



Grand Bend Wind Farm Wind Turbine Specifications Report

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Prepared for:

Grand Bend Wind Limited Partnership,
Northland Power Inc. as agent

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Record of Revisions

Revision	Date	Description
0	August 27, 2012	Initial Draft Submission to Municipal and Aboriginal Communities as well as Selected Government Agencies
1	February 15, 2013	Application for Renewable Energy Approval
2	January 21 , 2014	Turbine Change – Update Report

Executive Summary

This Wind Turbine Specification Report is one component of the application for Renewable Energy Approval (REA) of the Project, and has been prepared in accordance with Item 14, Table 1 of O.Reg. 359/09 which sets out specific content requirements as follows:

- The make, model, name plate capacity, hub height above grade, rotational speeds.
- The acoustic emissions data, determined and reported in accordance with standard CAN/CSA-C61400-11-07, "Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques", dated October 2007, including overall sound power level, measurement uncertainty value, octave-band sound power levels (linear weighted), tonality and tonal audibility.

Northland Power Inc. is planning to construct the Grand Bend Wind Farm with a total electricity generation capacity of 100 MW, making this a class 4 wind facility (as defined in O.Reg. 359/09).

Northland is planning to use, subject to availability and pricing, the Siemens SWT-3.0-113, 2.48 MW from the Siemens D3 wind turbine platform. Forty (40) of these wind turbines are required to meet the Project's contractual requirements with the Ontario Power Authority (OPA). Northland is seeking approval for 48 turbine locations, but only 40 of the locations will actually be constructed. The extra 8 locations are only being permitted should one or more of the preferred 40 locations not be constructible due to unexpected geotechnical conditions or some other factor(s). We anticipate that any conditions of the renewable energy approval would reflect this project planning approach.

The fundamental components of each turbine are included in the report. Acoustic emissions data have been supplied by Siemens and included in an appendix to the report. Further detail on acoustic emissions and analysis is provided in the Environmental Noise Impact Assessment provided under a separate cover.

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1.0 Introduction

1.1 Background

Grand Bend Wind Limited Partnership, with Northland Power Inc. (“Northland”) as agent, are proposing to develop, construct and operate a 100 MW wind facility located north of Grand Bend, Ontario. An application for approval has been prepared under Ontario Regulation 359/09 of the *Environmental Protection Act*. The project is classified as a Class 4 Wind facility under the Regulation. The Grand Bend Wind Farm (“the Project”) is located in Huron County, spanning the lower-tier municipalities of Bluewater and Huron South. Portions of the transmission line also traverse the municipality of Huron East and municipality of West Perth in Perth County. The project location and study area is outlined in the Project Description Report under a separate cover.

Northland Power Inc. is seeking approval for 48 turbine locations, but only 40 locations will actually be constructed. The extra 8 locations are only being permitted should one or more of the preferred 40 locations not be constructible due to unexpected geotechnical conditions or some other factor(s). Subject to availability and pricing, Siemens SWT-3.0-113, 2.48 MW turbines from the Siemens D3 wind turbine platform will be used. No more than 40 turbines are required to meet the OPA contractual requirements. We anticipate that any conditions of approval would reflect this project planning approach.

The basic project components to be constructed will include:

- 40 Siemens SWT-3.0-113, 2.48 MW Turbines direct drive wind turbine generators with a total name plate capacity of 100 MW;
- Turbine access roads;
- A 36 kV electrical collection system;
- Transformer substation;
- A parts and storage (office/maintenance) building;
- A new transmission line within municipal road right-of ways (“ROWs”) along Sararas Road, Rodgerville Road, and Road 183 with connection to the provincial power grid at the 230 kV transmission line south of the Seaforth Transformer Station;
- A switch station at the Hydro One connection point.

During construction temporary components will include access roads and work/storage areas at the turbine locations and transmission connections.

1.2 Objective

This Wind Turbine Specification Report is one component of the REA Application for the Project, and has been prepared in accordance with Item 14, Table 1 of O.Reg. 359/09 which sets out specific content requirements as provided in **Table 1.1**.

