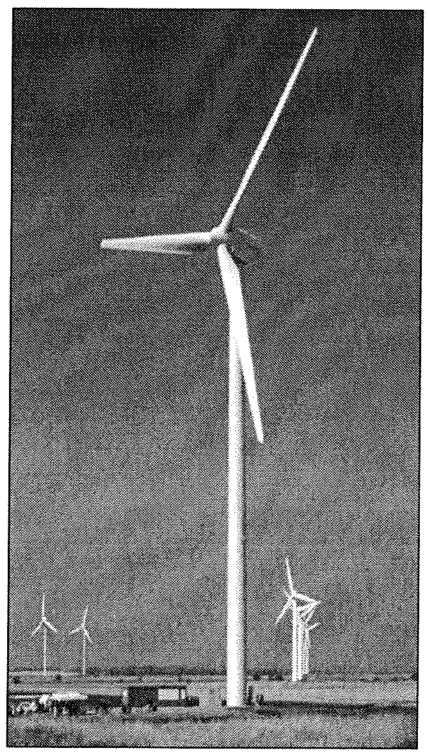
TECHNICAL DESCRIPTION AND SPECIFICATIONS

Wind Turbine Generator System

GE Wind Energy 1.5sle 60 Hz



All technical data are subject to possible alteration due to advancing technical development!

Manufacturer: GE Wind Energy GmbH
Holsterfeld 16
D-48499 Salzbergen

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Tables

Figures

1 Introduction

This document summarizes the technical description and specifications of the GE Wind Energy (GEWE) 1.5sle 60Hz wind turbine generator system. GE Wind Energy (GEWE), a subsidiary of GE Power Systems (GEPS), manufactures this system. The specification is for the model GE Wind Energy 1.5sle 60Hz and is based on the data given in section 3 – Technical Description.

2 Overview multi generation product map

See product map document:
1.5serie_GD_allComp_prodmapx

3 Technical Description of the Wind Turbine and Major Components

The GE Wind Energy 1.5sle 60Hz is a three bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 77 m. The turbine rotor and nacelle are mounted on top of a tubular tower giving a rotor hub height of 64.7 m, 80 m or 85 m respectively. 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 from the speed variable drive train concept (designed to produce nominal 60 Hertz (Hz), 575-volt (V) electric power).

The GE Wind Energy 1.5sle 60Hz 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 Fig. 3.2).

Turbine installation is completed with the mounting of the three-bladed rotor hub to the main shaft after the nacelle assembly has been mounted to the top of the tower.

