AMHERST ISLAND WIND ENERGY PROJECT
WIND TURBINE SPECIFICATIONS REPORT

File No. 160960595
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Prepared for:

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1.0 Overview

1.1 PROJECT OVERVIEW

Windlectric Inc. (the Proponent or Windlectric) is proposing to develop, construct, and operate the 56 - 75 megawatt (MW) Amherst Island Wind Energy Project (the Project) within Loyalist Township (the Township) in the County of Lennox and Addington (the County) in eastern Ontario, in response to the Government of Ontario's initiative to promote the development of renewable electricity in the province.

The basic components of the proposed Project include up to 36 Siemens wind turbines. The turbine model proposed utilizes the same 36 turbine pad locations that have been subject to the assessment required under the Renewable Energy Approval (REA). The layout includes 24 Siemens SWT-2.3-113 2300 kW and twelve (12) Siemens SWT-2.3-113 2221 kW model wind turbines. The final layout will result in a total installed nameplate capacity of approximately 56 - 75 MW. The number of wind turbines will be dependent upon final selection of the model of the wind turbine most appropriate to the proposed Project.

The proposed Project will also include a 34.5 kilovolt (kV) underground and/or overhead electrical power line collector system, fibre optic data lines from each turbine and/or wireless technology for the communication of data, a transmission line, truck turnaround areas, a submarine cable, an operations and maintenance building, permanent dock, a substation, a switching station, an un-serviced storage shed, one connection point to the existing electrical system, cable vault areas, meteorological tower(s) (met tower(s)), access road(s) to the met tower site(s), and turbine access roads with culvert installations, as required, at associated watercourse crossings.

Temporary components during construction may include staging areas for the turbines, access roads, met tower(s), collector lines and transmission line as well as crane paths, a temporary dock, site office(s), batch plant, central staging areas, and associated watercourse crossings. The electrical power line collector system would transport the electricity generated from each turbine to the substation, along the submarine cable to the mainland and then to a switching station located near to an existing Hydro One Networks Inc. (HONI) 115 kV transmission line.

The Proponent has elected to assess and seek approval for some alternative Project configurations. The REA application process will consider:

- two alternative mainland transmission line routes;
- two alternative switching station locations and corresponding point of common coupling with the HONI line;
- three alternative mainland temporary dock locations along the mainland;

- a submarine cable with three alternative submarine cable routes near the mainland;
- three alternative mainland submarine cable landing locations and corresponding cable vault locations;
- up to three alternative met tower locations; and,
- up to three potential locations for an operations and maintenance building.

Final selection of the sites to be used would be based on the results of consultation activities, detailed design / engineering work, and the conditions experienced during construction.

Windlectric 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, this Project is classified as a Class 4 Wind Facility. The *Draft Wind Turbine Specifications Report* is one component of the REA application for the Project, and has been prepared in accordance with O. Reg. 359/09, and the Ministry of the Environments' (MOE) *Technical Guide to Renewable Energy Approvals* (MOE 2011).

1.2 REPORT REQUIRMENTS

The purpose of the *Draft Wind Turbine Specifications Report* is to provide the public, aboriginal communities, municipalities, and regulatory agencies with an understanding of the technical specifications of the wind turbine generators to be utilized for the proposed Project.

The *Draft Wind Turbine Specifications Report* has been prepared in accordance with Item 13, Table 1 of O.Reg.359/09 which sets out specific content requirements for the Wind Turbine Specifications Report as provided in the following table (Table 1.1).

Table 1.1: Wind Turbine Specifications Report Requirements (as per O. Reg. 359/09 – Table 1)

Requirements	Section Reference
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.	1.0

2.0 Project Components

This section provides a description of the major equipment and infrastructure associated with operation of the Project.

2.1 WIND TURBINE GENERATORS

The proposed Project will include up to 36 Siemens wind turbines. The turbine model proposed utilizes the same 36 turbine pad locations that have been subject to the assessment required under the Renewable Energy Approval (REA). The layout includes 24 Siemens SWT-2.3-113 2300 kW and twelve (12) Siemens SWT-2.3-113 2221 kW model wind turbines.. The final layout will result in a total installed nameplate capacity of approximately 56 - 75 MW. A summary of the basic specifications of the SWT-2.3-113 2300 kW and SWT-2.3-113 2221 kW model wind turbines is provided in Table 2.1 and 2.2 below. A complete description of the general specifications for this turbine model is found in the manufacturer's brochure provided as **Appendix A**.

A summary of the basic specifications of the turbine models being considered is provided in Table 2.1 below.

