# *PJM Generator Interconnection Request*
# *Monterey 69 kV*
# *Feasibility Study Report*
# *Queue #J01*

**December, 2003**
**DMS # 237940**

## Preface

The intent of the Feasibility Study is to determine a plan, with "ball park" costs and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: **(1) Direct Connections**, which are new facilities and/or facility upgrades needed to connect the generator to the PJM network, and **(2) Network Upgrades**, which are facility additions or upgrades to existing facilities, which are needed to maintain the reliability of the PJM system.

In some instances, the interconnecting generator may not be responsible for 100% of the identified network upgrade cost because other transmission network uses (e.g. another generation interconnection) may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation will be deferred until the System Impact Study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required generation facilities. The project developer is responsible for the rights-of-way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

## General

The interconnection customer (IC) has proposed a 35 MW generating station to be installed in Highland County, Virginia and will interconnect with Allegheny Power at a new station on Allegheny Power's Durbin-Monterey 69 kV line. The generating facilities will consist of twenty-two, 1.65 MW wind turbines and will be located at a site called Red Oak Knob. The project is "energy-only." The proposed in-service date for the project is June 1, 2005.

## Direct Connection

The project will be connected to the Durbin-Monterey 69 kV at a point approximately 5.43 miles northwest of Allegheny Power's Monterey Substation. The direct connection costs are as follows:

The estimated total cost to prepare a suitable site, provided by the developer approximately 5.43 circuit miles northwest of Monterey Substation, and to complete all work required to install the facilities required for this interconnection is **$1,205,000 in 2005 dollars**. This estimate does not include any tax gross up. Completion of the work herein described will enable the developer to install and operate a new generating facility in Allegheny Power's Monterey Service Center.

The scope of work and estimated cost for individual project segments are as follows:

- The estimated cost to prepare the site and construct a 69kV switching station called Red Oak Knob is **$1,075,000 in 2005 dollars.**

  *(The new switching station will include three dead-end structures, six 69 kV air-break switches, three 69 kV circuit breakers, and facilities for 69 kV interconnection metering. The station would include a control building to house all protective relaying, metering and all communications equipment, including SCADA RTU facilities.)*

- The estimated cost to prepare the right of way and to construct new facilities required to loop the Durbin-Monterey 69 kV line into the proposed new switching station is **$120,000 in 2005 dollars**.

- While Allegheny Power can't mandate that their personnel install protective relaying and communications equipment at the generator site, Allegheny Power has responsibility for designing the protection scheme and providing specifications for all relays to be employed on the interconnection breaker terminal at the generation site to assure that the protective relaying equipment will be compatible with that installed on the interconnection breaker terminal at the new switching station. The relaying package will likely include both primary and backup protection. Allegheny Power is also responsible for testing and calibrating all relays and performing all tests to assure that relaying at the generator site is properly installed and functional. The estimated total cost of this engineering and field test effort is **$5,000 in 2005 dollars**.

  *Note: Purchase and installation of protective relaying and associated equipment at the generation site <u>is not included in this scope of work.</u> This phase of work is the responsibility of the developer.*

- The estimated cost for Controls Engineering to complete a coordination review of the area, develop new relay settings, and implement the required changes is approximately **$5,000 in 2005 dollars**.

The figures above do not include construction of the 69kV line required to interconnect the customer's proposed new generating facilities with the Allegheny Power system grid. Route selection, line design, right of way acquisition and construction of these lines will be entirely the responsibility of the interconnection customer.

The information provided in this report is reasonable for the scope of work defined; however, the developer must recognize that the cost figures are conceptual in nature at this stage, as an engineering team has not been assigned to the project. Obviously, any change to the scope of work will require that the estimates be revisited.

## Network Impacts

The # J01 project was studied with a total of 35 MW capacity injection into the Durbin-Monterey 69 kV line. Project # J01 was evaluated for compliance with reliability criteria for summer peak conditions in 2007. Potential network impacts were as follows:

### Normal System:
No identified problems.

### Single Contingency:
No identified problems.

### Multiple Facility Contingencies (i.e. Tower Line Outages);
No identified problems.

### Generator Deliverability:
No identified problems.

### Short Circuit Study:
No breaker replacements required for interconnection.

### New System reinforcements (upgrades):
No identified problems.

### Contribution to Previously Identified System Reinforcements;
None.

Cost allocation percentages are not provided as part of the Feasibility Study analysis, however, cost allocation will be provided during the Impact Study evaluations.

## Fault Information

No breaker replacements are required for this interconnection.

Listed below is the positive and zero sequence source equivalent impedance at the Red Oak Knob site with the GSU and generators OPEN.

Positive: (0.22654 + j0.60779)
Zero: (0.48282 + j1.49844)

Below are the Impedances used for the GSU and Generators.

*Transformers:*

69 – 34.5 kV grounded wye-delta (1)
Z = 10% on a 40 MVA base

34.5 kV – 600 volts grounded wye – grounded wye (18)
Z = 6% on a 2 MVA base

*Generator:*

X"d = 15% on 2 MVA base (18)