Baron Winds Project

Case No. 15-F-0122

1001.34 Exhibit 34

Electric Interconnection

EXHIBIT 34 ELECTRIC INTERCONNECTION

Interconnection of the Facility to the electric transmission system is achieved using multiple systems. The wind turbines themselves produce power at a low voltage, which will be stepped up to a medium voltage at the output of each turbine. A medium voltage collection system, comprised of underground and overhead wires, transmits the power to a collection substation. The substation steps the voltage up to a high voltage and a high voltage transmission line carries the power to an existing point of interconnection (POI) substation, New York State Electric and Gas Corporation's (NYSEG) Canandaigua station. The POI substation connects the Facility to the NYSEG transmission system.

(a) Design Voltage and Voltage of Initial Operation

A padmount transformer located near the base of each wind turbine tower, or internally within the tower, will raise the voltage of electricity produced by the turbine generator from 650 volts up to the 34.5 kilovolt (kV) voltage level of the collection system. The electrical collection system will total approximately 36 miles in length, and will be installed adjacent to Facility access roads and public roads to the extent practicable. Up to nine incoming circuits will converge at the collection substation, which is the terminus of the 34.5 kV collection system. The collection substation, to be located adjacent to the existing Canandaigua station in the Town of Cohocton, will increase the voltage of the collection system from 34.5 kV to 230 kV.

(b) Type, Size, Number, and Materials of Conductors

The collection system will be comprised of underground and overhead cable systems. The underground system (approximately 33 miles) will be comprised of numerous cable sections in parallel, connecting each of the wind turbines to the collection substation. Each section will be comprised of 3 type Underground Residential Distribution (URD) aluminum conductors, each surrounded by electrical insulation (typically tree-retardant crosslinked polyethylene, TRXLPE) and an overall jacket (typically, linear low-density polyethylene, LLDPE). The size of each conductor will depend on how many turbines are producing power into that conductor, but will typically range from 4/0 to 1500 kcmil AWG (American wire gauge).

The overhead system (approximately 3 miles) will be similar in concept to the underground section. Each section is comprised of three ACSR (aluminum conductor, steel reinforced) conductors. The size will range from 336.4 to 795 kcmil. It is anticipated the conductors will be made of specular material.

The collection substation will contain both flexible and rigid conductors. The system will be comprised of three conductors. The flexible conductors will be AAC (all aluminum conductors) ranging in size from 336.4 to 1590 kcmil. The rigid conductors will be tubular 6063-T6 aluminum alloy schedule 40 pipe ranging in size from 1.5 to 5 inches.

(c) Insulator Design

Typical utility-grade ceramic/porcelain or composite/polymer insulators, designed and constructed in accordance with ANSI C29, will be used. Insulators in the collection substation will generally be porcelain and insulators on the overhead collection system will be polymer. Insulators in the POI substation are anticipated to be porcelain.

(d) Length of the Transmission Line

The Facility is not proposing a transmission line. The collection substation and the existing POI substation are expected to be located fence-to-fence.

(e) Typical Dimensions and Construction Materials of the Towers

Although overhead collection design is currently preliminary, it is anticipated that the overhead collection line will be carried on treated wood pole structures that range in height from 50 to 60 feet above ground level, and will have an average span length of approximately 250 to 300 feet. Refer to drawings SK-001-01 through -03, SK-002-01 through -03, SK-005-01 through -03, SK-006-01 through -03 and SK-007-01 through -03 in Appendix H.

(f) Design Standards for Each Type of Tower and Tower Foundation

Overhead collection line structures will be designed in accordance with the following standards:

- National Electric Safety Code (NESC) standards for heavy loading and high wind
- American Society of Civil Engineers (ACSE) Manual 72, “Design of Steel Transmission Pole Structures,” and Standard 48, “Design of Steel Transmission Pole Structures”
- Rural Utilities Service Bulletin 1724E-200 “Design Manual for High Voltage Transmission Lines.”
- ANSI – American National Standards Institute
- ASTM – American Society for Testing and Materials
- OSHA – Occupational Safety and Health Administration
- IEEE – Institute of Electrical and Electronic Engineers
- NEC – National Electric Code

The foundation for each wooden pole is granular fill that is installed into the voids around the pole in the hole drilled for embedment. The fill is compacted in small lifts to ensure a solid, compacted base for each pole.