3 **Technical** Description of the Wind Turbine and Major Components

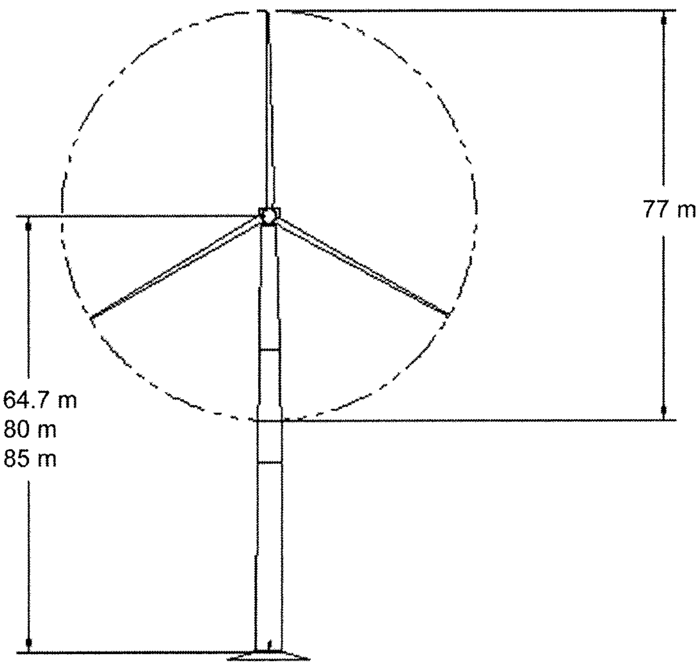


Fig. 3.1: GE Wind Energy 1.5sle 60Hz Wind Turbine Generator

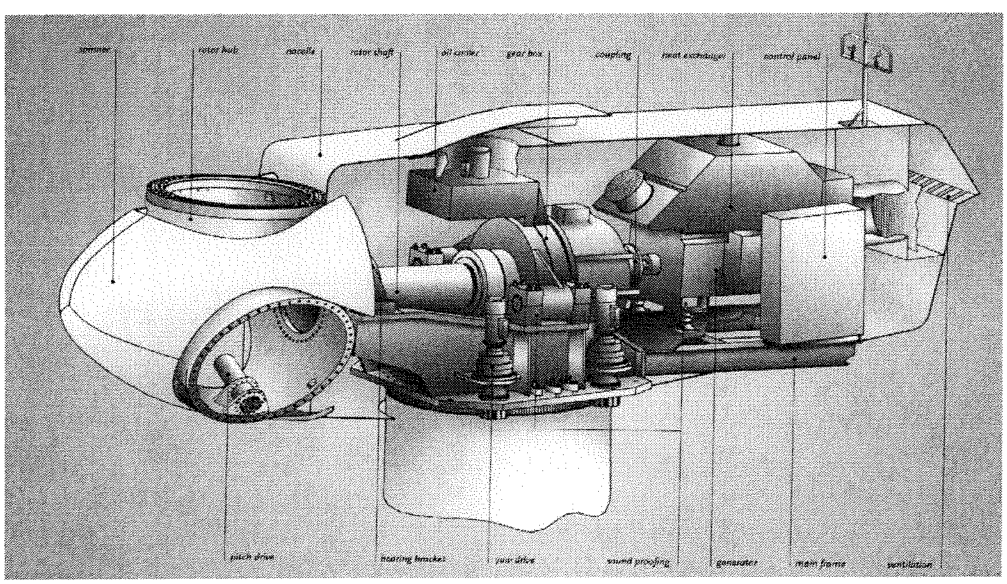


Fig. 3.2: GE Wind Energy 1.5sle 60Hz Wind Turbine Nacelle Layout

3.1 Rotor

The rotor on the GE Wind Energy 1.5sle 60Hz wind turbine is designed to operate in an upwind configuration (blades positioned upwind of the turbine tower) and is comprised of three blades mounted to a cast ductile iron hub.

The rotor diameter is 77 m, resulting in a swept area of 4,657 m^2, and is designed to operate between 10 and 20 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 degrees, with the zero degree 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 degrees accomplishes aerodynamic braking of the rotor; whereby the blades "spill" the wind thus limiting rotor speed.

To give greater clearance between the rotor and the tower, the rotor is tilted upward and away from the tower by approximately 4 degrees and the blades have an effective coning angle of 1.25 degrees.

3.2 Blades

There are three rotor blades used on each GE Wind Energy 1.5sle 60Hz wind turbine. The blades are manufactured from fiberglass epoxy resin and with a smooth layer of gel coat on the outer surface that is designed to provide UV protection and blade color.

The rotor blades use a custom, proprietary family of airfoils that were designed specifically for use on wind turbines. The airfoils are designed to reduce sensitivity to blade-surface roughness caused by insect and dirt build-up seen during normal operation.

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.

3.3 Blade Pitch Control System

The GE Wind Energy 1.5sle 60Hz rotor utilizes three (one for each blade) independent electric pitch motors and controllers to provide adjustment of the blade pitch angle during normal 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 Fig. 3.2).

GEWE'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 windspeed 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 battery packs 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.

3.4 Hub

The hub is manufactured from cast ductile iron and 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 for inspection and service of the electric pitch system and blade mounting hardware.

3.5 Gearbox

The gearbox in the GEWE 1.5sle 60Hz wind turbine is designed to function as a speed increaser and transmit power between the low-rpm turbine rotor and high-rpm electric generator. The gearbox for the 60 Hz version of the GEWE 1.5sle 60Hz is a three-stage planetary/helical gear design with a ratio of gear 1:72. The gearbox is mounted to the machine bedplate with elastomeric elements that are designed to provide vibration damping and noise reduction between the gearbox and bedplate. The gearbox housing is cast from ductile iron and is designed to house the drive train gearing. 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.

3.6 Bearings

The blade pitch bearing is a dual, four-point ball bearing 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 on the GEWE 1.5sle 60Hz is a double-row spherical 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.

3.7 Gearbox Lubrication System

The gearbox has a forced-lubrication system (driven by an electric pump). The fluid capacity of the gearbox is approximately 300 liters (L).