Table 1.1 Wind Turbine Specification Report Requirements

Required Documentation	Requirement Met	Location in Submission
Provide specifications of each wind turbine, including:		
1. The make, model, name plate capacity, hub height above grade, rotational speeds	Yes	Section 2.0 and Appendix A
2. The acoustic emissions data, determined and reported in accordance with standard CAN/CSA-C61400-11-07, "Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques", dated October 2007, including overall sound power level, measurement uncertainty value, octave-band sound power levels (linear weighted) and tonality and tonal audibility	Yes	Appendix A

2.0 Wind Turbine Specifications

Northland Power Inc. is seeking approval for 48 turbine locations, but only 40 locations will actually be constructed. Total electricity generation capacity will be approximately 100 MW making this a class 4 wind facility (as defined in O.Reg. 359/09). The Siemens SWT-3.0-113, 2.48 MW turbines from the Siemens D3 wind turbine platform will be utilized as detailed below.

The fundamental components of each turbine include the following:

- a reinforced concrete spread footing foundation (approximately 3 m deep and 18 to 22 m in diameter, depending on subsurface conditions);
- five steel tower sections (resulting in a hub height of 99.5 m);
- hub (central component of rotor assembly);
- three glass-fibre reinforced epoxy rotor blades;
- nacelle (gearbox, electrical generator, brake assembly and housing);
- meteorological instruments (anemometer and wind vane);
- a step-up Transformer adjacent to each tower at the base;
- electrical wiring and grounding; and
- tower lighting (in accordance with Transport Canada requirements).

Table 2.1 provides a summary of the relevant turbine specifications required for this report. **Appendix A** contains further technical specifications provided by Siemens.

Table 2.1 Siemens SWT-3.0-113, 2.48 MW Turbine Specifications

Manufacturer	Siemens
Model	SWT-3.0-113, Rev.0, Max. Power 2483 kW
Nameplate Capacity	2.48 MW
Hub Height Above Grade	99.5 m
Blade Length	55 m
Rotor Diameter	113 m
Rotor Sweep Area	10,000 m ²
Rotational Speed Range	6-15.5 rpm
Overall Sound Power Level	Sound Power level is 101.5 dBA
Measurement Uncertainty Value	± 1.5 dBA
Octave-band Sound Power Levels (Linear Weighted)	Varies based on wind speed - refer to Appendix A
Tonality	None under normal operating conditions – refer to the <u>Environmental Noise Impact Assessment</u> under a separate cover for further detail.
Tonal Audibility	Guaranteed by Siemens to be 2 dB or less

3.0 Acoustic Emissions Data


Acoustic emissions data have been supplied by Siemens and included in Appendix A. For further detail on acoustic emissions and analysis, refer to the Environmental Noise Impact Assessment provided under a separate cover.

4.0 Conclusion

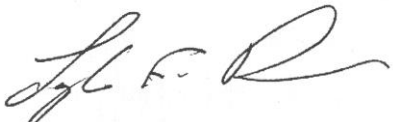
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Respectfully submitted,

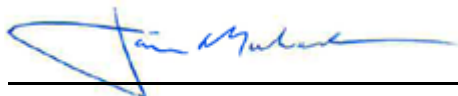
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Appendix A

Turbine Specifications from Siemens



SIEMENS



Siemens D3 platform – 3.0-MW direct drive wind turbines

Reduced complexity,
increased profitability

Answers for energy.



Your trusted partner

Siemens has been a major driver of innovation in the wind power industry since 1980 when wind turbine technology was still in its infancy.

Technology has changed with the times, but Siemens' commitment to providing its customers with proven wind turbine solutions remains the same.

The combination of robust and reliable turbines, highly efficient solutions for power transmission and distribution, and a deep understanding of the entire energy market ensures that Siemens will continue to take the wind power industry to new levels.

When it comes to on-time delivery, Siemens' record is outstanding. Long-lasting customer relationships, based on a track record of successful, reliable project deliveries, provide a sound, sustainable and profitable investment.