(g) Type of Cable System and Design Standards for Underground Construction

The underground cable systems described in section (b), along with the fiber optic communication cables that comprise a single circuit, will collect the electricity produced by the wind turbine generators. Direct burial methods through the use of a cable plow, rock saw, rock wheel trencher and/or similar equipment will be used during the installation of underground electrical collection system whenever possible. If a rock saw is used, water or other nonhazardous compounds will be used as a lubricant. Direct burial will involve the installation of bundled cable (electrical and fiber optic bundles) directly into a "rip" in the ground created by the plow, saw blade or rock wheel. The rip disturbs an area approximately 24 inches wide with bundled cable installed to a minimum depth of 36 inches in most areas, and 48 inches in active agriculture and pasture lands. Sidecast material will be replaced with a small excavator or small bulldozer. All areas will be returned to approximate pre-construction grades and restored.

Due to specific collection line routing constraints, alternative methods may be necessary for construction. Where direct rips/trenches are not allowed, installation of the underground cables will be accomplished using subsurface bores/horizontal directional drilling. This method involves having a surface-launched carrier pipe that is pushed/drilled into the ground to go underneath obstructions. It can be "steered" to guide the drill head down and then to arc back up the surface on the other side of the crossed facility. Small pits are required at either end of the bore to send and receive the drill head, as well as to hold drilling fluid. The cable is then pulled through the installed carrier pipe and transitioned back to direct burial using the "rip" method.

Design of the system will comply with:

- ANSI – American National Standards Institute
- ASTM – American Society for Testing and Materials
- OSHA – Occupational Safety and Health Administration
- IEEE – Institute of Electrical and Electronic Engineers
- NEC – National Electric Code

The underground collection lines can be spliced using cold shrink or heat shrink splicing kits. Each splice kit contains a bolted or compression conductor connector, insulation shield, ground strap and connectors, insulating tape, splice body, jacket material, etc. The ends of the cables to be spliced together are cut and prepared according to splice manufacturer instructions. This generally includes cutting the jacket, peeling back the neutral wires/tape and semi-con layer and smoothing the cable insulation. A connector is installed to join and secure the conductors. The splice point is covered with the insulating splice body and secured differently depending on the type of splice. A cold shrink splice will contract around the splice point when a core holding the splice open is removed/unwound, which allows the splice to contract to its natural position tightly around the splice. A heat shrink splice requires the use of a heat source (heat gun, torch, etc.) to shrink the material around the splice point. While no splices are planned for initial installation, if any circumstances arise that require the installation of one or more splices, they will be directly buried and will not require any additional splicing structures.

(h) Profile of Underground Lines

Refer to drawings SK-102-01 and SK-103-01 in Appendix H for depth of the underground collection cable and associated material. As stated above, the depth may increase in certain areas (agricultural/pasture lands). There is no additional insulation/cooling system required, such as pumped oil or water. There are no below-grade manholes required.

(i) Equipment to be Installed in Substations or Switching Stations

The collection substation will include 34.5 kV and 230 kV busses, one or more power transformers, circuit breakers, steel structures, a control building, metering units, and air break switches. The POI substation is existing and owned by NYSEG. Refer to drawing 100-01 for a plan/overview of the collection substation and SK-104-01 for a plan/overview of the additions to the POI substation in Appendix J.

(j) Any Terminal Facility

The only terminal facilities expected are the POI and collection substations and are described/shown above in Section (i).

(k) Need for Cathodic Protection Measures

There are no cathodic protection measures expected to be required for installation of the underground systems, as no metallic pipelines will be used. Therefore, cathodic protection measures are not discussed further in the Application.