STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Petition of BNE Energy Inc. for a Declaratory Ruling for the Location, Construction and Operation of a 4.8 MW Wind Renewable Generating Project on Flagg Hill Road in Colebrook, Connecticut ("Wind Colebrook South")	:	**Petition No. 983**
	:	**December 3, 2013**

OBJECTION TO PARTIAL SEALING OF BNE ENERGY INC.'S DEVELOPMENT AND MANAGEMENT PLAN MODIFICATION

FairwindCT, Inc., Susan Wagner and Stella and Michael Somers (the "Grouped Parties"), hereby object to the partial sealing of the Development and Management (D&M) plan modification submitted by petitioner BNE Energy Inc. ("BNE") on November 5, 2013. The Grouped Parties object to the sealing of Exhibits B, C, and D to the D&M plan modification because: (1) the Protective Order approved in this docket prevents any meaningful use of the data and information under seal, and (2) the exhibits filed do not contain data and information requiring confidential protection, in part because the same type of documents are publicly available for older series of General Eletric ("GE") wind turbines.

In support of this Objection, the Grouped Parties state the following:

1. On November 5, 2013, BNE filed its D&M plan modification with the Connecticut Siting Council (the "Council"). Exhibits B, C, and D were filed under seal pursuant to the Protective Order entered by the Council in this docket.

2. That protective order, dated April 14, 2011, permits review of sealed documents only at the Council's offices, prohibits any note taking, and further prohibits the data and information from being disseminated to parties' experts, notwithstanding

whether those experts have agreed to be bound by the protective order. (Protective Order, Petition 983, dated Apr. 14, 2011.)

3. On November 7, 2013, and December 2, 2013, Nicholas Harding, one of the Grouped Parties' attorneys visited the Council offices to view the exhibits filed under seal. An Affidavit in support of this Objection executed by Mr. Harding is attached to this Objection and referred to herein as "Harding Aff."

4. The exhibits filed under seal total approximately 46 pages. (Harding Aff. ¶ 5.)

5. Exhibit B, referred to by BNE as "GE 2.85 MW Technical Documentation," is subtitled "Technical Description and Data." (Id. ¶ 7.)

6. Exhibit B, generally, contains a description of the wind turbine generator system and its main components, such as the rotor, mechanical drive train, nacelle and electrical system. (Id. ¶ 7.)

7. Similar documents for older GE series of wind turbines are publicly available. (Id. ¶ 8.)

8. Exhibit C, referred to by BNE as "GE 2.85 MW Product Acoustic Specifications," is actually subtitled "Product Acoustic Specifications," and is another document in GE's "Technical Documentation" series of publications. (Id. ¶ 9.)

9. Exhibit C, generally, discusses the expected noise that would be caused by various wind speeds, the uncertainty level of this expected noise, and its tonality – all matters of public health concern. (Id.)

10. Similar documents for older GE series of wind turbines are publicly available. (Id. ¶ 10.)

11. Exhibit D, the GE 2.85-103 Mechanical Loads Analysis, is an assessment by GE Energy of the project's feasibility using 103-meter blades, taking into account turbine locations, wind data, and the capabilities of the turbines themselves. (Id. ¶ 12.)

12. Exhibit D is likely the most critical of the information submitted by BNE, due to its site-specific nature, but it contained several pages of tables that were impossible to decipher without magnification. Even after borrowing a magnifying glass from the Council's staff, Mr. Harding was unable to read the tables of data. (Id. ¶ 13.)

13. Without the ability to further enlarge or copy the tables, or even take notes to share with the engineer hired by the Grouped Parties, review of GE Energy's assessment is impossible. (Id. ¶ 14.)

14. The Protective Order, including its prohibition on the taking of notes, its restriction on disclosure to only parties and intervenors rather than experts of parties and intervenors, and the use of small print in Exhibit D, prevents any party from effectively analyzing BNE's exhibits. (See Order, Petition 983, dated Apr. 14, 2011, ¶ 15.) The use of small print also presumably will prevent the Council from analyzing Exhibit D.

15. The Grouped Parties object to the sealing of all the exhibits for several reasons.

16. The Council's rules permit parties to seek protective orders to prevent the public disclosure of "proprietary information, including but not limited to critical energy infrastructure information (CEII)."

17. The sealed exhibits are not CEII – they do not contain "specific engineering, vulnerability, or detailed design information about proposed or existing critical infrastructure." 18 CFR § 388.113(c)(l). "Critical infrastructure means existing and proposed systems and assets, whether physical or virtual, the incapacity or destruction of which would negatively affect security, economic security, public health or safety, or any combination of those matters." Id. § 388.113(c)(2).

18. The FERC guidelines regarding CEII state that such "process is not intended as a mechanism for companies to withhold from public access information that does not pose a risk of attach on the energy structure." (Federal Energy Regulatory Commission, Guidelines for Filing Critical Energy Infrastructure Information, at 1, available at http://www.ferc.gov/help/filing-guide/file-ceii/ceii-guidelines/guidelines.pdf.)

19. The FERC guidelines go on to state that the FERC "emphasizes that 18 CFR § 388.112(b)(1) requires that submitters provide justifications for CEII treatment. The way to properly justify CEII treatment is by describing the information for which CEII treatment is requested and explaining the legal justification for such treatment." (Id.)

20. BNE did not provide such description or legal justification – in fact, BNE did not even file its exhibits under seal with an accompanying motion.

21. The Grouped Parties dispute that the exhibits warrant exemption from the presumption that " all records maintained or kept on file by any public agency, . . . shall be public records and every person shall have the right to (1) inspect such records promptly during regular office or business hours, (2) copy such records in accordance with subsection (g) of section 1-212, or (3) receive a copy of such records in accordance with section 1-212." Conn. Gen. Stat. § 1-210.

22. The Freedom of Information Act does provide for protection of trade secrets, but the exhibits fail to meet the definition of trade secrets because they do not "derive independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from their disclosure or use." See Conn. Gen. Stat. § 1-210(5)(A)(i). As such, the exhibits should not be entitled to the "secrecy" afforded to trade secrets. See Conn. Gen. Stat. § 1-210(5)(A)(ii).

23. As demonstrated by the attachments to Mr. Harding's affidavits, documents authored by GE with identical titles and the same type of information related to GE's older series of wind turbines are publicly available. (See Harding Aff. ¶¶ 8, 10.)

24. Information in the public domain is certainly not entitled to the "secrecy" afforded to trade secrets, because "[i]n order to qualify for a trade secret exemption under § 1-210(b)(5)(A), [a] substantial element of secrecy must exist, to the extent that there would be difficulty in acquiring the information except by the use of improper means." See Dir., Dep't of Info. Tech. v. Freedom of Info. Comm'n, 274 Conn. 179, 194 (2005).

25. It is reasonable to assume that it is only a matter of time before the documents related to GE's newer 2.85 series wind turbines will be available on the internet as well, since these documents seem to become publicly available when projects are built using the turbines and the documents are attached to public filings during the approval process. (See Harding Aff. ¶ 11.)

26. Because GE has not taken measures to protect the confidentiality of this information with respect to its other turbines, and because the technical description and data and noise specifications of GE's turbines do not "derive independent economic value," Exhibits B and C are not proprietary trade secrets. See Conn. Gen. Stat. § 1-210(5)(A)(i).

27. Moreover, Exhibit D has no independent economic value, because it is specific to BNE's project on BNE's site. It is therefore also not a proprietary trade secret. See id.

WHEREFORE, for the foregoing reasons, the Grouped Parties object to the partial sealing of the D&M plan modification submitted by BNE.

By: [signature]

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AFFIDAVIT OF NICHOLAS J. HARDING

The undersigned being duly sworn does hereby depose and say:

1. I am over the age of eighteen, understand the meaning and obligation of an oath, and am competent to testify as to the matters stated herein.

2. I make this Affidavit on personal knowledge.

3. I am an attorney at Reid & Riege, P.C., and I represent FairwindCT, Inc., Stella and Michael Somers and Susan Wagner, parties to Petition No. 983.

4. On November 7, 2013, and December 2, 2013, I visited the offices of the Council in order to view the exhibits filed under seal by BNE in its Development and Management Plan Modification.