The bearings are force-lubricated by cross flow from individual spray nozzles. Before the oil is pumped through the oil lines, it passes through a filter, a heat exchanger and a pressure reduction valve designed to provide clean oil at the correct pressure to the bearings.

3.8 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 battery bank 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 immediately on certain emergency-stops (E-stops). This brake also prevents rotation of the machinery as required by certain service activities.

3.9 Generator

The generator is a doubly fed induction-generator with wound rotor and slip rings. The generator synchronous speed is 1200 rpm, and a variable frequency power converter tied to the generator rotor allows the generator to operate at speeds ranging from 870 rpm to 1600 rpm. Nominal speed at 1.5 MW power output is 1440 rpm.

The generator meets protection class requirements of the International Standard IP 54 (totally enclosed) and is air-cooled. The generator housing is grounded and an air-to-air thermal exchanger cools the windings under normal operating conditions.

The generator is mounted to the bedplate on elastomeric foundations to reduce vibration and associated noise.

Temperature sensors are built into the generator windings to provide a temperature reading to the wind turbine controller. In the event the generator temperature is outside of the normal operating range, an automatic shutdown of the turbine is initiated if the generator is on-line. Additionally the machine will be unable to start if the windings are below their acceptable operating temperature limit.

3.10 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 3 times limit of the drive train.

3.11 Yaw System

A roller bearing attached between the nacelle and tower facilitates yaw motion. Four 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.

A wind vane sensor mounted on top of the nacelle sends a signal to the turbine controller to evaluate the position of the nacelle with respect to wind direction. Within a specified time interval, the controller activates the yaw drives to align the nacelle to the average wind direction. The yaw drives require electric power to operate.

On the underside of the yaw deck, a cable twist sensor is mounted to provide a record of nacelle yaw position and cable twisting. After the sensor detects 900-degree rotation in one direction (net), the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing of the nacelle, and restarts the wind turbine.

3.12 Tower

The GE Wind Energy 1.5sle 60Hz wind turbine is mounted on top of a tubular tower, putting the wind rotor hub height at 64.7 m, 80 m and 85 m depending on the configuration.The tubular tower is tapered and manufactured in three or four 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.

3.13 Nacelle

The nacelle of the GEWE 1.5sle 60Hz turbine is constructed of fiberglass and lined with sound-insulating foam (see Fig. 3.2). This sound insulating foam helps reduce acoustic emissions from the wind turbine.

Access from the tower into the nacelle is through a manhole in the bedplate, which is located beneath the wind rotor main shaft.

The nacelle is ventilated and illuminated with electric lights and a skylight hatch.

A hatch at the front end of the nacelle provides access to the blades and hub. When the rotor is stopped and secured in position with a hydraulic rotor lock, the interior of the hub can be accessed through one of three hatches located in the rotor spinner.

3.14 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.

3.15 Lightning Protection

The rotor blades are equipped with a strike sensor mounted in the blade tip. Additionally a solid copper conductor from the blade tip to root provides a grounding path that leads to the grounding system at the base of the tower foundation (see Fig. 9.1). 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.

3.16 Wind Turbine Control System

The GEWE 1.5sle 60Hz wind turbine machine can be controlled automatically or manually from either the control panel located inside the nacelle or from a personal computer (PC) located in 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.

Using the tower top control panel, the machine can be stopped, started, and turned out of the wind. 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.

Under partial load, the blade pitch angle is held constant and the rotor speed is controlled by the generator/converter control system. Once the rated wind speed is reached, the rotor blades operate in a servo mode whereby turbine power output and rotor speed are controlled by varying the blade pitch angle in combination with the generator/converter torque/speed control system.

3.17 Power Converter

The GEWE 1.5sle 60Hz 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. Altogether this complete system functions as a pulse-width-modulated converter in 4-quadrant operation.

The converter system consists of an insulated gate bipolar transistor (IGBT) power module and the associated electrical equipment. Variable output frequency of the converter allows a rotational speed-module operation of the generator within the range of 870 rpm to 1600 rpm.