Drawing on more than 30 years of experience in the wind power industry, a strong focus on renewables and a global network of highly-skilled and trained employees, Siemens has proven itself to be a trustworthy and reliable business partner, and will continue to be so in the future.

With an increasing number of turbines being installed at inland, coastal and offshore sites, reliability and best in class maintenance under challenging conditions are essential for optimizing return on investment throughout a project's life cycle.

Over the past 30 years, Siemens has accumulated millions of hours of service experience. Drawing on this substantial knowledge, the company has established a flexible range of service solutions that are designed to optimize the output of wind turbines.



SWT-3.0-101

SWT-3.0-108

SWT-3.0-113

Intelligent ways to drive down the cost of electricity

Wind power is coming of age. It could soon be directly competitive with traditional energy sources.

Driving down the levelized cost of wind energy is a key target for Siemens as we strive to make wind power independent of subsidies.

Innovation and industrialization are the core levers to this. And our new platform strategy, founded on the knowledge and experience of more than 30 years in wind power, is a milestone on this path.

Standardization and modularization are fundamental to the new platform approach – allowing us to streamline the entire manufacturing and installation process. The categorization into product platforms allows standardized modules, such as rotors, generators, towers or hubs, to be used across different products. Thereby the total number of different components is kept to a minimum.

All of which means that we are helping our customers drive down the cost of electricity.

Each of our products is now a member of one of four platforms: the Siemens G2, Siemens D3, Siemens G4 and Siemens D6. “G” denotes geared turbines, “D” signifies direct drive technology and the associated numbers represent the predominant power rating. Therefore, the D3 platform is comprised of onshore direct drive wind turbines with a power rating of 3.0-MW.

Outstanding performance with reduced complexity

The Siemens 3.0-MW wind turbines of the D3 platform embody tried and tested innovation in the field of direct drive generators, with hundreds of units already installed and operational.

As wind power plants develop capacities similar to conventional power plants, power generation companies throughout the world are striving for greater efficiency and cost-effectiveness. Siemens’ solution: increase availability and profitability through innovative technology and reduced complexity.

Siemens direct drive turbines of the D3 and D6 platforms offer innovation through the consistent implementation of a common, highly efficient generator concept. With less than half the moving parts of a conventional geared turbine, the direct drive wind turbines improve performance, reliability and maintainability. In addition, the compacted design allows for cost-effective transportation and installation.



Performance and profitability go hand in hand

With its direct drive wind turbines, Siemens started with the ambitious aim of making a more cost-effective machine in order to become competitive with conventional power plants. Thanks to innovative engineering, that vision is becoming a reality.

In designing a wind turbine, a holistic view of the design and construction, materials, processes, manufacture, and installation is critical. The gearless 3.0-MW wind turbines carefully balance all these factors in a compact system. Service personnel have been involved in the development process in order to optimize working conditions and serviceability.

Reduced complexity

The Siemens D3 platform offers the simplest and most straightforward wind turbine design. Regardless of the reliable track record of gearboxes over the years, the

gearbox is fundamentally the most complex component of a wind turbine. Eliminating the gearbox reduces complexity and can increase reliability.

Replacing the gearbox, the coupling and the high-speed generator with a low-speed generator eliminates two-thirds of the conventional drive train arrangement. As a result, the number of rotating and wear-prone parts is vastly reduced compared to a geared machine. Siemens has opted for a permanent magnet generator for improved efficiency.

Unlike an electrically-excited machine with a gearbox, a permanent magnet-excited machine does not expend any energy on the excitation itself. The D3 platform wind turbine generators also have an outer rotor, where the rotor spins on the outside of the stator. This design feature allows the rotor to operate within narrower tolerances, which helps to keep the dimensions of the nacelle compact.

Simplified design

Due to the removal of the gearbox and other design simplifications, Siemens has given service technicians more space within the nacelle. Here, key components are readily accessible and can be interchanged without impacting others. The wind turbines of the D3 platform have a dual cooling system that provides an even cooling of the generator via a top-mounted, passive cooling system for improved energy efficiency.