5. The material filed under seal consists of three exhibits totaling 46 pages.

6. The restrictions of the protective order prevented me from taking notes. Below is my best recollection of my review of the exhibits filed under seal.

7. Exhibit B, referred to by BNE as "GE 2.85 MW Technical Documentation," is subtitled "Technical Description and Data." Exhibit B, generally, contains a description of the wind turbine generator system and its main components, such as the rotor, mechanical drive train, nacelle and electrical system.

8. Documents with the same subtitle and similar content are publicly available for other GE series of wind turbines, including the GE 1.6 series turbines for which BNE petitioned for approval from the Council. See, e.g., Exhibit 1 to this Affidavit, at https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B5C1937 04-14C4-4036-A7FF-E77898F4F975%7D&documentTitle=20113-60668-01 (1.6 series); Exhibit 2 to this Affidavit, at http://dufferinwindpower.ca/Portals/23/Downloads/Final/Final% 20Wind%20Turbine%20Specification%20Report/Appendix%20A%20_%20Turbine%20Manufact urer%20Technical%20Specification_2.75MW.pdf (2.5-2.75 series).

9. Exhibit C, referred to by BNE as "GE 2.85 MW Product Acoustic Specifications," generally discusses the expected noise that would be caused by various wind speeds, the uncertainty level of this expected noise, and its tonality – all matters of public health concern.

10. Documents containing the same kind of information for other GE series of wind turbines, including the GE 1.5 series and GE 2.5 series, are publicly available, and alternately titled "Product Acoustic Specifications" and "Noise Emission Characteristics." See, e.g., Exhibit 3 to this Affidavit, at http://mcleansmountain.northlandpower.ca/site/northland_power___ mclean_s_mountain/assets/pdf/ge_acoustic_specifications.pdf (Product Acoustic Specifications for GE 2.5-103); Exhibit 4 to this Affidavit, at http://bayshorersa.com/images/08.09_BRSA _Sound_Assess._Study_Full_Document_.pdf (Appendix C) (Noise Emission Characteristics for GE 1.5xle).

11. GE's 2.85 series wind turbines is new to the market. Based on our experience in searching for the "Technical Documentation" and "Commercial Documentation" series of papers related to GE's various series of wind turbines, I would expect that Exhibits B and C will be

available on the internet in the very near future, because these documents seem to become publicly available when projects are proposed using the turbines and the documents are attached to public filings during the approval process.

12. Exhibit D, the GE 2.85-103 Mechanical Loads Analysis, is an assessment by GE Energy of the project's feasibility using 103-meter blades, taking into account turbine locations, wind data, and the capabilities of the turbines themselves.

13. Exhibit D is likely the most critical of the information submitted by BNE, due to its site-specific nature, but it contained several pages of tables that were impossible to decipher without magnification. Even after borrowing a magnifying glass from the Council staff, I was unable to read the smaller text in the tables.

14. Had I been able to further enlarge or copy the tables, or even take notes to share with the engineer hired by the Grouped Parties, a review of GE Energy's assessment may have been possible, but due to the restrictive terms of the Protective Order, this review was not an option.

15. The Protective Order prevents any party, other than the Council, from effectively questioning BNE's exhibits.

Nicholas J. Harding

Subscribed and sworn to before
me this 3rd day of December, 2013.

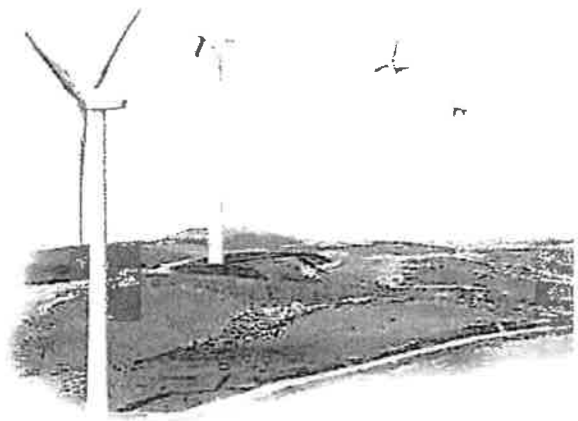
Notary Public
My Commission Expires: 10/31/2018

22942.000/592422.3

EXHIBIT 1

GE Energy

Technical Documentation
Wind Turbine Generator Systems
GE 1.6xle - 50 Hz / 60 Hz



Technical Description and Data

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All technical data is subject to change in line with ongoing technical development!

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Table of Contents

1 Introduction

This document summarizes the technical description and specifications of the GE Energy (GE) 1.6xle wind turbine generator system.

2 Technical Description of the Wind Turbine and Major Components

The wind turbine is a three bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 82.5 m. The turbine rotor and nacelle are mounted on top of a tubular tower giving a rotor hub height of 80 or 100 m. The machine employs active yaw control (designed to steer the machine with respect to the wind direction), active blade pitch control (designed to regulate turbine rotor speed), and a generator/power electronic converter system.

The wind turbine features a distributed drive train design wherein the major drive train components including main shaft bearings, gearbox, generator, yaw drives, and control panel are attached to a bedplate (see Figure 1).

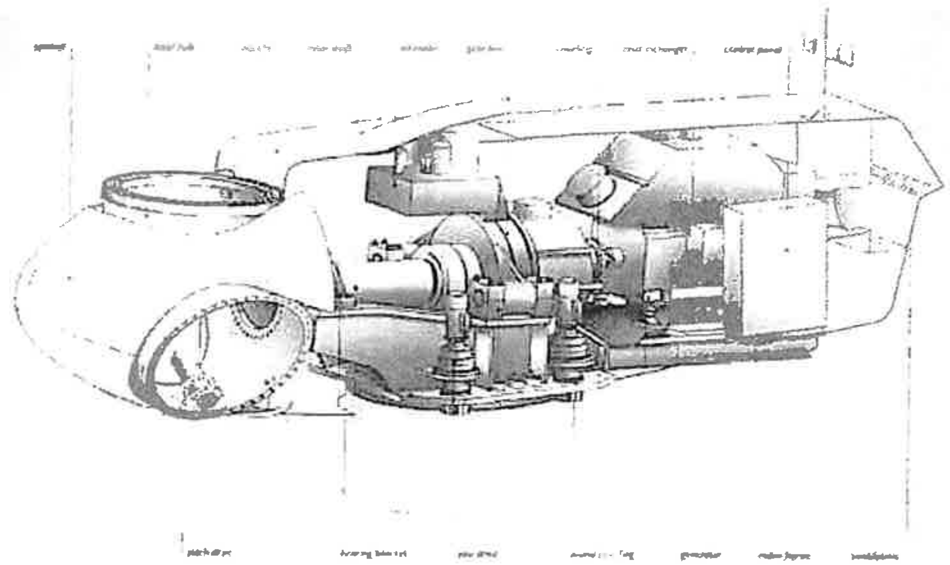


Figure 1: GE Energy 1.6xle Wind Turbine Nacelle Layout

2.1 Rotor

The rotor diameter is 82.5 m, resulting in a swept area of 5,346 m^2, and is designed to operate between 9.6 and 18.7 revolutions per minute (rpm). Rotor speed is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clock-wise direction under normal operating conditions when viewed from an upwind location.

Full blade pitch angle range is approximately 90°, with the 0°-position being with the airfoil chord line flat to the prevailing wind. The blades being pitched to a full feather pitch angle of approximately 90° accomplishes aerodynamic braking of the rotor, whereby the blades "spill" the wind thus limiting rotor speed.

2.2 Blades

There are three rotor blades used on each wind turbine. The airfoils transition along the blade span with the thicker airfoils being located in-board towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip.

2.3 Blade Pitch Control System

The rotor utilizes three (one for each blade) independent electric pitch motors and controllers to provide adjustment of the blade pitch angle during operation. Blade pitch angle is adjusted by an electric drive that is mounted inside the rotor hub and is coupled to a ring gear mounted to the inner race of the blade pitch bearing (see Figure 1).

GE's active-pitch controller enables the wind turbine rotor to regulate speed, when above rated wind speed, by allowing the blade to "spill" excess aerodynamic lift. Energy from wind gusts below rated wind speed is captured by allowing the rotor to speed up, transforming this gust energy into kinetic which may then be extracted from the rotor.