3.18 Grid Connection Requirements

See Electrical Grid Data Document:
1.5serie_60Hz_EGD_allComp_xxxxxxxx

3.19 Electrical Configuration

The electrical configuration for the GE Wind Energy 1.5sle 60Hz wind turbine generator is given in Fig. 3.3 below:

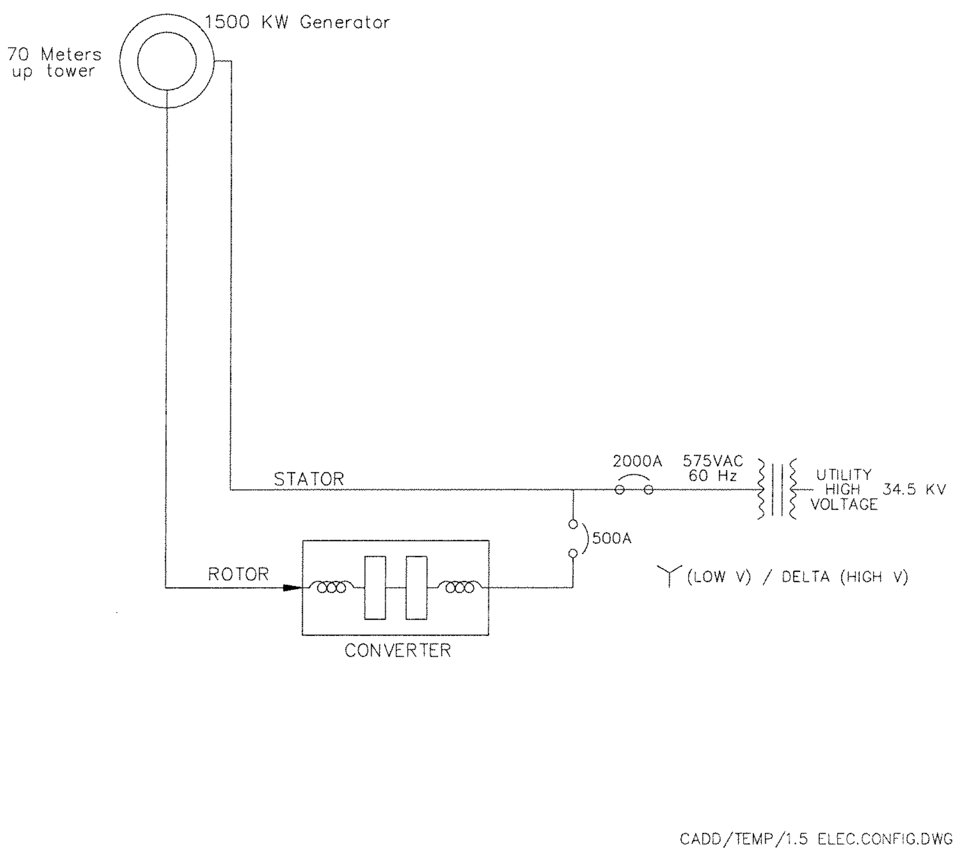


Fig. 3.3: Electrical Configuration

4 Technical Data GE Wind Energy 1.5sle 60Hz Wind Turbine

See Technical Data Document:
1.5sle60H_TD_allComp_xxxxxxxx

5 Operational limits

5.1 Operational Temperature Range

GEWE 1.5sle – Standard (former CWL version)	GEWE 1.5sle – Cold Weather Extreme Option (CWE)
+45° to –20° C	+45° to –30° C

Table 5.1: Operational Temperature Range

5.2 Survival Temperature

GEWE 1.5sle – Standard (former CWL version)	GEWE 1.5sle – Cold Weather Extreme Option (CWE)
+50° to –20° C	+50° to –40° C

Table 5.2: Survival Temperature

5.3 Survival Extreme Wind Velocity

GEWE 1.5sle – Standard (former CWL version)	GEWE 1.5sle – Cold Weather Extreme Option (CWE)
@ -10° = 55 m/s @ -20° = 52.5 m/s	@ –10° C = 55 m/s @ –40° C = 52.5 m/s

Table 5.3: Survival Extreme Wind Velocity

6 Powerperformance and Cut in / out wind speed

See Power Curve Document:
1.5sle_PCD_allComp_GE37cxxx

7 Acoustic Performance

104.0 dB(A) according to: IEC 61400-11: 1998 Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques

1.5s 50 Hz document is also relevant for the 1.5sle 60 Hz turbines since the blade tip speed are identical on both turbine variants. The blade tip speed is the key driver concerning noise emission.

See Sound Capacity Document:
1.5s_SCD_allComp_slpxxxxx

8 Electrical Interconnect Specifications

Section 8 provides information intended to assist in evaluating how the GEWE 1.5sle 60Hz wind turbine integrates with the grid electrical system.

