High Bridge Wind Project

Case No. 18-F-0262

1001.34 Exhibit 34

Electric Interconnection

EXHIBIT 34 ELECTRIC INTERCONNECTION

Interconnection of the Facility to the electric transmission system will be achieved using multiple systems. The wind turbines produce power at a low voltage, which will be stepped up to a medium voltage (34.5 kilovolts [kV]) at the output of each turbine. A medium voltage collection system comprised of underground cables will transmit the power to a collection substation. The collection substation will step the voltage up to a high voltage (115 kV) and a high voltage transmission line slack span will carry the power approximately 200 feet to the adjacent point of interconnection (POI) substation. The POI substation will connect the Facility to the Jennison to East Norwich 115 kV transmission line owned by New York State Electric and Gas (NYSEG).

(a) Design Voltage and Voltage of Initial Operation

A pad mount 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 approximately 650 volts to 34.5 kV, the voltage level of the collection system. The electrical collection system will total approximately 33.4 miles in circuit length and will be installed adjacent to Facility access roads and public roads to the extent practicable. Up to four incoming circuits will converge at the collection substation, which is the terminus of the 34.5 kV collection system. The collection substation will increase the voltage of the collection system from 34.5 kV to 115 kV.

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

The collection system will be comprised of underground cable systems. The underground system (approximately 33.4 miles) will be comprised of numerous cable sections in parallel, connecting each of the wind turbines to the collection substation. Each section is anticipated to be comprised of three URD (underground residential distribution) aluminum conductors, each surrounded by electrical insulation (typically tree-retardant cross-linked polyethylene [TRXLPE]) and an overall jacket (typically linear low-density polyethylene [LLDPE]). The size of each conductor will depend on how many turbines are connected to the conductor but will typically range from 1/0 AWG to 1250 kcmil.

The collection substation is anticipated to contain three conductors that will be either flexible or rigid depending on location. Flexible conductors will be AAC (all aluminum conductors) ranging in size from 336.4 to 1590 kcmil. Rigid conductors will be tubular 6063-T6 aluminum alloy schedule 40 pipe ranging in size from 1.5 to 6 inches.

(c) Insulator Design

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

(d) Length of the Transmission Line

The overhead 115 kV transmission line slack span will run approximately 200 feet between the collection substation and the POI substation.

(e) Typical Dimensions and Construction Materials of the Towers

It is anticipated that all collection lines will be buried. However, in areas where burial could have unfavorable impacts (e.g., wetlands, steep slopes, etc.) or is impractical (e.g., shallow bedrock, unfavorable topography), the lines could be carried on overhead support structures. The precise dimensions and construction materials of these structures will be determined once the need for such structures has been identified.

The overhead 115 kV transmission line span between stations will utilize self-supporting steel dead end structures. It is anticipated that there will be two dead end structures total, one inside the collection substation and the other inside the POI station. There will be a single dead-end span between the two structures of approximately 200 feet connecting the stations. The proposed conductor to be used will be a 795 ACSR 26/7 Strand "Drake" conductor with an optical ground wire (OPGW) and steel shield wire as required.

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

Overhead collection line structures, if any, 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

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

From the transformer at each wind turbine, underground power cables and fiber optic communication cables, which comprise a single circuit, will collect the electricity produced by wind turbine generators. Direct burial methods, through use of a cable plow, rock saw, rock wheel trencher and/or similar equipment, will be used during the installation of underground electrical collection systems whenever possible. If a rock saw is used, water or other nonhazardous compounds would be used as a lubricant. Direct burial will involve the installation of bundled cable (electrical and fiber optic bundles) directly into the "rip" in the ground created by the plow, saw blade, or rock wheel. The rip will disturb an area approximately 24 inches wide. The bundled cable will be installed to a minimum depth of 42 inches in most areas, and 48 inches in active agriculture and pasture lands. Side cast material will be replaced with a small excavator or bulldozer. All direct burial areas will be returned to approximate pre-construction grades and restored with a native seed mix, or appropriate crop/pastureland species in active agricultural land, per the Project Stormwater Pollution Prevention Plan (SWPPP) (see Appendix 21-D).

Trenchless technologies, as described below, may be utilized to install underground collection lines in or near sensitive areas (i.e., wetlands, streams, etc.) or as needed (i.e., to cross roadways, etc.).

<u>Jack and Bore</u>

The jack and bore installation method involves digging a bore pit and receiving pit on each side of the obstacle. The underground crossing is installed by setting up a drilling or auguring machine in the bore pit. The bore or augured path is typically installed horizontally but an angle, upward or downward is allowable. The Contractor will augur the hole for a distance roughly equal to the length of one section of conduit. The augur is then removed from the hole and a length of conduit is jacked through the hole. This process of auguring then jacking length of conduit through the hole is repeated until the conduit protrudes into the receiving pit. Afterwards the auguring equipment is recovered, and the open trench can be joined to the crossing. The auguring bit is cooled by drilling fluid which is typically a bentonite clay solution. The spoils are collected by pumping the drilling fluid and spoils into a tanker truck and transporting them to an authorized disposal facility or area.

<u>Horizontal Directional Drilling (HDD)</u>

HDD 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 to 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 direct burial using the “rip” method can resume. Additional information regarding HDD is provided in Exhibit 21, and in the Draft Inadvertent Return Plan (Appendix 21-B).

Design of the cable 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 will 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 HBW-E-520-01, HBW-E-520-02, and HBW-E-520-03 in Appendix 05-B for depth of the underground collection cables (minimum 36 inches), typical spacing of parallel circuits and associated material. As stated above, the depth will increase to at least 48 inches in agricultural lands. There are no insulation/cooling systems or below-grade manholes required. Each parallel trench will be spaced 15 feet apart. The layout consists of one, two, three, and four trenches in parallel which can be seen in drawing HBW-E-500-01.

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

The collection substation will include four 34.5 kV underground feeder risers and three cable risers for two reactor banks and battery energy storage system (BESS) all connected into a common 34.5 kV collector bus, cable and rigid tubular bus, two 34.5-115 kV main power transformers, 115 kV and 34.5 kV circuit breakers, air break switches, instrument transformers, 34.5-120/240V station service transformer, surge arresters, relaying and check metering units, lightning masts, ground grid, lighting poles, steel support structures and a control building. The collector substation will connect to the POI substation via 115 kV overhead slack span utilizing horizontal dead-end terminations. The POI substation will include a new 115 kV 3 breaker ring bus switchyard consisting of cable and rigid tubular bus, circuit breakers, air break switches, instrument transformers, station service voltage transformer, surge arresters, relaying and metering units, lightning masts, ground grid, lighting poles, steel support structures and a control building. Refer to drawing HBW-E-110-01 for the general arrangement plan of the proposed collection substation and HBW-E-111-01 for the general arrangement plan of the proposed POI substation in Appendix 05-B.

(j) Any Terminal Facility

The only terminal facilities expected are the POI substation and the collection substation, which are described/shown in Exhibit 34(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 are anticipated to be used. Therefore, cathodic protection measures will not be discussed further in this Exhibit.