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 -350 MW Injection into the Hosensack 500kV substation (D18)

Network Impacts

Potential network impacts for the injection of an additional 350 MW into the Steel City 500 kV substation were evaluated under summer peak conditions in 2005.

Normal System

- No identified problems.

Single Contingency (MAAC Criteria IIA)

- Outage of the Steel City- Hosensack 500kV circuit results in a 122% overload of the 500/230kV transformer #1 at Steel City, a 154% overload to the Steel City-Quarry 230kV circuit and a 122% overload on the Northwood-Glendon-Belfast 115kV circuit.

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

- The project contributes 45 MW to a previously identified overload of the MartinsCreek – Morris Park – Gilbert 230 kV circuit due to an outage of the Portland – Greystone Q 230 kV and Portland – Kittatiny 230 kV tower line.

Generator Deliverability

- The project contributes 40 MW to a previously identified overload on Portland – Kittatinny 230 kV for the outage of Portland – Greystone 230 kV.

- The project contributes 35 MW to a previously identified overload on Portland – Greystone 230 kV for the outage of Portland – Kittatinny 230 kV.

Short Circuit

- No identified problems

Stability

- Stability studies have not been run. A complete system stability analysis will be performed in the Impact Study stage.

System Reinforcements

- Overload of the 500/230kV transformer #1 at Steel City will be alleviated by the installation of a second 500/230kV transformer at Steel City. This will require the installation of four (4) 500kV circuit breakers at Steel City, two to terminate transformer #1 and two to terminate the new transformer. It will also require constructing the second 230kV bus at Steel City and adding two 230kV circuit breakers. See Figure #1. The estimated cost for the installation of this equipment is $13.5 million and the estimated time to completion is 24-30 months from the signing of an Interconnection Service Agreement.

- Overload of the Steel City-Quarry 230kV line will be alleviated by installing new conductors, approximately 2 miles, on the open side of the Steel City-Quarry 230kV tower line. The new line will be terminated at Steel City by adding a third 230kV circuit breaker. See Figure #1. The line will be terminated in a new bay position at Quarry substation, requiring the installation one 230kV circuit breaker and retermination of the 230/69kV transformer #4 at the substation. See Figure #2. The estimated cost for the new circuit is $2.9 million consisting of $1.4 million for the termination at Quarry substation, $0.5 million for installing the new conductor and $0.5 million for the installation of the one 230kV circuit breaker at Steel City substation. The estimated time for completion is 24-30 months from the signing of an Interconnection Service Agreement. This estimate assumes no involved archaeological or permitting cost, no litigation cost and no condemnation cost.

- Overload of the Northwood-Glendon-Belfast 115kV circuit will be alleviated by increasing the circuit rating by replacing the 4/0 copper bus and drop loop wire at Glendon, estimated cost $58,000, and replace the 500 kcmil copper bus and drop loop wire at Belfast substation, estimated cost $144,000. The estimates do not include gross-up for taxes of approximately 30%. The time for completion is 9 months.

- The Portland – Kittatinny 230 kV overloads will be eliminated by upgrading the circuit to a 160 °C emergency rating of 888 MVA. This will be accomplished by replacing a current transformer at Portland, replacing a disconnect switch at Kittatinny, and replacing Towers #11 and #12 to gain proper clearance. The cost is estimated at $780,000 and is expected to take 2 years to complete. (Note that the tower upgrades required for this project was determined based on a review of the original design specifications. There may be additional upgrades discovered in the Facilities study stage when a line survey is conducted).

- The Portland – Greystone 230 kV overload will be eliminated by upgrading the circuit to a 160 °C emergency rating of 888 MVA. This will be accomplished by replacing terminal equipment at Greystone at an estimated cost of $150,000. The replacement Towers #11 and #12 identified for the Portland – Kittatinny 230 kV upgrade are also required for the Portland – Greystone 230 kV upgrade. (Note that the tower upgrades required for this project was determined based on a review of the original design specifications. There may be additional upgrades discovered in the Facilities study stage when a line survey is conducted).

- To alleviate the Martins Creek – Morris Park – Gilbert 230 kV overloads listed above, the Martins Creek – Morris Park – Gilbert 230 kV path will be upgraded to include a second 1590 ACSR circuit on the existing structures for most of the path (the initial 0.37 mile section of the path will require new single circuit construction in parallel with the existing line). The Delaware River crossing, which consists of a 0.3 mile section built to 2-2493 ACAR construction, will not require upgrading.

  Specific upgrades include:

  - From Martins Creek 230 kV substation to the Delaware River crossing, install a second 0.37 mile section of single circuit 1590 ACSR parallel with the existing ssingle circuit Martins Creek – Morris Park 230 kV line. The estimated cost is $0.865 million

  - Upgrade the line termination by replacing equipment in Bay 0 with 3000 amp equipment at Martins Creek 230 substation. The estimated cost is $1.725 million

The above listed work will be done by PPL Utilities. The estimated cost is $2.6 million.

- String 1590 45/7 kcmil ACSR conductor at 125 degrees C on the vacant side of the Martins Creek-Morris Park Tap double circuit tower line from the Delaware River crossing to the Morris Park Tap (7.8 miles). The estimated cost is $1.451 million

- String 1590 45/7 kcmil ACSR conductor at 125 degrees C on the vacant side of the Morris Park Tap-Gilbert double circuit tower line from Morris Park Tap to the Route 78 crossing (3.0 miles) and from the other side of Route 78 to Gilbert substation (7.25 miles). The estimated cost is $1.945 million.

