



Stantec

BROOKE-ALVINSTON WIND FARM
WIND TURBINE SPECIFICATIONS
REPORT

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Prepared for:

Zephyr Farms Limited
2700 Matheson Blvd. East
Suite 300, West Tower
Mississauga, ON L4W 4V9

Prepared by:

Stantec Consulting Ltd.
Suite 1, 70 Southgate Drive
Guelph, ON N1G 4P5

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1.0 Introduction

1.1 PROJECT OVERVIEW

Zephyr Farms Limited (Zephyr Farms) is proposing to develop the Brooke-Alvinston Wind Farm (the Project) in the Township of Brooke-Alvinston, Lambton County, Ontario. The Project has been awarded a Power Purchase Agreement with the Ontario Power Authority (RESOP 11836). The basic components of the Project include four Samsung Heavy Industries 2.5 MW wind turbine generators for a total installed nameplate capacity of 10 MW, transformers at each turbine, electrical collector lines and fibre optic data lines, a switchyard with associated control room, a meteorological tower (met tower) and associated power and data cabling, and turbine access roads. The electrical transmission system would transport the electricity generated from each turbine to Hydro One Networks Inc.'s (HONI's) distribution network. The Project also includes interconnection equipment and installations specified by HONI. All Project components would be situated on private land and municipal road allowance. A copy of the Project Location and Project Study Area map is provided within the Draft Project Description Report.

Zephyr Farms has retained Stantec Consulting Ltd. (Stantec) to prepare a Renewable Energy Approval (REA) Application, as required under Ontario Regulation 359/09 - Renewable Energy Approvals under Part V.0.1 of the Act of the *Environmental Protection Act* (O. Reg. 359/09). According to subsection 6(3) of O.Reg.359/09, the Project is classified as a Class 4 Wind Facility and will follow the requirements identified in O.Reg.359/09 for such a facility.

1.2 REPORT REQUIREMENTS

This Wind Turbine Specifications Report is one component of the REA Application for the Project, and has been prepared in accordance with Item 13, Table 1 of O. Reg. 359/09 which sets out specific content requirements as provided in the following table (Table 1.1).

Required Documentation	Requirement Met	Location in Submission
Provide specifications of each wind turbine, including make, model, name plate capacity, hub height above grade, rotational speeds and acoustic emissions data, including the sound power level and frequency spectrum, in terms of octave-band power levels.	ü	Section 2.1; Appendix A

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2.0 Wind Turbines

2.1 SPECIFICATIONS

The Project consists of four wind turbine generators (2.5 MW each) with a total nameplate capacity of 10 MW. The following table (Table 2.1) provides a description of the Samsung 25 xc wind turbine which will be used for the Project. Additional turbine specifications are provided in Appendix A of this report and in Appendix B of the Design and Operations Report.

Manufacturer	Samsung
Model	25xc
Name plate capacity (MW)	2.5 MW
Hub height above grade	80 m
Blade length	48.7 m
Rotor diameter	99.8 m
Blade sweep area	7,823 m ²
Nominal revolutions (rotational speed)	14.35 rpm
Frequency Spectrum	57.5 Hz – 61.5 Hz
Sound power	4 m/s – 89 dBA 5 m/s – 94.6 dBA 6 m/s – 99.1 dBA 7 m/s – 102.9 dBA 8 m/s – 106.2 dBA

Each wind turbine consists of eight key components:

- concrete tower foundation;
- four steel tower sections;
- nacelle (comprised of gearbox, electrical generator, step-up transformer and housing);
- three rotor blades;
- hub (the structure to where the blades attach);
- power convertor; and
- electrical wiring and grounding.

The tower would be supported by a concrete foundation, approximately 3 m deep, depending upon subsurface conditions. The turbine tower consists of tubular towers with flange connections. The tower height is 80 m.

The tower supports the nacelle which houses the main components of the wind turbine (comprised of gearbox, electrical generator, step-up transformer and housing). The nacelle cover is made of fibreglass and is accessible via a hatch in the floor. Wind sensors and skylights are located on the roof of the nacelle with access to the nacelle roof via the skylights. A step-up transformer, located in a separate locked room in the nacelle of each wind turbine, is required to transform the electricity created in the nacelle (i.e. 690 V to 27.6 kV). The converter is also located within the nacelle and controls the energy conversion in the generator by feeding power to and from the grid.

The 99.8 m rotor supports three blades and a hub. Each blade is constructed of two carbon and fibreglass airfoil shells bonded to a supporting beam. The blades are 48.7 m in length. The pitch of the blades is adjustable, allowing maximum energy input from the wind and also acting as a braking system.

Electrical wiring includes a high voltage cable which runs down the turbine tower to the 27.6 kV switchgear located at the bottom of the tower. From the switchgear, underground collector lines would carry the electricity from the turbines to a switchyard, and then to an overhead collector line system on wood poles in the municipal road allowance.

Turbine tower lighting would be in accordance with Transport Canada Regulations and Standards as described in the Design and Operations Report.

3.0 Closure

The Brooke-Alvinston Wind Farm Wind Turbine Specifications Report has been prepared by Stantec Consulting Ltd. for Zephyr Farms Limited in accordance with Item 13, Table 1 of O.Reg 359/09.

This report has been prepared by Stantec for the sole benefit of Zephyr Farms Limited, and may not be used by any third party without the express written consent of Zephyr Farms Limited. The data presented in this report are in accordance with Stantec's understanding of the Project as it was presented at the time of reporting.

STANTEC CONSULTING LTD.



Robert Rowland, MSc, P.Geo.
Senior Project Manager



Mark Knight, MA
Project Manager

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4.0 References

O.Reg.359/09 - Ontario Regulation 359/09 - Renewable Energy Approvals Under Part V.0.1 of the Act under the Environmental Protection Act.

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