Hoffman Falls Wind Project

Case No. 23-00038

900-2.6 Exhibit 5

Design Drawings

Revision 1

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LIST OF APPENDICES

EXHIBIT 5 DESIGN DRAWINGS

(a) Design Drawings

The Civil, Electrical, and Substation Design Drawings (Appendices 5-A, 5-B, and 5-C) were prepared by Westwood Surveying & Engineering and RAE LLC, WBE. These drawings are labeled "not for construction" and were prepared at direction of professional engineers, licensed and registered in New York State whose names are clearly printed on the drawings. More information is provided in Exhibit 5(f).

(b) Setback Requirements for Wind Turbines Towers

The Facility layout (Figure 2-2) has been designed to meet or exceed the setback requirements outlined in §900-2.6(b). Manufacturer setbacks for the GE wind turbine model under consideration are equal to or less stringent than the setbacks required by §900-2.6(b) (see Appendix 5-D). The manufacturers for other turbine models under consideration for the Facility (Vestas and Nordex) do not have minimum setback recommendations. Setback distances prescribed by §900-2.6(b) based on the tallest turbine model under consideration for the Facility are detailed in Table 5-1.

Table 5-1 Required Setback Distances for Wind Turbine Towers

Structure Type	Required Standard	Setback Distance[1]
Substation	1.5 x the maximum blade tip height	293.8 meters (964 feet)
Above-ground bulk electric system (operated at 100 kV or higher)	1.5 x the maximum blade tip height	293.8 meters (964 feet)
Gas wells (unless waived by landowner and gas well operator)	1.1 x the maximum blade tip height	215.5 meters (707 feet)
Public roads	1.1 x the maximum blade tip height	215.5 meters (707 feet)
Non-participating Property lines	1.1 x the maximum blade tip height	215.5 meters (707 feet)
Non-participating, non-residential structures	1.5 x the maximum blade tip height	293.8 meters (964 feet)
Non-participating residences	2 x the maximum blade tip height	392.0 meters (1,286 feet)

[1] Calculated based on the height of the tallest turbine model listed below in Table 5-3.

A receptor dataset was developed by Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) and then provided to the Applicant for the purposes of studying the potential impacts of noise and shadow flicker from the Facility (see Exhibits 7 and 8, respectively). Specifically, this sensitive receptor survey identified and classified structures or places that

may meet the sensitive receptor definition outlined in 19 NYCRR § 900-2.8(h)(1) that are located within a 2-mile radius of any proposed wind turbine or substation (the Receptor Study Area). EDR used several publicly available databases to identify and classify potential receptors within the Receptor Study Area. The initial desktop survey conducted in March 2023 consisted of the following:

1. EDR GIS analysts identified potential sensitive receptors within the Study Area utilizing publicly available data and recent aerial imagery.[2]
2. Cadastral data and NYS Property Classification Codes were spatially joined to each sensitive receptor and were utilized together with contextual information evident in the aerial imagery to support an initial classification. Each point was placed into one of the following categories.
    - **Year-round Residence** – A structure displaying an obvious capacity for occupation throughout the year (e.g., house, apartment building).
    - **Seasonal Residence** – Structures with strong evidence indicating only seasonal occupation (e.g., hunting cabins, seasonal homes [inferred based on evidence such as no public utility connections], campers or groups of campers with electric hook ups and/or structures built around them (i.e., decks, porches, or patios).
    - **Uninhabitable Residence** – A structure lacking basic functions of habitation (e.g., door or windows missing, burned down, collapsed or non-functional roof or walls, etc.).
    - **Institutional Structure** – A school, hospital, emergency response building (e.g., fire or ambulance station), municipal building, or other government building.
    - **Commercial Structure** – An office, warehouse, retail shop, restaurant, or building/structure associated with agricultural production operations.
    - **Public Structure** – A structure/space allocated for public use (e.g., place of worship, park, library, public [federal, state, and local] land, camps, or cemetery).
    - **Other Structure** – An obvious non-residential structure (e.g., non-commercial barn, garage, or shed).
    - **Unknown Structure** – A structure that could not be definitively classified during field review due to lack of access (e.g., private road, seasonal use road impassible during field review, etc.) or visibility during field review.