8.1 GEWE 1.5 MW Turbine Generator Configuration

The GEWE 1.5sle 60Hz turbine has the capability of operating at leading or lagging power factor and is equipped with a doubly fed (wound rotor) asynchronous (induction) generator with slip rings and an AC-DC-AC electronic power converter.

8.2 Selectable Power Factor

The Standard GEWE 1.5sle 60Hz Wind Turbine is designed with a selectable power factor. At 1.0 pu voltage (575 V) and full power (1500 kW), a power factor of 0.95 overexcited (reactive power delivered by the wind turbine) to 0.90 underexcited (reactive power absorbed by the wind turbine) is possible. The power factor is settable at each WTG or by the wind farm SCADA system.

8.3 WINDVAR

Dynamic voltage control, commonly referred to as WindVAR, controls the wind plant's power factor or voltage. WindVAR is a high-speed closed loop controller that adjusts each WTG's reactive power output to control either the collective power factor or overall voltage at the wind farm. WindVAR optimizes local system conditions to improve plant reliability and availability. WindVAR can be customized to meet the local utility demands.

8.3.1 Closed Loop VAR Regulator

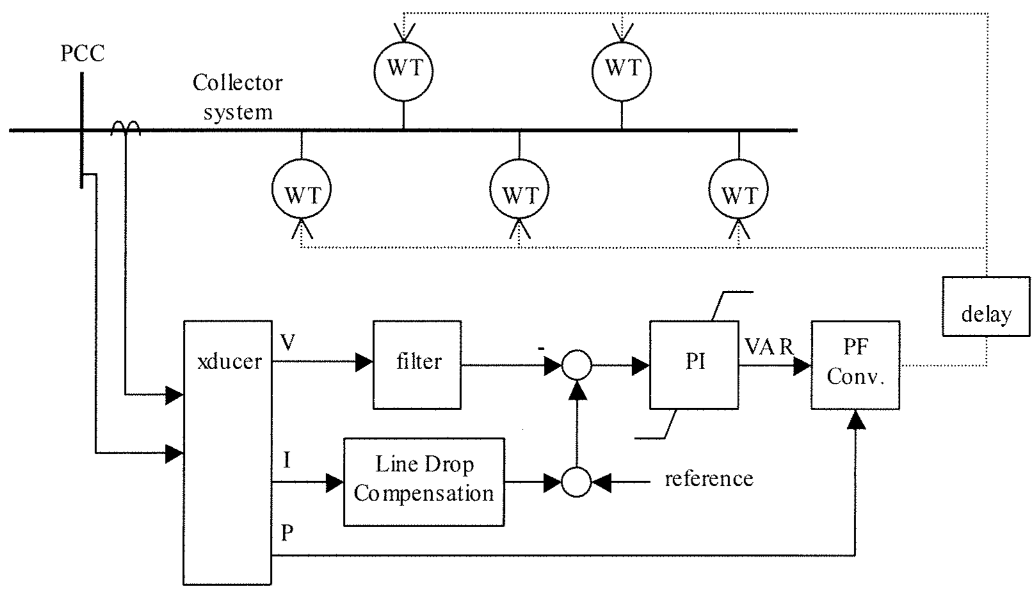


Fig. 8.1: Closed Loop VAR Regulator

A closed loop voltage regulator is implemented at the point of coupling (PCC) with the utility. Measured voltage is compared with a reference signal and the error is applied to a non-windup PI regulator. The desired windfarm VAR output is converted to a power factor set point communicated to the individual wind turbines (WT). Optional additional features include line drop compensation based on measured current at the PCC and a VAR boost function implemented at each WT. VAR boost will override watts production to deliver more VARs during emergency under-voltage conditions.

Document: 1.5sle60H_GD_allComp_xxxxxxxx
Originator: Ulrich Uphues
Revision: 00

Filter	Measurement and I/O delay. Represent as simple 10ms lag.
PI – regulator	Lead term set to cancel the regulator delays roughly 40ms. Gain set for a closed loop response to meet utility needs. One-second response is common.
Delay	Communication, I/O and turbine response. Represent as simple 40 – 60 ms lag.
Line-drop comp.	Typically I*X (reactive current times system reactance) where X is provided by the utility.

Table 8.1: Closed Loop Voltage Regulator Parameters

Filter: Power Serve Power meter measures at ¼ cycle

PI Regulator: Gains Kp Ki, to be determined based on Transmission system characteristics.