The key components in a wind turbine – the blade, rotor hub, tower, and controller – are all adopted from the existing Siemens geared turbine portfolio. The utilization of proven components alongside rigorous testing on rigs and in the field enables Siemens to eliminate many of the variables traditionally associated with the introduction of such an innovative product.

Innovative tower solution

Higher towers significantly increase the energy yield of a wind turbine on sites with a high wind shear. At the same time, they pose considerable challenges in terms of transportability and costs. Siemens offers an innovative and economically-viable tower concept to allow its wind

turbines to reach heights above 100 meters. The bolted steel shell tower consists of multiple tower sections, mounted on top of each other and assembled together on site. The modular space concept of the bolted steel shell tower allows for very high hub heights (in excess of 140 meters) with very low transportation requirements. The tower is erected in a short time and requires minimal maintenance. In fact, the HRC bolts require no re-torquing during the tower's lifetime.

Ease of transportation and erection

The D3 platform has a compact, light-weight design and has been engineered to meet even the most demanding of transportation routes. Key bridge and tunnel clearance specifications have been carefully considered when engineering the machine, and as a result, the 3.0-MW wind turbine can navigate many of the most demanding transport routes.



Expertise in practice: fully developed technology, advanced design

Grid performance with NetConverter®

Siemens sets the standard in the field of grid compliance. Power conversion is implemented by the Siemens' NetConverter® system. This system is characterized by full conversion of the power generated, efficiently decoupling generator and turbine dynamics from the grid. The NetConverter® system offers maximum flexibility in the turbine's response to voltage and frequency control, fault ride-through and output adjustment. As a result, Siemens wind turbines can be configured to comply with a variety of relevant grid codes in major markets and can be readily connected to the grid.

Siemens IntegralBlade®

The rotors of the D3 platform benefit from blades manufactured using patented IntegralBlade® technology. The blades are made in one piece from fiberglass-reinforced epoxy resin during a single production step. As a result, all glue joints – the potential weak points that could expose the structure to cracking, water ingress, ice formation and lightning – are eliminated.

Siemens WebWPS SCADA system

Via a standard web browser, the Siemens WebWPS SCADA system provides a variety of status views of electrical and mechanical data, operation and fault status, meteorological and grid station data.

Wind turbine condition monitoring

Siemens' wind turbine condition monitoring compares the vibration levels of the main nacelle components with a set of established reference spectra and instantly detects deviations from normal operating conditions. This allows Siemens to proactively plan the service and maintenance of the wind turbines, as any unusual event can be categorized and prioritized based on severity.

Turbine Load Control (TLC)

The Turbine Load Control system continuously monitors the structural loading on the wind turbine. In case the loads exceed normal values, the turbine automatically regulates operation to bring loads back within the design envelope. In addition, the TLC system – an optional feature of the D3 platform – monitors the accumulated fatigue loading on the turbine, thereby providing key input for fact-based asset management.

High Wind Ride Through (HWRT)

Wind turbines are normally programmed to shut down if the 10-minute mean wind speed exceeds 25 m/s. This may lead to significant challenges for the grid system if the turbines in large wind farms are shut down more or less simultaneously, e.g. at the passage of a gust front. The Siemens D3 platform works to enhance grid stability due to High Wind Ride Through – an optional feature of the D3 platform. This replaces the fixed high wind shutdown-threshold with an intelligent load-based reduction in output power at some storm level wind speeds.