Three independent back-up units are provided to power each individual blade pitch system to feather the blades and shut down the machine in the event of a grid line outage or other fault. By having all three blades outfitted with independent pitch systems, redundancy of individual blade aerodynamic braking capability is provided.

2.4 Hub

The hub is used to connect the three rotor blades to the turbine main shaft. The hub also houses the three electric blade pitch systems and is mounted directly to the main shaft. Access to the inside of the hub is provided through a hatch.

2.5 Gearbox

The gearbox in the wind turbine is designed to transmit power between the low-rpm turbine rotor and high-rpm electric generator. The gearbox is a multi-stage planetary/helical gear design. The gearbox is mounted to the machine bedplate. The gearing is designed to transfer torsional power from the wind turbine rotor to the electric generator. A parking brake is mounted on the high-speed shaft of the gearbox.

2.6 Bearings

The blade pitch bearing is designed to allow the blade to pitch about a span-wise pitch axis. The inner race of the blade pitch bearing is outfitted with a blade drive gear that enables the blade to be driven in pitch by an electric gear-driven motor/controller.

The main shaft bearing is a roller bearing mounted in a pillow-block housing arrangement.

The bearings used inside the gearbox are of the cylindrical, spherical and tapered roller type. These bearings are designed to provide bearing and alignment of the internal gearing shafts and accommodate radial and axial loads.

2.7 Brake System

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Any single feathered rotor blade is designed to slow the rotor, and each rotor blade has its own back-up to provide power to the electric drive in the event of a grid line loss.

The turbine is also equipped with a mechanical brake located at the output (high-speed) shaft of the gearbox. This brake is only applied as an auxiliary brake to the main aerodynamic brake and to prevent rotation of the machinery as required by certain service activities.

2.8 Generator

The generator is a doubly-fed induction type. The generator meets protection class requirements of the International Standard IP 54 (totally enclosed). The generator is mounted to the bedplate and the mounting is designed so as to reduce vibration and noise transfer to the bedplate.

2.9 Flexible Coupling

Designed to protect the drive train from excessive torque loads, a flexible coupling is provided between the generator and gearbox output shaft this is equipped with a torque-limiting device sized to keep the max. allowable torque below the maximum design limit of the drive train.

2.10 Yaw System

A roller bearing attached between the nacelle and tower facilitates yaw motion. Planetary yaw drives (with brakes that engage when the drive is disabled) mesh with the outside gear of the yaw bearing and steer the machine to track the wind in yaw. The automatic yaw brakes engage in order to prevent the yaw drives from seeing peak loads from any turbulent wind.

The controller activates the yaw drives to align the nacelle to the average wind direction based on the wind vane sensor mounted on top of the nacelle.

A cable twist sensor provides a record of nacelle yaw position and cable twisting. After the sensor detects excessive rotation in one direction, the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing of the nacelle, and restarts the wind turbine.

2.11 Tower

The wind turbine is mounted on top of a tubular tower. The tubular tower is manufactured in sections from steel plate. Access to the turbine is through a lockable steel door at the base of the tower. Service platforms are provided. Access to the nacelle is provided by a ladder and a fall arresting safety system is included. Interior lights are installed at critical points from the base of the tower to the tower top.

2.12 Nacelle

The nacelle houses the main components of the wind turbine generator. Access from the tower into the nacelle is through the bottom of the nacelle. The nacelle is ventilated. It is illuminated with electric light. A hatch at the front end of the nacelle provides access to the blades and hub. The rotor can be secured in place with a rotor lock.

2.13 Anemometer, Wind Vane and Lightning Rod

An anemometer, wind vane and lightning rod are mounted on top of the nacelle housing. Access to these sensors is accomplished through a hatch in the nacelle roof.

2.14 Lightning Protection

The rotor blades are equipped with a lightning receptors mounted in the blade. The turbine is grounded and shielded to protect against lightning, however, lightning is an unpredictable force of nature, and it is possible that a lightning strike could damage various components notwithstanding the lightning protection deployed in the machine.

2.15 Wind Turbine Control System

The wind turbine machine can be controlled automatically or manually from either an interface located inside the nacelle or from a control box at the bottom of the tower. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA), with local lockout capability provided at the turbine controller.

Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation, Emergency-stop buttons located in the tower base and in the nacelle can be activated to stop the turbine in the event of an emergency.

2.16 Power Converter

The wind turbine uses a power converter system that consists of a converter on the rotor side, a DC intermediate circuit, and a power inverter on the grid side.

The converter system consists of a power module and the associated electrical equipment. Variable output frequency of the converter allows operation of the generator.

NIA/000107

3 Technical Data for the 1.6xle

3.1 Rotor

Diameter	82.5 m
Number of blades	3
Swept area	5346 m2
Rotor speed range	9 – 18 rpm
Rotational direction	Clockwise looking downwind
Maximum tip speed	77.2 m/s
Orientation	Upwind
Speed regulation	Pitch control
Aerodynamic brakes	Full feathering

3.2 Pitch System

Principle	Independent blade pitch control
Actuation	Individual electric drive

3.3 Yaw System

Yaw rate	0.5 degree/s

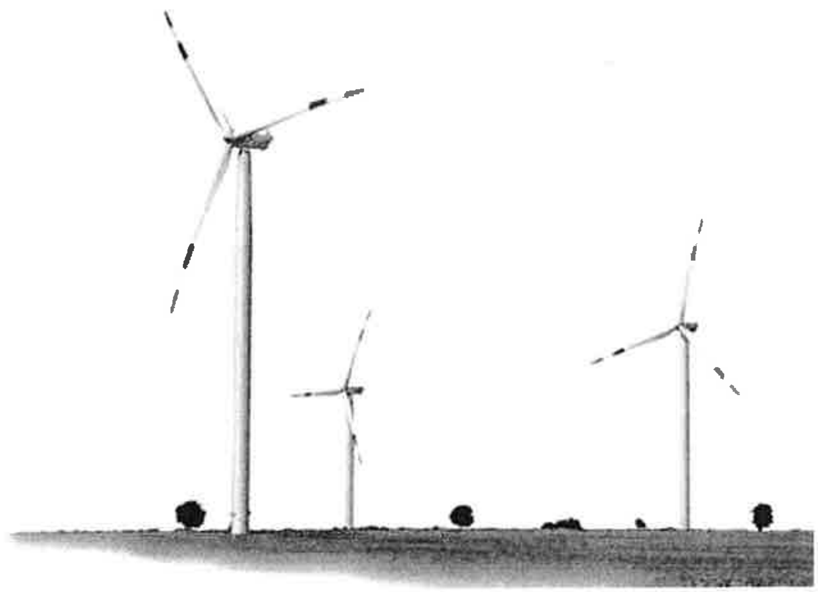
4 Operational Limits

[illegible]	Maximum 2500 m [illegible] below.
Minimum [illegible] standard [illegible]	Standard weather -15°C [illegible] +20°C Cold weather package -30°C [illegible] -40°C [illegible] for 1.6x-60Hz switching on [illegible] hysteresis of 5K -10°C resp. -25°C
Maximum standard ambient temperature [illegible]	+40°C [illegible] 50°C The turbine has a feature reducing the maximum output [illegible] reduced turbine revolutions once the component temperatures [illegible] thresholds. This feature operates best at higher altitudes, as the heat transfer properties of air diminish with decreasing density. Please note that the units are not derated in respect to site conditions. The unit reactions related to this feature are based solely on sensor temperatures.
Wind conditions according to IEC 61400	**60 Hz: (IEC 2B with reduced gust)** Standard weather package: V_{ave} = 8.5 m/s, T_i = 16% at 15 m/s Cold weather package: V_{ave} = 8.5 m/s, T_i = 16 % at 15 m/s **50 Hz: (IEC 3B)** Standard weather package: V_{ave} = 7.5 m/s, T_i = 16 % at 15 m/s
Maximum extreme gust (10 min) according to IEC 61400	**60 Hz:** Standard weather package: 40 m/s Cold weather package: 37.1 m/s **50Hz:** Standard weather package: 40 m/s
Maximum extreme gust (3 s) according to IEC 61400	**60 Hz:** Standard weather package: 56 m/s Cold weather package: 52.5 m/s **50 Hz:** Standard weather package: 56 m/s

EXHIBIT 2

GE Energy

Commercial Documentation Wind Turbine Generator Systems 2.5-2.75 Series



Technical Description and Data

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GE Energy

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Table of Contents

1 Introduction

This document summarizes the technical description and specifications of the GE Energy 2.5-2.75 Series wind turbine generator system.