Delay: 40 to 60 ms

Line Drop Compensation: To be determined, based on transmission system parameters. Power factor command is sent in terms of Phi. Phi command is sent to Wind turbine generator Converter Control Unit (CCU). The CCU measures the real power and uses the commanded phi signal to compute Q. Q = tan (phi)*P. Internal CCU computation is at 4800 Hz.

8.3.2 Open Loop VAR Regulator

An open loop regulator is implemented at the point of coupling (PCC) with the utility. The objective is to generate VARs that follow a specified VAR/Watt curve. The curve is calculated off-line to provide a desired voltage profile at some point in the utility system. The desired wind farm VAR output is converted to a power factor set point communicated to the individual wind turbines (WT). In addition a VAR boost function can be implemented at each WT. VAR boost will override watts production to deliver more VARs during emergency under voltage conditions.

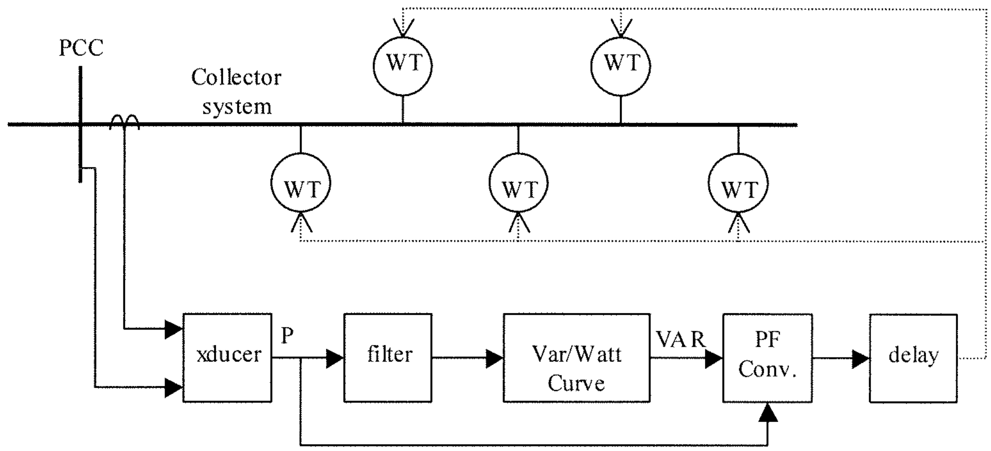


Fig. 8.2: Open Loop VAR Regulator

Filter	Measurement and I/O delay. Represent as simple 10ms lag.
Var/Watt Curve	Desired profile determined by the utility in off-line studies.
Delay	Communication, I/O and turbine response. Represent as simple 30ms lag.

Table 8.2: Open Loop VAR Regulator Parameters

8.4 Harmonics & IEEE-519

The GEWE 1.5sle 60Hz wind turbine is designed to produce power with current harmonics (based on the full load current) that are below the standard set forth in IEEE-519.

8.5 Input Parameters for Power System Studies

GEWE will assist customers and utilities in the electrical modeling of the GEWE 1.5sle 60Hz wind turbine generator system to determine the impact on utility power systems.

9 Lightening Protection/Grounding

9.1 System Grounding Requirements

The grounding system installed, as part of the wind turbine foundation pad must be designed to meet local conditions and regulations. The same grounding system is utilized for lightning protection.

A resistance to neutral earth of 2 ohms or less is preferred, and a 50 kA surge protector is provided as standard equipment in the low voltage distribution cabinet of the GEWE 1.5sle 60Hz wind turbine.

If the ground resistance is between 2-5 ohms, the addition of a 100 kA (min) surge protector at the low voltage side of the transformer is strongly recommended as part of the Owner's balance of plant obligation.

If ground resistance is more than 5 ohms, GEWE requires the addition of a 100 kA surge protector at the low voltage side of the transformer.

9.2 1.5 MW WTG and 1750 kVA Transformer Grounding System

The grounding system of the wind turbine generator must be connected to the grounding system of the transformer.

Local soil conditions and resistivity must be considered in the installation of the grounding system as noted in section 9.1 above. The ground grid must be made of closed ring conductor and connected to ground rods using CadWeld connectors. If ground resistance is not sufficiently low, the grounding system must be improved. In many cases this improvement may be accomplished by adding two ground rods at a time and spaced equally around the perimeter of the ring conductor.