Service

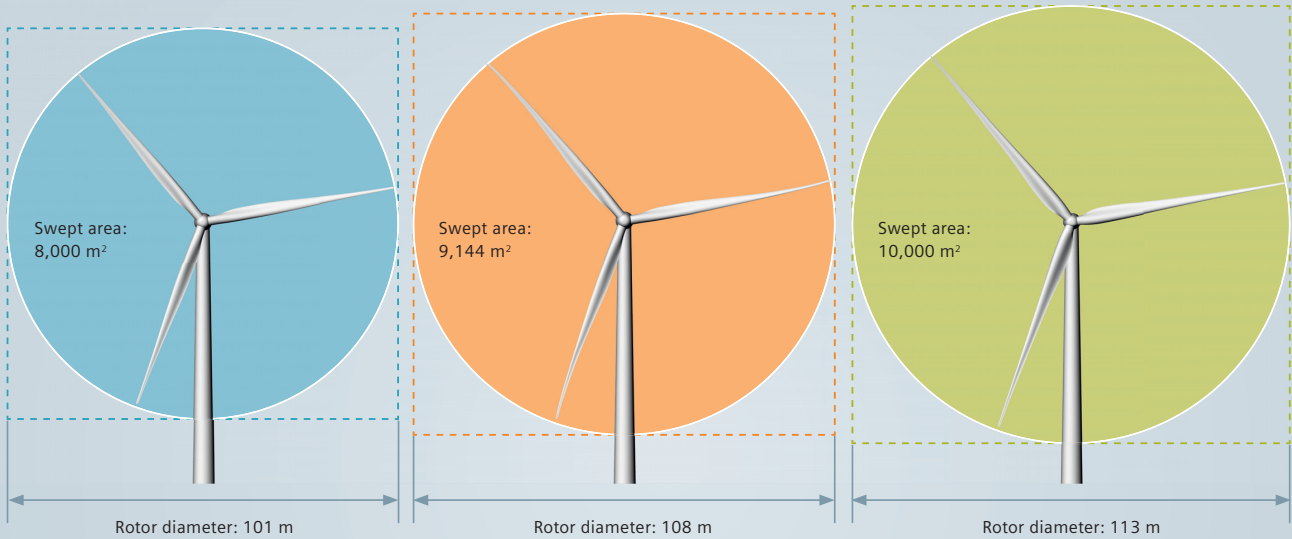
From the highly qualified local technician, to the senior engineer at service headquarters, it is the track record and the vast obtained experience of the Siemens service team that makes the difference.

Siemens offers tailor-made service solutions for each of our turbine platforms, e.g. the SWPS-100B, the SWPS-200A and the SWPS-300W service solutions for onshore wind turbines.

Further improvements in safety

Safety is at the heart of all Siemens operations. From production to installation, operation, and service, Siemens strives to set the standard for a zero harm culture.

In addition the fail-to-safe capabilities within a turbine, combined with Siemens' superior lightning protection system, are designed to enhance overall safety.



SWT-3.0-101	
IEC Class	IA
Rotor diameter	101 m
Blade length	49 m
Swept area	8,000 m ²
Hub height	74.5 – 99.5 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	10,500 MWh
Nacelle weight	78 t
Rotor weight	60 t

SWT-3.0-108	
IEC Class	IA
Rotor diameter	108 m
Blade length	53 m
Swept area	9,144 m ²
Hub height	79.5 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	11,100 MWh
Nacelle weight	78 t
Rotor weight	60 t

SWT-3.0-113	
IEC Class	IIA
Rotor diameter	113 m
Blade length	55 m
Swept area	10,000 m ²
Hub height	79.5 – 142 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	11,800 MWh
Nacelle weight	78 t
Rotor weight	67 t

* site specific

SWT-3.0-101

The toughest turbine for the roughest conditions

Extreme wind conditions place tremendous loads on a turbine. The SWT-3.0-101 is built to deliver reliable performance under the world's harshest operating conditions.

The SWT-3.0-101 utilizes the same rotor as Siemens' SWT-2.3-101 geared machine. Through the application of proven components, Siemens balances innovation with security of investment.

SWT-3.0-108

The durable choice for strong wind conditions

When winds are strong, the SWT-3.0-108 offers a superior combination of a large rotor and robust design.

The B53 quantum blade of the 108-meter rotor uses Siemens' innovative aeroelastic blade design, which allows a larger rotor diameter and higher energy output without compromising structural loads. As a result, the SWT-3.0-108 turbine provides a lower cost of energy in high wind conditions.