Each of the wind turbine installations would consist of the following key components:

- Concrete foundation;
- Steel support tower (comprised of 5 sections);
- Nacelle containing the electrical generator;
- Hub (rotating structure that holds the turbine blades);
- 3 rotor blades;
- A pad mount transformer to convert power from 690 V to 34.5 kV; and,
- Electrical controls and connections.

Table 2.1: Turbine Description – Siemens SWT-2.3-113 2.3 MW

Operating Data	Specification
General	
Rated capacity (kW)	2,300 kW
Cut-in wind speed (m/s)	3 m/s
Cut-out wind speed (m/s)	25 m/s
Rotor	
Number of rotor blades	3
Rotor diameter (m)	113 m
Blade length (m)	55 m
Swept area (m^2)	10,000 m^2
Rotor speed (rpm)	6 - 13 rpm
Tower	
Hub height (m)	99.5 m or site-specific
Tip height (m)	154.5 m or site-specific
Acoustic Emissions Data	
Overall sound power level	105 dBA
Measurement uncertainty value	+/- 1.5 dBA
Octave band sound power level (linear weighted)	114.2 dBA @ 7m/s
Tonality and tonal audibility	< 2 dB

Table 2.2: Turbine Description – Siemens SWT-2.3-113 2.221 MW

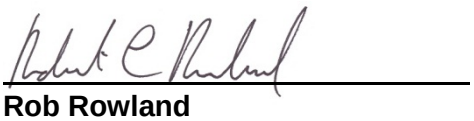
Operating Data	Specification
General	
Rated capacity (kW)	2,221 kW
Cut-in wind speed (m/s)	3 m/s
Cut-out wind speed (m/s)	25 m/s
Rotor	
Number of rotor blades	3
Rotor diameter (m)	113 m
Blade length (m)	55 m
Swept area (m^2)	10,000 m^2
Rotor speed (rpm)	6 - 13 rpm
Tower	
Hub height (m)	99.5 m or site-specific
Tip height (m)	154.5 m or site-specific
Acoustic Emissions Data	
Overall sound power level	104 dBA
Measurement uncertainty value	+/- 1.5 dBA
Octave band sound power level (linear weighted)	113.8 dBA @ 6m/s
Tonality and tonal audibility	< 2 dB

3.0 Signatures

The Amherst Island Wind Energy Project *Draft Wind Turbine Specifications Report* has been prepared by Stantec for Windlectric in accordance with Ontario Regulation 359/09, and in consideration of the *Technical Guide to Renewable Energy Approvals*.

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

STANTEC CONSULTING LTD.



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4.0 References

Ontario Ministry of the Environment, 2011. Technical Guide to Renewable Energy Approvals. Renewable Energy Approvals. Queen's Printer for Ontario.

Appendix A

Turbine Specifications

SIEMENS

SWT-2.3-113

Turning moderate wind into maximum results

At the leading edge of evolution

The new Siemens SWT-2.3-113 wind turbine is the ultimate choice for low to moderate wind conditions. The revolutionary direct drive generator and the new, optimized Quantum Blade are paired to extract as much energy as possible from the wind.

Efficient. Quiet. Robust and reliable. The Siemens SWT-2.3-113 is the new benchmark wind turbine for low to medium wind speeds. As a result of more than 30 years of research and development, it is designed to harvest more energy out of moderate wind conditions than anyone thought possible.

Proven design

The SWT-2.3-113 is built around the same revolutionizing direct drive generator as the SWT-3.0-101. The direct drive turbine offers exceptional reliability and efficiency – with only 50% of the parts normally required for a conventional wind turbine.
By using the same proven design and sharing the majority of components with its larger sibling, production costs and lead times can be kept down.

Unique aerodynamics

The Quantum Blade combines exceptional aerodynamic performance with patented manufacturing technology. Based on innovative aerodynamic solutions in the root and tip sections, the Quantum Blade offers maximum efficiency at low to medium wind speeds.

Maximum availability

Simplicity is the ultimate sophistication. With the simple and robust direct drive concept with 50% fewer parts, the SWT-2.3-113 wind turbine is designed for maximum availability. Furthermore, the spacious nacelle and the ergonomic working conditions facilitate serviceability and contribute to minimizing downtime for scheduled maintenance.


“You cannot change the wind.
It may be strong, it may be light.
This leaves it up to us to extract
as much energy as we can from it.
Anne Schannong Vinther, Quality Engineer

Innovation for efficiency

Siemens direct drive technology and the new Quantum Blade represent groundbreaking wind turbine design and technology. The result of these two key innovations is a turbine with maximum efficiency and reliability, which helps to enable a solid return on investment.