2 Technical Description of the Wind Turbine and Major Components

The 2.5-2.75 Series is a three bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 100 or 103 meters. The turbine rotor and nacelle are mounted on top of a tubular tower giving a rotor hub height of 75, 85, 98.3 or 100 meters (see Fig. 1 to Fig. 4).

	2.5-100	**2.5-103**	**2.75-100**	**2.75-103**
50 Hz:	100 m, 85 m, 75 m	98.3 m, 85 m	100 m, 85 m, 75 m	98.3 m, 85 m
60 Hz:	98.3 m, 85 m	98.3 m, 85 m	98.3 m, 85 m	98.3 m, 85 m

Table 1: 2.5-2.75 Series hub heights depending on 50 or 60 Hz market

The machine employs active yaw control (designed to steer the machine with respect to the wind direction), active blade pitch control and variable speed generator (designed to regulate turbine rotor speed), and a power electronic converter system (see Fig. 6).

A transformer, supplied by General Electric, is located inside the tower or can be pad-mounted outside the tower. It transforms the voltage level of the generator to the required grid/collector system voltage (consult the Scope of Supply for available voltage options).

The wind turbine features a modular drive train design wherein the major drive train components including main shaft bearing, gearbox, generator and yaw drives are attached to a bedplate (see Fig. 5).