- String 2493 kcmil ACAR conductor at 100 degrees C on the vacant side of the Morris Park Tap-Gilbert double circuit tower line where it crosses Route 78 (.3 miles). The estimated cost is $0.166 million.

- Tie the ends of both circuits together to form a new single circuit. The work will include

    - Connecting each new single conductor on the double circuit tower line at the Delaware River to the existing single circuit, double conductored, 500kV tower.

    - Tying each of the single conductors on the double circuit tower line together at Morris Park Tap and connecting the resultant tap to the Morris Park 230kV bus.

    - Tying each of the single conductors on the double circuit tower line together at Gilbert substation and Connecting the resultant circuit to the Gilbert 230kV bus.

The estimated cost is $0.316 million

The above listed work will be done by GPU Energy. The estimated cost is $3.878 million.

The total cost to upgrade the Martins Creek-Morris Park-Gilbert line is $6.478 million. It is estimated it will take 24-36 months from initiation of design engineering to complete the upgrade.

Line lengths (ft)

Martins Creek – Morris Park
38966 + 2080 + 1603 (river crossing, 2-2493 ACAR 500 kV const) + 1793 (steel pole) + 199

Morris Park - G Gilbert
38274 + 1440 + 15669

Since this project causes the transformer overload at Steel City and the Steel City-Quarry 230kV line overload the project is responsible for 100% of the cost to alleviate the overloads. Since the project contributes to the remaining overloads the project will be allocated a portion of the costs to remediate the problems based upon the severity of the impact the project has on the facilities. The cost allocation will be completed in the Impact Study report

Figure #1

Proposed modifications to Steel City 500/230 kv Sub

For connection of D18 nug

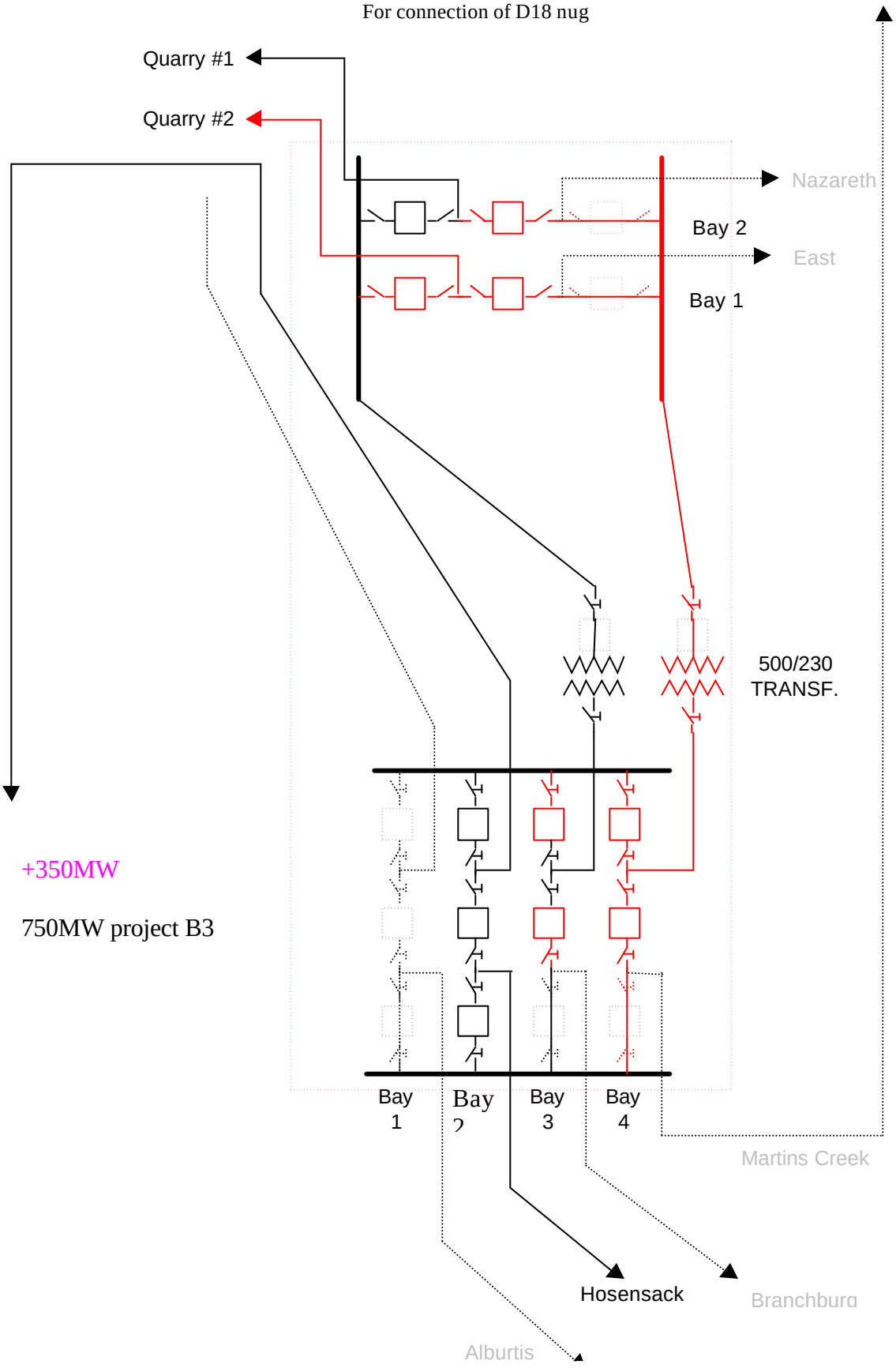

Figure #2