Maximized performance with 50% fewer parts

The Siemens direct drive design incorporates a permanent magnet generator with fewer moving parts than ever before.

The simple permanent magnet design offers increased efficiency directly by minimizing energy losses and indirectly by reducing maintenance needs. The outer rotor arrangement leads to a more compact and lightweight generator, making transportation and installation easier and faster.

The B55 Quantum Blade

The new generation of Siemens wind turbine blades is lighter than previous designs but retains the superior strength known from earlier generations of blades. Thanks to unique airfoils and redesigned tip and root sections, the blade offers superior performance at low to medium wind speeds. The root section uses Siemens "flatback" profiles to minimize root leakage and provide higher lift. The tip has also undergone a fine-tuning process to give enhanced lift and acoustic performance.

One-piece moulding

Like other Siemens blades, the new Quantum Blades are manufactured in Siemens proprietary IntegralBlade® process. Each blade is moulded in one single production step from fiberglass-reinforced epoxy resin, resulting in a stronger, lighter blade without any joints.

Lower noise

With a low 105 dB noise level, the SWT-2.3-113 is one of the quietest wind turbines on the market. As a result, this turbine type has an extremely high ratio of energy output per noise affected area, resulting in fewer disturbances to people and wildlife.

Superior grid compliance

The Siemens NetConverter® is designed for maximum flexibility in the turbine's response to voltage and frequency variations, fault ride-through capability and output adjustment. The advanced wind farm control system provides state-of-the-art fleet management.

Technical specification

Rotor

- Type: 3-bladed, horizontal axis
- Position: Upwind
- Diameter: 113 m
- Swept area: 10,000 m²
- Speed range: 6–13 rpm
- Power regulation: Pitch regulation with variable speed
- Rotor tilt: 6 degrees

Blade

- Type: Self-supporting
- Blade length: 55 m
- Tip chord: 0.63 m
- Root chord: 4.2 m
- Aerodynamic profile: NB 1-7, SWPNA1_XX12, FFAxxx
- Material: GRE
- Surface gloss: Semi-mat, <30 / ISO2813
- Surface colour: Light grey, RAL 7035

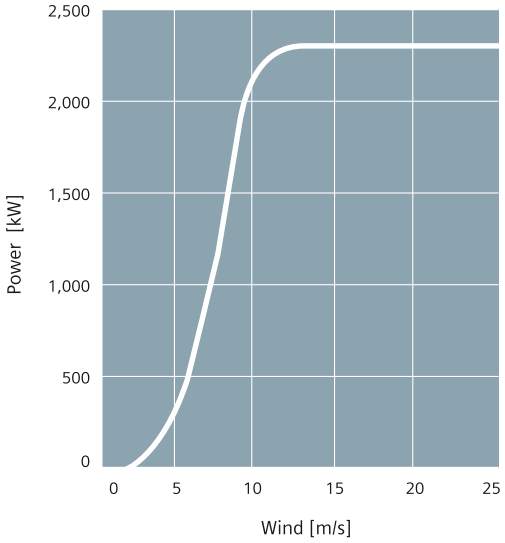
Aerodynamic brake

- Type: Full span pitching
- Activation: Active, hydraulic

Load-supporting parts

- Hub: Nodular cast iron
- Main shaft: Cast
- Nacelle bed plate: Cast

Sales power curve



Mechanical brake

- Type: Hydraulic disc brake
- Position: Generator rear end
- Number of callipers: 3

Canopy

- Type: Totally enclosed
- Surface gloss: Silk mat, 30–40 / ISO2813
- Colour: Light grey, RAL 7035

Generator

- Type: Synchronous, PMG
- Nominal power: 2,300 kW

Grid terminals (LV)

- Nominal power: 2,300 kW
- Voltage: 690 V
- Frequency: 50 Hz or 60 Hz

Yaw system

- Type: Active
- Yaw bearing: Externally geared
- Yaw drive: 8 (optional 10) electric gear motors
- Yaw brake: Passive friction brake

Controller

- Type: Microprocessor
- SCADA system: WPS
- Controller designation: SWTC, STC-1, SCS-1

Tower

- Type: Cylindrical and/or tapered tubular
- Hub height: 99.5 m or site-specific
- Corrosion protection: Painted
- Surface gloss: Silk mat, 30–40 / ISO2813
- Colour: Light grey, RAL 7035

Operational data

- Cut-in wind speed: 3 m/s
- Nominal power at: 12–13 m/s
- Cut-out wind speed: 25 m/s
- Maximum 3 s gust: 59.5 m/s (IEC version)

Weights (approximately)