The grounding system, at a minimum, is made of 250 kCM bare copper and 5/8" diameter-8' ground rods. Ring conductor must be installed 30" below ground level and approximately 18" from the foundation. Ground rods must be equally spaced around the perimeter of the ring conductor at approximately

24" from it. The 250 kCM ground conductor must be extended to the transformer at approximately 12" from the transformer pad. Two ground rods must be connected to the ground conductor at 26" apart. The H0 and X0 terminals of the transformer must be connected to the ground through the grounding pad at the high-voltage and low-voltage compartments respectively.

The lightning protection/grounding for the GE Wind Energy 1.5s 60Hz turbine is a function of site specific requirements and local state, federal electrical codes and requirements.

GEWE provides the lighting protection / grounding hardware from the blade tips to the base of the tower (Fig. 9.1). The grounding system from the transformer and tower foundation is the Owner's obligation.

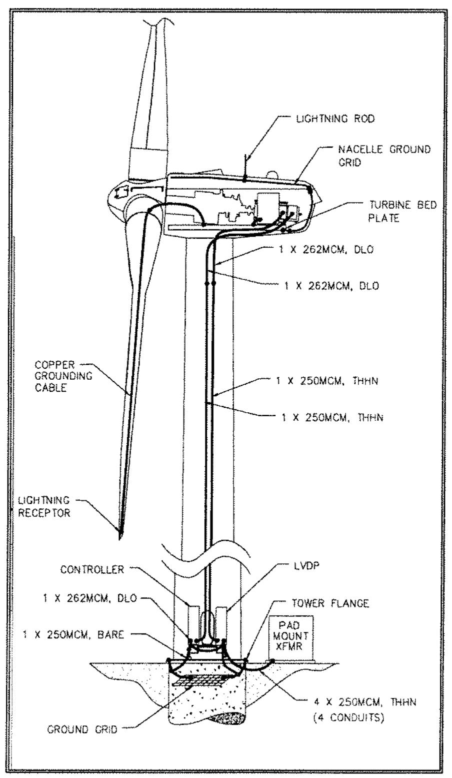


Fig. 9.1: Lightning Protection and Grounding Illustration

10 Dynamic Model

The GEWE wind turbine should not be modeled as a synchronous generator. Additionally, the generator acts as a traditional induction generator only when the crowbar operates thus short circuiting the converter.

The generator is a doubly-fed induction generator with a power converter interfacing the rotor to the grid.
A detailed dynamic model of the GEWE 1.5 MW, 60 Hz wind turbine is currently available in PSLF V.13/14 (from GE Power Systems Energy Consulting, PSEC) and PSS/E V.28/29 (from Power Technologies, Inc., PTI). Users with current licenses of the respective software should have access to this model.
The model characterizes the prime mover (turbine, blade pitch and shaft) and the generator, converter, controls and protection.

11 Special optional features

11.1 Cold weather adaptations

See Cold weather adaptations document:
1.5serie_GD_allComp_CWxxxxxx

11.2 LVRT – Low Voltage ride through

See Low Voltage ride through document:
1.5serie_60Hz_GD_allComp_LVRTxxxx

11.3 Condition monitoring

See Condition monitoring document:
1.5serie_GD_CMS_xxxxxxxx

Change List

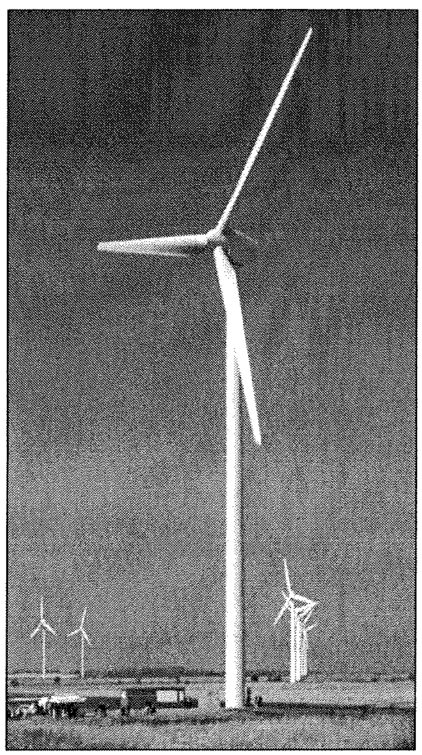
Document	Rev.	Release Date (d/m/y)	Affected Pages	Change
1.5sle60H_GD_allComp_xxxxxxxx	00	10/10/2003	all	New document

Prepared by:	10/10/2003	Christoph Rex	[signature]
	Date (d/m/y)	Name	Signature
Approved by:	10/10/2003	Ulrich Uphues	[signature]
	Date (d/m/y)	Name	Signature (system integration leader)

TECHNICAL DATA

Wind Turbine Generator System

GE Wind Energy 1.5sle 60 Hz



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All technical data are subject to possible alteration due to advancing technical development!