3. Receptor IDs were applied to each unique point; and a geo-referenced list of potential sensitive receptors was generated.

In April 2023, EDR staff conducted a field survey of the Receptor Study Area to confirm the status of potential sensitive receptors identified in the initial desktop survey and identify any new sensitive receptors (i.e., new construction, structures not visible from aerial imagery, etc.). The survey was performed using publicly accessible roadways and other publicly accessible vantage points to confirm the location and apparent primary use of each sensitive receptor.

Visual confirmation of most sensitive receptors was achieved during the field survey. However, due to limitations in the data and conditions on site, such as screening from trees and private roads preventing

[2] NYSDOP 2017 orthoimagery map service. Google Earth Pro 2020 map service.

access to specific sensitive receptors, the potential that some sensitive receptors were misclassified does exist. The locations of receptor structures were then used to determine setback boundaries for Section 94-c requirements. These setbacks are shown in the design drawings (Appendix 5-A).

In addition to the setbacks listed above, the Applicant reviewed setback standards established by the Towns in which wind turbines are proposed. The Towns of Eaton, Fenner, Nelson and Smithfield each have adopted setback requirements that differ from the setback requirements contained in the 94-c regulations. Below is a table of setbacks by Town compared to the setbacks required under 94-c.

Table 5-2. Local Law Setback Requirements

Structure Type	94-c	Eaton	Smithfield	Fenner	Nelson
Substation	1.5x Total Height	N/A	N/A	N/A	N/A
Above-Ground Transmission	1.5x Total Height	2.0x Total Height	2.0x Total Height	1.5x Total Height	1.5x Total Height
Public Roads	1.1x Total Height	2.0x Total Height	2.0x Total Height	1.5x Total Height	1.5x Total Height
Non-Participating Property Lines	1.1x Total Height	2.0x Total Height	2.0x Total Height	1.5x Total Height	1.5x Total Height
Non-Participating Non-Residential Structures	1.5x Total Height	N/A	N/A	N/A	N/A
Non- Participating Residences	2.0x Total Height	N/A	N/A	1.5x Total Height	1.5x Total Height
Meteorological Towers	N/A	N/A	N/A	1.5x Total Height	1.5x Total Height
Other Turbines	N/A	2.0x Total Height	2.0x Total Height	1.5x Total Height	1.5x Total Height

As discussed in Exhibit 24, the Applicant has designed the Facility to meet most of the setbacks required within the Towns of Eaton, Fenner, Nelson, and Smithfield. However, the Applicant is seeking a waiver of the local property line setback requirements within each of the four towns that the Project is sited within, as well as the 2.0 times setback from public roads established in the Towns of Eaton and Smithfield. See Exhibit 24 for additional information on the waiver request.

(c) Power, Hub, Height, Rotor Diameter, Total Height of Turbines

Due to market factors such as availability and cost, a specific turbine model has not yet been confirmed for the Facility. Turbine models that have been determined to be suitable for the Facility include those identified in Table 5-2; see also Appendix 5-E. The total height for these turbine models ranges from 599 to 643 feet. The Applicant may select a turbine model not presented in this Application provided that the total height, rotor diameter, and sound power level output of the selected turbine are not greater than those analyzed in this Application.

Table 5-2. Approximate Turbine Dimensions by Model

Turbine Model	Rated Power	Hub Height	Rotor Diameter	Total Height
General Electric GE158	6.1 MW	117 meters (384 feet)	158 meters (518 feet)	196 meters (643 feet)
Nordex N149	4.X MW	108 meters (354 feet)	149 meters (489 feet)	182.5 meters (599 feet)
Vestas V150	4.5 MW	120 meters (394 feet)	150 meters (492 feet)	195 meters (640 feet)

(d) Setback Requirements for Solar Facility Components

The proposed Facility is not a solar energy generating facility; therefore, the requirements of §900-2.6(d) are not applicable.

(e) Maximum Height of Solar Facility Components

The proposed Facility is not a solar energy generating facility; therefore, the requirements of §900-2.6(e) are not applicable.