SWT-3.0-113

Getting the most out of moderate conditions

Offering the largest rotor in the Siemens D3 platform, the SWT-3.0-113 is designed to increase energy output at sites with moderate wind conditions.

Once again the competitive edge of a Siemens turbine is based on innovative blade design. The B55 quantum blade benefits from an optimized root design extracting maximum power from the wind. Furthermore, the SWT-3.0-113 has reduced noise emissions due to a lower rotor speed. With its combination of high energy output and low noise levels, the SWT-3.0-113 is the ideal choice for most inland sites across the globe.

The Siemens D3 platform – one of the four new product platforms – embodies tried and tested innovation in the field of direct drive generators. Offering three rotor sizes and a standard rating of 3.0-MW, the D3 platform is a perfect combination of performance and profitability for all wind conditions.

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general descriptions of the technical options
available, which may not apply in all cases.
The required technical options should therefore
be specified in the contract.

Technical Description

SWT-3.0-113

General

The following is a brief technical description of the main components of the SWT-3.0-113 wind turbine.

Rotor

The SWT-3.0-113 rotor is a three-bladed cantilevered construction, mounted upwind of the tower. The power output is controlled by pitch regulation. The rotor speed is variable and is designed to maximize the aerodynamic efficiency.

Blades

The B55 blades are made of fiberglass-reinforced epoxy in Siemens' proprietary IntegralBlade® manufacturing process. In this process the blades are cast in one piece to eliminate weaker areas at glue joints. The blades are mounted on pitch bearings and can be feathered 80 degrees for shutdown purposes. Each blade has its own independent pitching mechanism capable of feathering the blade under any operating condition. The blade pitch arrangement allows for optimization of the power output throughout the operating range, and the blades are feathered during standstill to minimize wind loads.

Rotor Hub

The rotor hub is cast in nodular cast iron and is fitted to the generator rotor with a flange connection. The hub is sufficiently large to provide a comfortable working environment for service technicians during maintenance of blade roots and pitch bearings from inside the structure.

Main Shaft

A cast, hollow and fixed main shaft ensures a comfortable internal access from the canopy to the hub.

Main Bearing

The rotating parts of the wind turbine are supported by a single, double-tapered roller bearing. The bearing is grease lubricated.

Generator

The generator is a fully enclosed synchronous generator with permanent magnet excitation. The generator rotor construction and stator winding are designed for high efficiency at partial loads. The generator is positioned between the tower and the hub producing a comfortably lean arrangement of the internals in the nacelle.

Mechanical Brake

The mechanical brake is fitted to the non-drive end of the generator rotor and has three hydraulic calipers.

Yaw System

A cast bed frame connects the shaft to the tower. The yaw bearing is an externally geared ring with a friction bearing. A series of electric planetary gear motors drives the yawing.

Canopy

The weather screen and housing around the machinery in the nacelle is made of fiberglass-reinforced laminated panels with multiple fire-protecting properties. The design implies fully integrated lightning and EMC protection.

Tower

The SWT-3.0-113 wind turbine is mounted on a tapered tubular steel tower. The tower has internal ascent and direct access to the yaw system and nacelle. It is equipped with platforms and internal electric lighting.

Controller

The wind turbine controller is a microprocessor-based industrial controller. The controller is complete with switchgear and protection devices. It is self-diagnosing and has a keyboard and display for easy readout of status and for adjustment of settings.

The NetConverter® power conversion system allows generator operation at variable speed, frequency and voltage while supplying power at constant frequency and voltage to the MV transformer. The power conversion system is a modular arrangement for easy maintenance and is water cooled.

SCADA

The SWT-3.0-113 wind turbine is equipped with the Siemens WebWPS SCADA system. This system offers remote control and a variety of status views and useful reports from a standard internet web browser. The status views present information including electrical and mechanical data, operation and fault status, meteorological data and grid station data.

