terminal line. The final configuration of this option would form two independent 115kV circuits; a Jackson Road – Cambria Slope 115kV line and a Cambria Slope – Summit 115kV line.

- The solution for the overload of the Cambria Slope transformer is an existing FirstEnergy system Operating Procedure, Memo 7, which calls for reduced generation output from the existing Cambria NUG facility and the Ebensburg NUG under the described system condition. **To the extent that the proposed operation would be tolerant of a reduced generation dispatch under emergency conditions the transformer reinforcement would likely not be required.** It is assumed for this report that Memo 7 would be revised to include the additional generation output and that a Cambria Slope transformer reinforcement would not be required. FirstEnergy accepts the operating procedure as an acceptable mitigation tool for transformer loading due to the inherent time delay of thermal transformer heating, but does not view this procedure as acceptable for controlling line overloads.