(f) Site Plans and Drawings

(1) General Site Plans

The Design Drawings and other supporting materials are organized by engineering discipline (civil, electrical, and high voltage [i.e., substation) at a common engineering scale of at least 1:200. Generally, the drawing sets for each of these disciplines are further organized by defined engineering area, or by Facility component. The Civil Design Drawings (Appendix 5-A), Electrical Design Drawings (Appendix 5-B), and Substation Design Drawings (Appendix 5-C) include a layout for all Facility components as well as the information outlined below:

- Access roads, turn-around areas, and temporary road improvements (Appendix 5-A, C400 Series and C500 Series);[3]
- Wind turbine locations, and associated temporary crane pads (Appendix 5-A, C400 Series);
- Buried electric collection line corridors (including an indication of the permanent right-of-way [ROW]), locations of proposed splice vaults/junction boxes and trenchless collection line installations (See Appendix 5-A and Appendix 5-B);

[3] Access roads were designed to comply with the NYS Fire Code, typical industry standards, and the recommendations contained in the preliminary geotechnical report (Appendix 10-A). The primary cross section is to be utilized in most areas (e.g., access roads, laydown yards, intersection improvements, etc.). The Town of Nelson cross section is applicable to roads in the Town of Nelson and complies with Section 614.2 of the Town of Nelson Land Use and Development Law. The existing access road cross section is applicable where proposed access roads follow existing farm roads. The aggregate ring section is applicable to the permanent gravel ring around the turbine, which has specific electrical hazard safety needs.

- Collector substation, Point of Interconnection (POI) switchyard, and Operation and Maintenance (O&M) building outlines, including local setbacks (Appendix 5-A, C600 Series, Appendix 5-C, and Figure 24-3);
- Existing electric transmission lines and interconnection location, including associated ROW (See Appendix 5-A, Sheets C600 Serices and Appendix 5-C);
- Approximate limits of disturbance for all Facility components (turbines, access roads, buildings, electric lines, collector substation, etc.) (Appendix 5-A);
- Approximate clearing limits for all Facility components (turbines, access roads, buildings, electric lines, collector substation, etc.) (Appendix 5-A, T300 Series);
- Proposed wind turbine setbacks based on the tallest wind turbine model under consideration from occupied structures, property lines and easements, existing overhead electric lines, and roads (Figure 24-1);[4]
- A permanent meteorological (MET) tower and applicable setbacks (Appendix 5-A, Sheets T329, EC329, and C429, and Figure 24-1).
- Lighting plans for the O&M facility and interconnection facilities (Appendix 5-A, C600 Series, and Appendix 05-C.

(2) Typical Design Detail Drawings and Plans

The Civil Design Drawings (Appendix 5-A), Electrical Design Drawings (Appendix 5-B), and Substation Design Drawings (Appendix 5-C) and other supporting drawings contain typical design details for all Facility components drawn to scale using computer graphics or computer-aided design software. Table 5-3 includes more information regarding what is included for each component.

Table 5-3. Typical Detail Drawings

Facility Component	Drawing Set(s)
Wind turbine elevations	Appendix 5-F
POI Switchyard station and interconnection facilities	Appendix 5-C
Collection substation	Appendix 5-C
Permanent point of access	Appendix 5-A
Underground infrastructure	Appendix 5-A, Appendix 5-B
Overhead electric collection lines	n/a
Overhead electric transmission lines	Appendix 5-A, Appendix 5-B

(3) Site Suitability Reports for Turbine Models

A temporary 60-meter-tall (197-foot-tall) MET tower was installed in the Town of Eaton on September 10, 2021 to generate the site-specific data necessary for modeling purposes and validation of the wind

[4] Wind turbine and meteorological tower setbacks are not shown on the drawings as the scale of the drawings is not appropriate to the scope of the setbacks, i.e., sufficient context is not provided at a 1:100 scale to correctly interpret 1,286-foot setbacks.

resource. Wind resource analyses were performed to optimize the turbine layout for maximum energy production within the context of the existing, site-specific constraints and support the estimated capacity factor for the Facility.

