HIGH RIVER ENERGY CENTER

Case No. 17-F-0597

1001.34 Exhibit 34

Electric Interconnection

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Exhibit 34: Electric Interconnection

This Exhibit will track the requirements of proposed Stipulation 34, dated August 26, 2019, and therefore, the requirements of 16 NYCRR § 1001.34. The solar power generated by the Project will be connected into the existing transmission grid from low voltage to high voltage using a collection cable system and rigid bus interconnected to the proposed Point of Interconnection (POI) switchyard, to be transferred to National Grid to own and operate. The solar panels will generate power at a low voltage, which will be converted from direct current (DC) to alternating current (AC) at the inverters. Medium voltage will be collected by a system comprised of underground cables, which will transmit power to the proposed, on-site collection substation. The collection substation will transform the power up to 115 kilovolts (kV) and will deliver the power to the POI switchyard. The Project will interconnect to the New York electric transmission system by connecting to National Grid's existing Stoner-Rotterdam #12 115 kV transmission line via a proposed 500-foot 115 kV line as described below, to be located within the Project Area.

34(a) Voltage

The collection lines will have a nominal voltage of 34.5 kV from line to line, with a maximum design level voltage of 35 kV. The 34.5 kV collection lines within the Project Area will gather power from the inverters and transport it underground to the collection substation. The collection substation transformer will step up the voltage to 115 kV and then transport power to an immediately adjacent POI switchyard that will then interconnect to the existing National Grid Stoner-Rotterdam #12 115 kV transmission line.

34(b) Conductors

The conductors associated with the transmission line are 336.4 aluminum conductor steel reinforced 18/1 "Merlin." The Project will use 12 – 1,000 kilo-circular mil (KCM) 35 kV all aluminum conductors (AAC) (2 per phase) for each of the two collector lines.

The conductors originating within the collection substation fence consist of bus conductors for the overhead 115 kV line interconnecting the POI switchyard with the Stoner-Rotterdam #12 line. The conductors will be 3 ½ inch SPS Aluminum Tube. Transformer conductor leads will be 2-1272 KCM AAC on low voltage site and 1-1272KCM AAC on the high voltage side.

The conductors for the 34.5 kV underground collector cable terminators and surge arresters will be 1272KCM AAC and 336KCM AAC, respectively.

34(c) Insulator Design

The insulators for the rigid bus system and disconnect switches will be porcelain station post, standard creep, and will be American National Standards Institute (ANSI) 70 gray. The load of the insulator shall not exceed the respective insulator strength published in ANSI C29.9, Tables 1 and 2.

34(d) Length of Transmission Line

The transmission line for the Project consists of approximately 500 feet of double circuit overhead 115 kV, parallel transmission line between the POI switchyard and the existing Stoner-Rotterdam #12 line.

34(e) Tower Dimensions & Construction Materials

The Project proposes the use of steel pole towers. The steel structures will be approximately 75 feet above ground utilizing a three-phase configuration (see Appendix 11-1, Preliminary Design Drawings).

34(f) Tower Design Standards

The design standards for proposed towers and tower foundations are provided in Table 34-1, below.

Table 34-1. Tower Design Standards

Standard	Name
ACI 318	Building Code Requirements for Reinforced Concrete
ANSI/AWS D1.1	Structural Welding Code
ASCE 48	Design of Steel Transmission Pole Structures
ASTM A123	Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143	Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes

Table 34-1. Tower Design Standards

Standard	Name
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A354	Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
ASTM A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A384	Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
ASTM A435	Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates
ASTM A490	Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A572	Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A588	Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A673	Standard Specification for Sampling Procedure for Impact Testing of Structural Steel
ASTM A767	Standard Specification for Zinc Coated Steel Bars for Concrete Reinforcement
ASTM A871	Standard Specification for High-Strength Low-Alloy Structural Steel Plate with Atmospheric Corrosion Resistance
SSPC-SP 6	Commercial Blast Cleaning
ACI 117	Specification for Tolerances for Concrete Construction and Materials (AC/ 117-10) and Commentary
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 301	Specifications for Structural Concrete

Table 34-1. Tower Design Standards

Standard	Name
ACI 305.1	Specification for Hot Weather Concreting
ACI 306.1	Standard Specifications for Cold Weather Concreting
ACI 336.1	Specification for the Construction of Drilled Piers
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C403	Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C617	Standard Practice for Capping Cylindrical Concrete Specimens
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881	Standard Specification/or Epoxy-Resin-Base Bonding Systems/or Concrete
ASTM C1059	Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete

Table 34-1. Tower Design Standards

Standard	Name
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1107	Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1S67	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
API RP 13B-1	Recommended Practice for Field Testing Water-Based Drilling Fluids
ACI: American Concrete Institute ASCE: American Society of Civil Engineers ANSI: American National Standards Institute AWS: American Welding Society ASTM: American Society for Testing and Materials SSPC: Society for Protective Coatings API: American Petroleum Institute	

34(g) Underground Cable System & Design Standards

Power produced by the solar array will be collected by the underground collector systems described in Sections 34(a) and 34(b). Collection cables will be designed in accordance with the following standards:

- Insulated Cable Engineers Association (ICEA) S-93-639
- Association of Edison Illuminating Companies (AEIC) CS8

34(h) Underground Lines Profile & Oil Pumping Stations/Manhole Locations

The underground collection lines and associated material are portrayed in Appendix 11-1. The cable will be buried at varying depths, depending on the location and environmental conditions, but generally no less than 36 inches outside of agricultural lands and 48 inches within agricultural lands.

Oil pumping stations and manhole locations are not utilized as part of the 34.5 kV collection system. This is typical of pipe-type cable installation.

34(i) Equipment to be Installed

The collector substation will include 34.5 kV and 115 kV busses, power transformers, circuit breakers, coupling capacitor voltage transformer, instrument transformer and revenue metering, air-break disconnect switches, ground switch, steel structures, and a control room (a non-habitable equipment structure). These components are necessary for delivery of energy produced by the Project to the existing electrical power grid.

All required equipment and structures will be designed in accordance with the requirements of National Grid, the transmission operator and owner of the existing Stoner-Rotterdam #12 line and the Rotterdam substation.

34(j) Any Terminal Facility

The terminal facilities for the Project consist of the collection substation and POI switchyard, both as described above.

34(k) Cathodic Protection Measures

Cathodic protection measures are not expected to be required on the underground portion (collection system) or for the steel poles (overhead 115 kV interconnection) for the Project.

34(l) Collection Lines

The collection system for the Project will be installed underground primarily by open trenching. Horizontal directional drilling (HDD) will be utilized in select locations to avoid impacts to existing roadways and environmentally sensitive areas as necessary. The location and extent of HDD activities for the Project are further described in Exhibit 21.

Overhead collection lines are not proposed for the Project. As noted above, overhead lines are proposed for the transmission line, connecting the collection substation to the POI switchyard and then the existing National Grid line for a span of approximately 500 feet. The overhead lines have been sited adjacent to a proposed array in an area that will not be utilized for agricultural purposes during operation of the Project. The transmission poles structures will be located between the POI switchyard and the Stoner-Rotterdam #12 transmission line and will not interfere with any agricultural practices.

34(m) Visual Impacts

Overhead transmission pole structures proposed have been incorporated in the Visual Impact Assessment, as discussed in Exhibit 24.