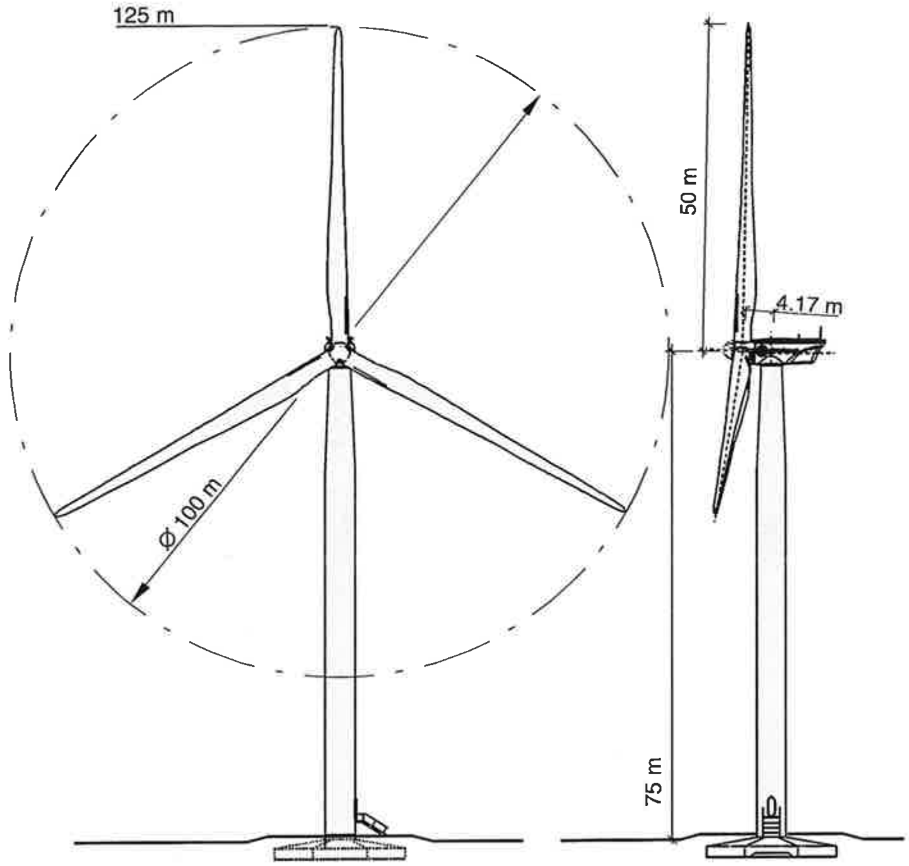

Fig. 1: 2.5-100 with 75 m hub height and 100 m rotor diameter

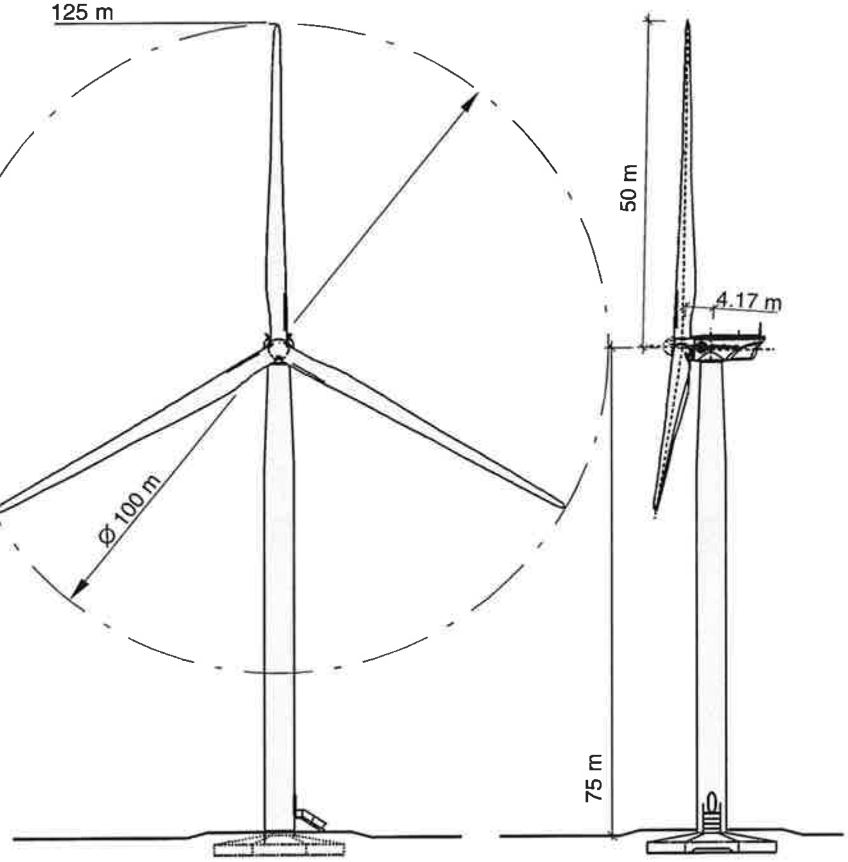

Fig. 2: 2.75-100 with 75 m hub height and 100 m rotor diameter

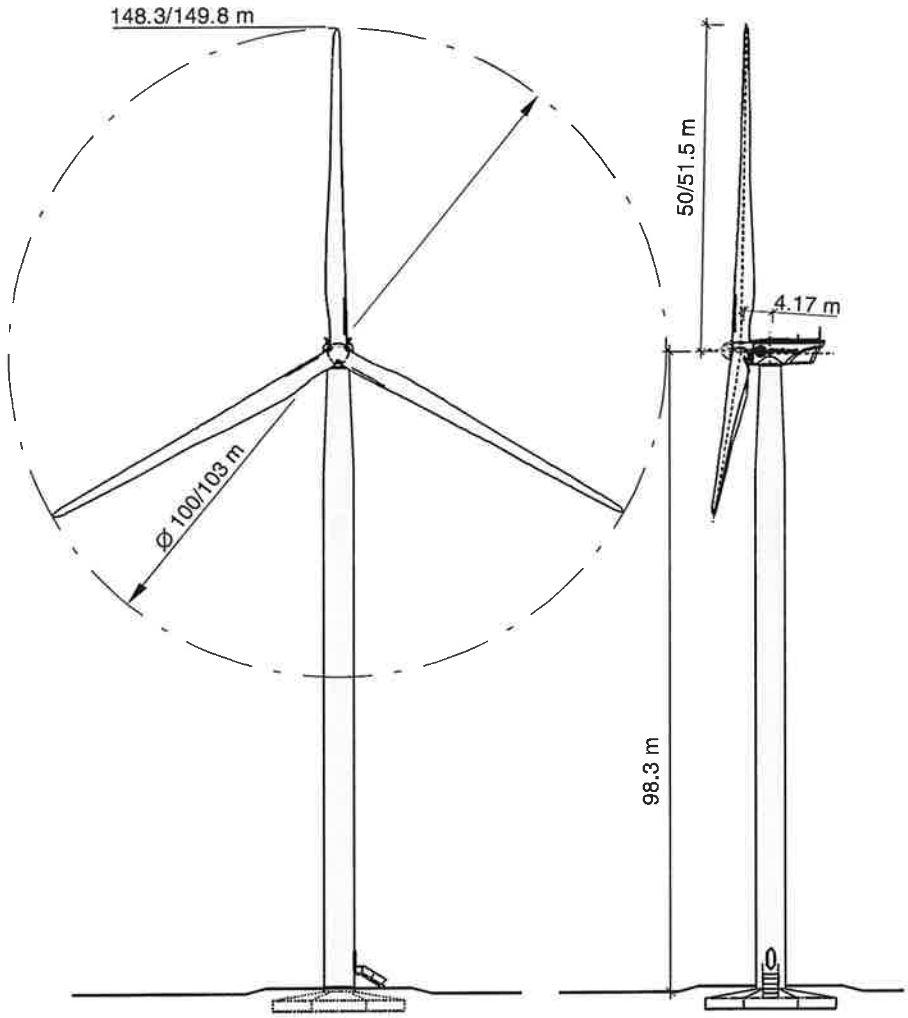

Fig. 3: 2.5-2.75 Series with 98.3 m hub height and 100/103 m rotor diameter

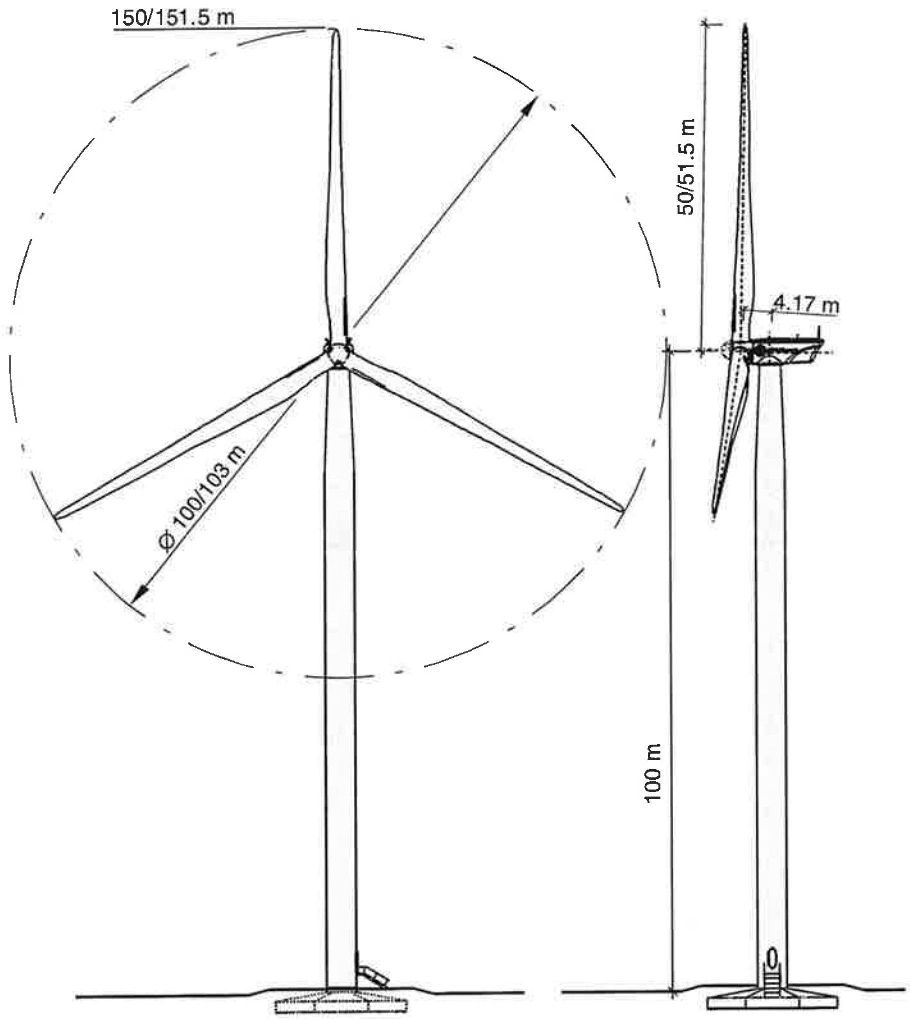

Fig. 4: 2.5-2.75 Series with 100 m hub height and 100/103 m rotor diameter

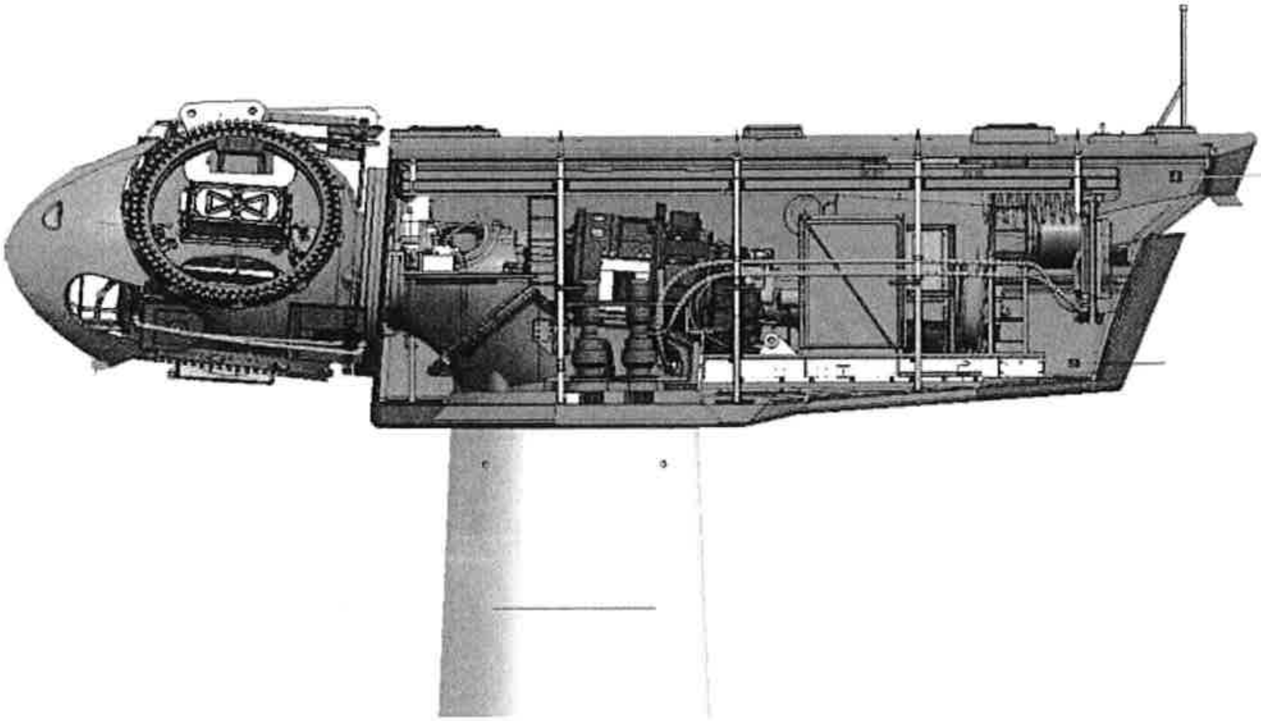

Fig. 5: 2.5-2.75 Series Nacelle

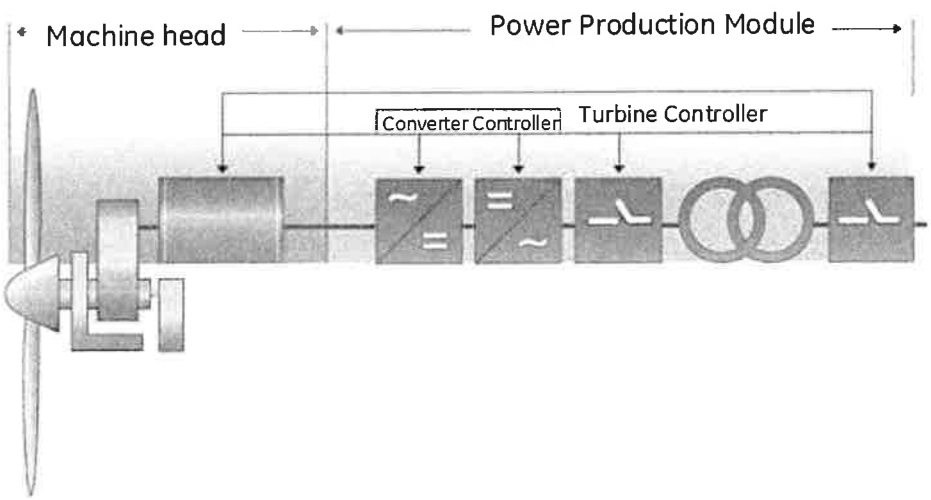

Fig. 6: 2.5-2.75 Series Electrical Concept

2.1 Rotor

The rotor diameter is 100 meters, resulting in a swept area of 7,854 m^2 or 103 meters with a swept area of 8,332 m^2 respectively. The rotor is designed to operate between 5 and 15 revolutions per minute (rpm). Rotor speed is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clockwise direction under normal operating conditions when viewed from an upwind location.

Full blade pitch angle range is approximately 90 degrees, with the zero degree position being with the blade flat to the prevailing wind. The blades being pitched to a full feather pitch angle of approximately 90 degrees accomplishes aerodynamic braking of the rotor whereby the blades "spill" the wind, thus limiting rotor speed.

2.2 Blades

There are three rotor blades used on each General Electric Energy 2.5-2.75 Series wind turbine. The airfoils transition along the blade span with the thicker airfoils being located inboard towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip.

2.3 Blade Pitch Control System

The rotor utilizes a pitch system to provide adjustment of the blade pitch angle during operation.

General Electric's active pitch controller enables the wind turbine rotor to regulate speed, when above rated wind speed, by allowing the blade to "spill" excess aerodynamic lift. Energy from wind gusts below rated wind speed is captured by allowing the rotor to speed up, transforming this gust energy into kinetic energy that may then be extracted from the rotor.

Independent back up is provided to drive each blade in order to feather the blades and shut down the machine in the event of a grid line outage or other fault. By having all three blades outfitted with independent pitch systems, redundancy of individual blade aerodynamic braking capability is provided.

2.4 Hub

The hub is used to connect the three rotor blades to the turbine main shaft. The hub also houses the blade pitch system and is mounted directly to the main shaft. To carry out maintenance work, the hub is entered through a hatch.

2.5 Gearbox

The gearbox in the wind turbine is designed to transmit torsional power between the low-rpm turbine rotor and high-rpm electric generator. The gearbox is a multi-stage planetary/helical design. The gearbox is mounted to the machine bedplate. The gearbox mounting is designed such that it minimizes vibration and noise transfer to the bedplate. The gearbox is lubricated by a forced, cooled lubrication system and a filter maintains oil cleanliness.

2.6 Bearings

The blade pitch bearing is designed to allow the blade to pitch about a span-wise pitch axis. The inner race of the blade pitch bearing is outfitted with a blade drive gear that enables the blade to be driven in pitch.

The main shaft bearing is a two-bearing system, designed to provide bearing and alignment of the internal gearing shafts and accommodate radial and axial loads.

2.7 Brake System

The blade pitch system acts as the main braking system for the wind turbine. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Only two feathered rotor blades are required to decelerate the rotor safely into idling mode, and each rotor blade has its own backup to drive the blade in the event of a grid line loss.