- Rotor: 66,700 kg
- Nacelle: 73,000 kg
- Tower: Site-specific

1 Quantum Blade

- Unique design and manufacturing process
- IntegralBlade® one-piece moulding for maximum strength
- Optimized aerodynamics for low to medium wind conditions
- Increased length for higher energy yield
- Blade root – designed for minimized root leakage and increased lift

2 Direct drive generator

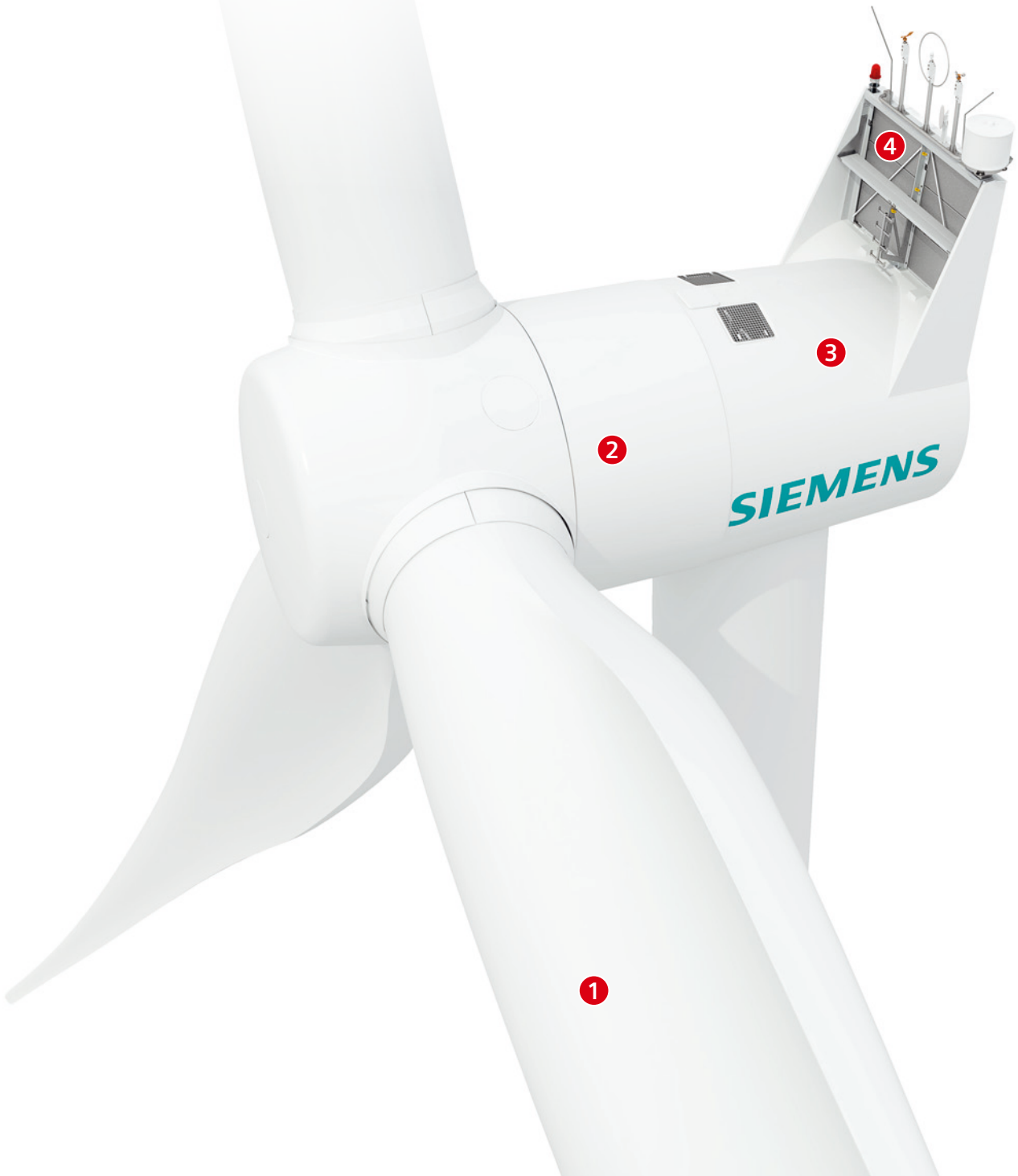
- Permanent magnet design
- Totally enclosed, easy to handle and lightweight design
- Optimum reliability and efficiency

3 Nacelle

- Solid, compact and lightweight structure
- Spacious, ergonomic design – maximum serviceability
- 50% fewer parts compared to geared turbines

4 Cooling

- Simple and robust LiquidLink® water cooling system
- Top-mounted passive cooling radiators
- High-efficient two-stage cooling as function of power



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