Turbine Condition Monitoring

In addition to the Siemens WebWPS SCADA system, the SWT-3.0-113 wind turbine is equipped with the unique Siemens TCM condition monitoring system. This system monitors the vibration level of the main components and compares the actual vibration spectra with a set of established reference spectra. Result review, detailed analysis and reprogramming can all be carried out using a standard web browser.

Operation Systems

The wind turbine operates automatically. It is self-starting when the wind speed reaches an average about 3 to 5 m/s. The output increases approximately linearly with the wind speed until the wind speed reaches 12 to 13 m/s. At this point, the power is regulated at rated power.

If the average wind speed exceeds the maximum operational limit of 25 m/s, the wind turbine is shut down by feathering of the blades. When the average wind speed drops back below the restart average wind speed, the systems reset automatically.

Siemens Wind Power A/S reserves the right to change the above specifications without prior notice.

SWT-3.0-113 Technical Specifications

Rotor

Type	3-bladed, horizontal axis
Position	Upwind
Diameter	113 m
Swept area	10.000 m ²
Speed range	6-15.5 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	Siemens proprietary airfoils, FFA-W3-XXX
Material	GRE
Surface gloss	Semi-gloss, < 30 / ISO2813
Surface colour	Light grey, RAL 7035

Aerodynamic Brake

Type	Full span pitching
Activation	Active, hydraulic

Load-Supporting Parts

Hub	Nodular cast iron
Fixed shaft	Nodular cast iron
Nacelle bed frame	Nodular cast iron

Mechanical Brake

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

Canopy

Type	Totally enclosed
Surface gloss	Semi-gloss, 25-45 / ISO-2813
Colour	Light grey, RAL 7035

Generator

Type	Synchronous, PMG
Nominal power	3000 kW

Grid Terminals (LV)

Nominal power	3000 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	Semi-gloss, 25-45 / ISO2813
Colour	Light grey, RAL 7035

Operational Data

Cut-in wind speed	3-5 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

Siemens Wind Power A/S reserves the right to change the above specifications without previous notice.

SWT-3.0-113, Rev. 0, Max. Power 2483 kW Contract Acoustic Emission, Hub Height 99.5 m Ontario - Canada

Sound Power Levels

The warranted sound power level is presented with reference to the code IEC 61400-11:2002 with amendment 1 dated 2006-05 based on a hub height of 99.5 m and a roughness length of 0.05 m as described in the IEC code. The sound power levels (L_{WA}) presented are valid for the corresponding wind speeds referenced to a height of 10 m above ground level.

Wind speed [m/s]	4	5	6	7	8	9	10	11	12	Up to cut-out
Max. Power 2483kW	95.1	99.3	101.3	101.5	101.5	101.5	101.5	101.5	101.5	101.5

Table 1: Acoustic emission, L_{WA} [dB(A) re 1 pW]

Typical Sound Power Frequency Distribution

Typical spectra for L_{WA} in dB(A) re 1pW for the corresponding centre frequencies are tabulated below for 6 - 10 m/s referenced to a height of 10.0 m above ground level.

Octave band, centre frequency [Hz]	Wind Speed (m/s)				
	6	7	8	9	10
63	89.4	90.5	91.2	91.3	91.1
125	92.2	92.5	92.6	92.1	91.4
250	95.5	95.2	94.7	94.1	93.5
500	93.7	93.5	93.1	92.9	92.8
1000	93.3	93.4	93.4	93.3	93.7
2000	92.7	93.4	93.8	94.0	94.6
4000	89.5	90.2	90.6	92.5	92.8
8000	80.7	82.3	83.3	83.3	83.4

Table 2: Typical octave bands for 6-10 m/s, L_{WA} [dB(A) re 1 pW]

Tonality

Typical tonal audibility for the Siemens wind turbine generators has not exceeded 2 dB as determined in accordance with IEC 61400-11:2002.

Measurement Uncertainty

A measurement uncertainty range of -1.5dB(A) to +1.5dB(A) is applicable.