2.8 Generator

The generator is mounted to the bedplate with a mounting so designed as to reduce vibration and noise transfer to the bedplate.

2.9 Gearbox/Generator Coupling

Designed to protect the drive train from excessive torque loads, a special coupling is provided between the generator and gearbox output shaft. This coupling is equipped with a torque-limiting device sized to keep the maximum allowable torque below the maximum design limit of the drive train torque.

2.10 Yaw System

The bearing attached between the nacelle and tower facilitates yaw motion. Yaw drives (with brakes that engage when the drive is disabled) mesh with the gear of the yaw bearing and steer the machine to track the wind in yaw. The automatic yaw brakes engage in order to prevent the yaw drives from seeing peak loads from any turbulent wind.

The controller activates the yaw drives to align the nacelle to the wind direction based on the wind vane sensor mounted on the top of the nacelle.

A sensor provides a record of nacelle yaw position and cable twisting. After the sensor detects excessive rotation in one direction, the controller automatically brings the rotor to a complete stop, untwists the cable by counter-yawing of the nacelle, and restarts the wind turbine.

2.11 Tower

The wind turbine is mounted on top of a tubular tower. Access to the turbine is through a door at the base of the tower. Service platforms are provided. A ladder provides access to the nacelle and also supports a fall arrest safety system. Interior lights are installed at critical points from the base of the tower to the tower top.

The tower can as an option be equipped with a moving platform, which is capable of transporting people or material up to a certain total weight limit. Specific information is provided on the document describing this option.

2.12 Nacelle

The nacelle houses the main components of the wind turbine generator. Access from the tower into the nacelle is through the bottom of the nacelle. The nacelle is ventilated, and illuminated by electric lights. A hatch provides access to the blades and hub.

2.13 Anemometer, Wind Vane and Lightning Rod

An anemometer, wind vane, and lightning rod are mounted on top of the nacelle housing. Access to these sensors is accomplished through the hatch in the nacelle.

2.14 Lightning Protection

The rotor blades are equipped with lightning receptors mounted in the blade. The turbine is grounded and shielded to protect against lightning; however, lightning is an unpredictable force of nature and it is possible that a lightning strike could damage various components notwithstanding the lightning protection employed in the machine.

2.15 Wind Turbine Control System

The wind turbine machine can be controlled locally either automatically or manually. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA) (purchased separately), with local lockout capability provided at the turbine controller.

Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation, emergency-stop buttons located in the tower base and in the nacelle can be activated to stop the turbine in the event of an emergency.

2.16 Power Converter

The wind turbine uses a power converter system that consists of a converter on the rotor side, a DC intermediate circuit, and a power inverter on the grid side. This allows for variable rotor speed while keeping in synchronization with the grid frequency. The converter system consists of a power module and associated electrical equipment accommodated in the base of the tower or installed on an external skid outside the tower. Variable output frequency of the converter allows variable speed operation of the generator.