Manufacturer: GE Wind Energy GmbH
Holsterfeld 16
D-48499 Salzbergen

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Tables

1 Rotor

Diameter	77 m
Number of blades	3
Swept area	4657 m^2
Rotor speed range	10 – 20 rpm
Rotational direction	Clockwise looking downwind
Nominal tip speed	73.8 m/s
Orientation	Upwind
Speed regulation	Pitch control
Aerodynamic brakes	Full feathering
Rotor shaft uptilt	4 degrees

Table 1: Rotor

2 Blades

Airfoils	GEWE design and LM 37
Material	Fiberglass and epoxy resin

Table 2: Blades

3 Pitch System

Principle	Independent blade pitch control
Actuation	Individual electric drive
Back up	Battery pack
Pitch drives	Planetary gearbox, DC motor
Pitch Bearing	Dual 4-point ball bearing

Table 3: Pitch System

4 Hub

Material	Cast ductile iron
Type	Rigid
Corrosion protection	Sandblasted & multi-layer coated

Table 4: Hub

5 Drivetrain

Three-stage planetary helical gear combination	
Mechanical power	1660 kW
Gear ratio	1:72
Cooling	Oil pump with oil cooler
Fluid capacity	300 Liters (approx.)
Operation speed	800 – 1600 rpm
Operation speed at rated power	1440 rpm

Table 5: Drivetrain

6 Generator

Doubly fed asynchronous generator with slip rings	
Rated power	1500 kW
Rated Speed	1440 rpm
Rated voltage	575 V
Rated frequency	60 Hz
Power factor	0.95 overexcited (reactive power delivered by the wind turbine) to 0.90 underexcited (reactive power absorbed by the wind turbine) at 1.0 pu voltage (575 V) and full power (1500 kW).
Protection class	Totally enclosed, IP54
Insulation class	F
Synchronous speed	1200 rpm
Cooling system	Air-to-air cooled
Protection Class	IP 54

Table 6: Generator

7 Converter

Type	2 x 4 Q with DC voltage bus bar
Control	pulse width modulation
Power stacks	IGBT 1700 V
Protection Class	IP 54

Table 7: Converter

8 Tower

Type	Tubular steel
Sections	3 (for 64.7m), 4 (for 80 m); 4 (for 85m)
Heights (hub height)	64.7 m, 80.0 m and 85 m

Table 8: Tower

9 Brake System

Primary brake system	Individual blade pitch (battery backup)
Emergency brake	Hydraulic-applied disc brake mounted on the gearbox high-speed shaft

Table 9: Brake System

10 Yaw System

Number of yaw drives	4
Actuation	Electrical
Yaw rate	0.5 degree / sec
Motor type	Asynchronous, 6 pole, and 1200 rpm
Voltage / frequency	575 VAC / 60 Hz

Table 10: Yaw System

11 Wind turbine control

Type	Bachmann integrated controller
Protection Class	IP 20

Table 11: Wind turbine control

12 Operational Limits

Height above sea level	max. 1000 m
Minimum temperature operational / survival	-20°C / -20°C
Minimum temperature with CWE option operational / survival	-30°C / -40°C
Maximum ambient operation / survive temperature	+45°C / +50°C
Wind conditions acc. IEC s	8.5 @ 18% turbulence
Maximum extreme gust (3 s)	55 m/s

Table 12: Operational limits

Change List

Document	Rev.	Release Date (d/m/y)	Affected Pages	Change
1.5sle60H_TD_allComp_xxxxxxxx	00	10/10/2003	all	New document

Table 13: Change List

	Date (d/m/y)	Name	Signature
Prepared by:	10/10/2003	Christoph Rex	
Approved by:	10/10/2003	Ulrich Uphues	(system integration leader)