The manufacturers of the wind turbines under consideration for the Facility provided site suitability reports showing that the turbine models are compatible with existing conditions (Appendix 5-F). Based on the site suitability reports, the wind turbines proposed for the Facility are rated to withstand wind speeds above those likely to occur in the Facility Site.

(4) Engineering Codes, Standards, Guidelines, and Practices

The list of codes and standards that have been, and will continue to be considered during the design, construction, operation, and maintenance of this Facility is extensive. The following is provided as a representative list of organizations which issue applicable codes and standards. This list will be updated with specific codes, standards, and guidelines following Certification, during final design.

- The Aluminum Association (AA)
- American Association of State Highway and Transportation Officials (AASHTO)
- American Concrete Institute (ACI)
- American Institute of Steel Construction (AISC)
- American Society of Civil Engineers (ASCE)
- American Society of Mechanical Engineers (ASME)
- American Society for Testing and Materials (ASTM)
- American Welding Society (AWS)
- Concrete Reinforcing Steel Institute (CRSI)
- Edison Electric Institute Publications (EEI-AEIC)
- Federal Energy Regulatory Commission (FERC)
- Insulated Cable Engineers Association (ICEA)
- International Electro-technical Commission (IEC)
- Institute of Electrical and Electronics Engineers (IEEE)
- Mine Safety and Health Administration (MSHA)
- National Bureau of Standards (NBS)
- National Electrical Manufacturers Association (NEMA)
- National Electric Code (NEC)
- National Electric Safety Code (NESC)
- National Electrical Testing Association (NETA)
- National Fire Protection Association (NFPA)
- National Institute of Standards and Technology (NIST)
- National Ready Mixed Concrete Association (NRMCA)
- Occupational Safety and Health Administration (OSHA)
- Portland Cement Association (PCA)
- Rural Electrification Administration (REA)
- Society of Automotive Engineers (SAE)

- Society for Protective Coatings (SSPC)
- Uniform Building Code (UBC)
- Underwriter's Laboratories, Inc. (UL).

The short section of proposed transmission line will be designed in accordance with the following specific standards:

- ANSI C2-2012 - National Electrical Safety Code (NESC)
- ANSI 05.1.2008 - Wood Poles – Specifications & Dimensions
- ASCE 48-2011 - Design of Steel Transmission Pole Structures
- ASCE MOP 74-2010 - Guidelines for Electrical Transmission Line Structural Loading
- ASCE MOP 91-1997 - Design of Guyed Electrical Transmission Structures
- IEEE 81-2012 - Guide for Measuring Earth Resistivity, Ground Impedance, and EarthSurface Potentials of a Grounding System
- IEEE 516-2009 - IEEE Guide for Maintenance Methods on Energized Power Lines
- IEEE 524-2003 - Guide to the Installation of Overhead Transmission Line Conductors
- IEEE 563-1978 - Guide on Conductor Self-Damping Measurements
- IEEE 644-1994 - Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines IEEE 656-1992 - Standard for the Measurement of Audible Noise from Overhead Transmission Lines
- IEEE 691-2001 - Guide for Transmission Structure Foundation Design and Testing
- IEEE 738-2006 - Standard for Calculating the Current-Temperature of Bare Overhead Conductors
- IEEE 977-1991 - Guide to Installation of Foundations for Transmission Line Structures
- IEEE 1243-1997 - Guide for Improving the Lightning Performance of Transmission Lines
- IEEE 1313.2-1999 - Guide for the Application of Insulation Coordination
- IEEE Std 1542-2007 - Guide for Installation, Maintenance, and Operation of Irrigation Equipment Located Near or Under Power Lines.

(5) Manufacturer Design, Safety and Testing Information or Equipment

Technical and safety brochures to the extent available from the manufacturers are included in Appendix 5-G for turbines to be installed during construction, in accordance with §900-2.6(f)(5). Details regarding specific equipment to be installed at the Project collection substation and POI switchyard are not available at this time as they will be procured later in the Project timeline and, as with the POI switchyard, in cooperation with National Grid.