3 Technical Data for the 2.5-2.75 Series

3.1 2.5 WTG

3.1.1 2.5-100 m Rotor

Diameter:	100 m
Number of blades:	3
Swept area:	7,854 m^2
Rotor speed range:	4.7 - 14.1 min^{-1}
Rotational direction:	Clockwise viewed from an upwind location
Maximum speed of the blade tips:	73.6 m/s
Orientation:	Upwind
Speed regulation:	Pitch control
Aerodynamic brake:	Full feathering

3.1.2 2.5-103 m Rotor

Diameter:	103 m
Number of blades:	3
Swept area:	8,332 m^2
Rotor speed range:	4.7 – 13.7 min^{-1}
Rotational direction:	Clockwise viewed from an upwind location
Maximum speed of the blade tips:	74.0 m/s
Orientation:	Upwind
Speed regulation:	Pitch control
Aerodynamic brake:	Full feathering

3.2 2.75 WTG

3.2.1 2.75-100 m Rotor

Diameter:	100 m
Number of blades:	3
Swept area:	7,854 m^2
Rotor speed range:	4.7 - 14.8 min^{-1}
Rotational direction:	Clockwise viewed from an upwind location
Maximum speed of the blade tips:	77.4 m/s
Orientation:	Upwind
Speed regulation:	Pitch control
Aerodynamic brake:	Full feathering

3.2.2 2.75-103 m Rotor

Diameter:	103 m
Number of blades:	3
Swept area:	8,332 m^2
Rotor speed range:	4.7 - 14.8 min^{-1}
Rotational direction:	Clockwise viewed from an upwind location
Maximum speed of the blade tips:	79.7 m/s
Orientation:	Upwind
Speed regulation:	Pitch control
Aerodynamic brake:	Full feathering

3.3 Operational Limits

Wind turbine design standard	IEC 61400-1, second edition: 'Wind turbine generator systems'
Height above sea level	Maximum 1000 m with the maximum standard operational temperature of +40 °C (2.5 Series) / +35° C (2.75 Series). Above 1000 m, the maximum operational temperature is reduced per DIN IEC 60034-1 (e.g., maximum operational temperature reduced to +30 °C at 2000 m). For installations above 1000 m isolation distances of medium voltage terminals must also be re-evaluated.
Standard Weather Option (STW)	-15 °C – +40 °C (2.5 Series) / +35° C (2.75 Series) 2.75 Series derates up to 10 % from + 35 °C to + 40 °C
Cold Weather Option (CWE, in preparation for 2.75-103, available for all other types)	-30 °C – +40 °C (2.5 Series) / +35° C (2.75-100) 2.75 Series derates up to 10 % from + 35 °C to + 40 °C
Wind conditions according to IEC 61400-1 (ed. 2) for the standard temperature range	100 m and 98.3 m hub height: 8.0 m/s average wind speed (TC S, B-turbulence) 85 m and 75 m hub height: capable of both 7.5 m/s average wind speed and 8.5 m/s average wind speed (both TC IIb and IIIa TC S, B-turbulence)
Maximum extreme gust (10 min) according to IEC 61400-1 (ed. 2) for the standard temperature range	TC IIIa TC S, B-turbulence: approx. 37.5 m/s TC IIb and TC S, B-turbulence: approx. 42.5 m/s

Design guideline and wind class:
For **2.5-100** m rotor diameter

100 m hub height:	DIBt WZ III, IEC IIIa
98.3 m hub height:	DIBt WZ III, IEC IIIa
85 m hub height:	DIBt WZ II, IEC IIb
75 m hub height:	DIBt WZ II, IEC IIb

Design guideline and wind class:
For **2.5-103** m rotor diameter

100 m hub height:	IEC IIIa
98.3 m hub height:	IEC IIIa
85 m hub height:	IEC IIIa

Design guideline and wind class:
For **2.75-100** m rotor diameter

100 m hub height:	S: 8.0 m/s average wind speed; b-turbulence
98.3 m hub height:	S: 8.0 m/s average wind speed; b-turbulence
85 m hub height:	IEC IIb
75 m hub height:	IEC IIb

Design guideline and wind class:
For **2.75-103** m rotor diameter

98.3 m hub height:	DIBt WZ II, S: 8.5 m/s average wind speed; b-turbulence
85 m hub height:	S: 8.5 m/s average wind speed; b-turbulence

Atmospheric corrosion protection (corrosion categories as defined by ISO 12944-2:1998)					
		Standard		**Enhanced (Option)**	
		Internal	**External**	**Internal**	**External**
Americas	Tower shell	C-2	C-3	C-4	C-5M
	All other components	C-2	C-3	C-2	C-3
Europe	Tower shell	C-4	C-5M		
	All other components	C-2	C-3		

EXHIBIT 3

GE Energy

Commercial Documentation Wind Turbine Generator Systems 2.5-103 - 60 Hz

Product Acoustic Specifications

Canada Specific
Normal Operation according to IEC 61400-11

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GE Energy

Gepower.com

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Table of Contents

1 Introduction

This document defines the noise emission characteristics of the wind turbine series 2.5-103, 60 Hz version, equipped with 103 m rotor diameter (GE 50.2 type blade) operating in normal operation (NO).

General Electric continuously verifies specifications with measurements, including those performed by independent institutes.

The calculated apparent sound power level $L_{WA,k}$ as function of v_{10m} (reference wind speed 10 m above ground level) is provided for **normal operation** (NO) over cut-in to cut-out wind speed range.

The corresponding wind speeds at hub height v_{HH} are provided assuming different standard hub heights and a logarithmic wind profile.

If a wind turbine noise performance test is to be carried out, it needs to be done in accordance with both IEC 61400-11 and GE's "Machine noise performance test" reference guidelines.

Paragraph §2 provides **nominal calculated acoustic performance** for:

- 2.5-103 (60 Hz) calculated apparent sound power level $L_{WA,k}$ as function of v_{10m} and at **95% rated electrical power** per IEC 61400-11.
- 2.5-103 (60 Hz) tonality level $\Delta L_{a,k}$ per IEC 61400-11

Paragraph §3 provides 2.5-103 acoustic performances additional data:

- The wind speeds at reference height v_{10m} extrapolated to v_{HH} (wind speed at hub height)
- Uncertainty information
- IEC 61400-11 and IEC/TS 61400-14 additional information

2 2.5-103 Product Normal Operation Acoustic Performance

2.1 2.5-103 Normal Operation Calculated Apparent Sound Power Level

The Table 1 provides nominal acoustic specifications for 2.5-103 equipped with 103 m rotor diameter (GE 50.2 type blade) and 100 m hub height as function of wind speed v_{10m} (reference wind speed 10 m above ground level), operating at normal operation (NO) per IEC 61400-11 standard and GE's "Machine noise performance test" reference guidelines:

Wind speed at v_{10m} [m/s]	$L_{WA,k}$* Apparent sound power level [dB]
≤ 5	≤ 97.1
5.5	99.7
6	≤ 102.0
6.5	≤ 103.4
7	≤ 104.0
8	≤ 104.0
9	≤ 104.0
10-cut-Out	≤ 104.0

Table 1: Normal operations, 2.5-103 wind turbine, 50.2 m blades (103 m rotor) 100 m hub height, apparent sound power level at wind speed v_{10m}.

At wind speeds lower than 5 m/s the sound power levels decreases, and may get so low that the wind turbine noise becomes indistinguishable from the background noise. For a conservative calculation the data at 5 m/s may be used.

At wind speeds above 9 m/s turbine has reached rated power and the increasing pitch angle decreases the noise level. For a conservative calculation the data at 9 m/s may be used.

The nominal acoustic performances for **2.5-103**, 60 Hz version, equipped with 103 m rotor diameter (GE 50.2 type blade) operating in **normal operation** (NO), specified at **95 % rated electrical power**:

- The calculated apparent sound power level is $L_{WA,k}$ ≤ 104.0dBA.

* $L_{WA,k}$ indicates apparent sound power level per IEC-61400-11 standard measured in dB, A-weighted 10 base logarithmic value of apparent sound power relative to reference sound power of 10^{-12} W.

2.2 2.5-103 Normal Operation Calculated Tonality

The nominal acoustic performance for **2.5-103**, 60 Hz version, equipped with 103 m rotor diameter (GE 50.2 type blade) operating in **normal operation** (NO), specified at reference ground measuring distance R_o measurement position #1 per both IEC 61400-11 and GE's "Machine noise performance test" reference guidelines:

- Tonal audibility $\Delta L_{a,k}$ **< 2 dB**.

3 2.5-103 Product Additional Information

3.1 2.5-103 Wind Speeds at Reference Height extrapolated to Hub Height

The wind speeds v_{10m} at reference height (10 m above ground) can be extrapolated from v_{10m} to v_{HH} (wind speed at hub height), per IEC 61400-01, assuming surface roughness of $z_{0\ ref}$ = 0.05 m typical average condition and using:

$$V_{10m\ height} = V_{hub} \frac{\ln\left(\frac{10m}{z_{0ref}}\right)}{\ln\left(\frac{hub\ height}{z_{0ref}}\right)}$$

Meaning wind speeds from Table 1 can be extrapolated to 100 m hub height using $v_{HH} = v_{10m}$ * 1.43 and to 85 m hub height using $v_{HH} = v_{10m}$ * 1.40 per Table 2.

Wind speed at 10 m reference height v_{10m} [m/s]	Wind speed at 85 m hub height $V_{HH=85}$ [m/s]	Wind speed at 100 m hub height $v_{HH=100}$ [m/s]
≤ 5	≤ 7.0	≤ 7.2
5.5	7.7	7.9
6	8.4	8.6
6.5	9.1	9.3
7	9.8	10.0
8	11.2	11.5
9	12.6	12.9
10-cut-out	13.7-cut-out	14-cut-out

Table 2: Relation between wind speed at reference height v_{10m} and wind speeds at different hub heights v_{HH} for $z_{0\ ref}$ = 0.05 m

3.2 2.5-103 Testing Uncertainty and Product Variation per IEC/TS 61400-14

Per IEC/TS 61400-14, L_{WAd} is the maximum apparent sound power level resulting from *n* measurements performed according to IEC 61400-11 standard for 95 % confidence level: $L_{WAd} = \overline{L_{WA}} + K$, where $\overline{L_{WA}}$ is the mean apparent sound power level from *n* IEC 61400-11 testing reports and **K = 1,645 · σ_T**

The testing standard deviation values σ_T, σ_R and σ_P for measured apparent sound power level are described by IEC/TS 61400-14, where σ_T is the total standard deviation, σ_P is the standard deviation for product variation and σ_R is the standard deviation for test reproducibility.

Assuming σ_R **< 0.8 dB** and σ_P **< 0.8 dB** typical values, leads to calculated **K < 2 dB** for 95 % confidence level.

3.3 IEC 61400-11 and IEC/TS 61400-14 Terminology

- $L_{WA,k}$ is wind turbine apparent sound power level (referenced to 10^{-12}W) measured with A-weighting as function of reference wind speed v_{10m}. Derived from multiple measurement reports per IEC 61400-11, it is considered as a mean value
- σ_P is the product variation i.e. the 2.5-103 unit-to-unit product variation; typically < 0.8 dB
- σ_R is the overall measurement testing reproducibility as defined per IEC 61400-11; typically < 0.8 dB with adequate measurement conditions and sufficient amount of data samples
- σ_T is the total standard deviation combining both σ_P and σ_R
- **K = 1,645** $\cdot \sigma_T$ is defined per IEC/TS 61400-14 for 95 % confidence level
- R_o is the ground measuring distance from the wind turbine tower axis per IEC 61400-11
- $\Delta_{La,k}$ is the audibility according to IEC 61400-11, described as potentially audible narrow band sound

References:

- IEC 61400-1, Wind turbines – part 1: Design requirements, ed. 3, 2005-08
- IEC 61400-11, wind turbine generator systems part 11: Acoustic noise measurement techniques, ed. 2.1, 2006-11
- IEC/TS 61400-14, Wind turbines – part 14: Declaration of apparent sound power level and tonality values, ed. 1, 2005-03
- MNPT – Machine Noise Performance Test, Technical documentation, GE 2007

EXHIBIT 4

GE Energy

Technical Documentation
Wind Turbine Generator Systems
GE 1.5xle - 50 Hz & 60 Hz

Noise emission characteristics

Normal operation
according to IEC

GE imagination at work

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All technical data is subject to change in line with ongoing technical development!

GE imagination at work

Table of Contents

1 Introduction

The noise emission characteristics of the wind turbine series GE 1.5xle with a rotor diameter of 82.5-meter, 50Hz and 60 Hz versions, including Cold Weather Extreme versions, comprise sound power level data, tonality values, and octave band spectra.

This document describes the noise characteristics of the turbine for normal operation. Noise-reduced operating modes are not taken into consideration in this case.

GE continuously verifies specifications with measurements, including those performed by independent institutes.

The sound power level (L_{WA}) is calculated at hub height over the entire wind speed range from cut-in to cut out wind speed. Tabled specifications for L_{WA} are given as a function of hub height wind speed (reference values) together with an uncertainty band.

Also reference L_{WA}-values as a function of wind speed at 10-meter height are provided, assuming different standard hub heights and a logarithmic wind profile according to a surface roughness $z_{0, ref}$ = 0.03m, see section 2.2. Similar characteristics for different combinations of hub height and wind shear profile can be provided upon request.

If a wind turbine noise performance test is carried out, it needs to be done in accordance with the regulations of the international standard IEC 61400-11, ed. 2: 2002 (abstract available upon request).

2 Sound Power Levels

2.1 L_{WA} as a function of hub height wind speed

The following table provides the calculated reference sound power level values as a function of wind speed.

Wind speed at hub height [m/s]	GE 1.5 xle all hub heights L_{WA} [dB]
3	< 96
4	< 96
5	< 96
6	98.8
7	102.3
8	≤ 104
9	≤ 104
10 – cut out	≤ 104

Table 1 Calculated reference sound power level values

2.2 L_{WA} as a function of wind speed at 10m height

Following are tabled values for the L_{WA} as a function of the wind speed at 10-meter height for different hub heights. The wind speed is converted using a logarithmic wind profile, in this case using a surface roughness of z_{0ref} = 0.03m, which is representative for average terrain conditions.

$$V_{10m\ height} = V_{hub} \frac{\ln\left(10m / z_{0ref} \right)}{\ln\left(hub\ height / z_{0ref} \right)}$$ [1]

Characteristics for other combinations of surface roughness and hub height are available upon request.

Wind speed at 10m height [m/s]	GE 1.5 xle 58.7m HH L_{WA} [dB]	GE 1.5 xle 80m HH L_{WA} [dB]	GE 1.5 xle 100m HH L_{WA} [dB]
3	< 96	< 96	< 96
4	96.6	97.2	97.6
5	100.6	101.5	102.2
6	103.7	≤ 104	≤ 104
7 – cut out	≤ 104	≤ 104	≤ 104

Table 2: Reference sound power levels as a function of 10 m wind speed

3 Uncertainty Levels

Mean uncertainty levels for the sound power, or K-factors, are derived from independent measurements. Their value depends on the applied probability level and standard deviation for reproducibility (σ_R), as described in the IEC 61400-14 TS ed. 1[2]. Because the K-factor depends on the quality of the measurements, the number of the measurements, and on local regulations, a fixed value is used to define the uncertainty band with respect to the reference sound power level.

For all 1.5xle turbines an uncertainty band of **K = ± 2.0 dB** is defined.

4 Tonality

At the reference measuring point R_0, a ground distance from the turbine base equal to hub height plus half the rotor diameter, the GE 1.5xle turbine has a value for tonality of **$\Delta L_a \leq 4$ dB**, irrespective of wind speed, hub height, and grid frequency.[3]

[1] Simplified from IEC 61400-11, ed. 2 2002 equation 7

[2] Here referring to the unofficial release of the IEC 61400-14, ed. 1 TS 2004, labeled as 'CDV' (committee draft for voting)

[3] R_0 and ΔL_a are defined here according to IEC 61400-11, 2002

5 Octave Band Spectra

Following is a table with the octave band values at nominal turbine operation, typically corresponding to wind speeds larger than 10 m/s at 10-meter height.
Octave band spectra as a function of smaller wind speed at 10-meter height depend on hub height and surface roughness. Indicative octave band values can be derived using the table below thereby multiplying the tabled values below with the L_{WA} level for a given wind speed at 10-meter height (section 2) and dividing this by 104 dB(A):

Octave Band value ($V_{i,\,10\text{-}m}$) = Octave Band value (nominal operation) L_{WA} ($V_{i,\,10\text{-}m}$) / 104 dB(A).

Note: The octave band spectra are informative only.

Octave [Hz]	**Sound power level [dB]**
63	83.4
125	92.2
250	97.8
500	99.4
1000	97.7
2000	93.4
4000	86.6
8000	84.8
Sum	**104.0**

Table 3: Octave band spectra

CERTIFICATION

I hereby certify that a copy of the foregoing document was delivered by first-class mail and e-mail to the following service list on the 3rd day of December, 2013:

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Paul Corey
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David M. Cusick
Richard T. Roznoy
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and sent via e-mail only to:

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