SECTION 27

Public Safety

Section 27. Public Safety

A. Narrative.

The proposed project will include the installation of five Vestas V136-4.0 MW turbines. Attached is information provided by Vestas which attests to the safety standards of their WTG equipment. This includes information pertaining to overspeed controls See Exhibit 27.1.

The site plans included in this application demonstrates the safety setback zones for each WTG.

Also attached is the safety policy from Cianbro, who will be the general contractor for the project (Exhibit 27.2).

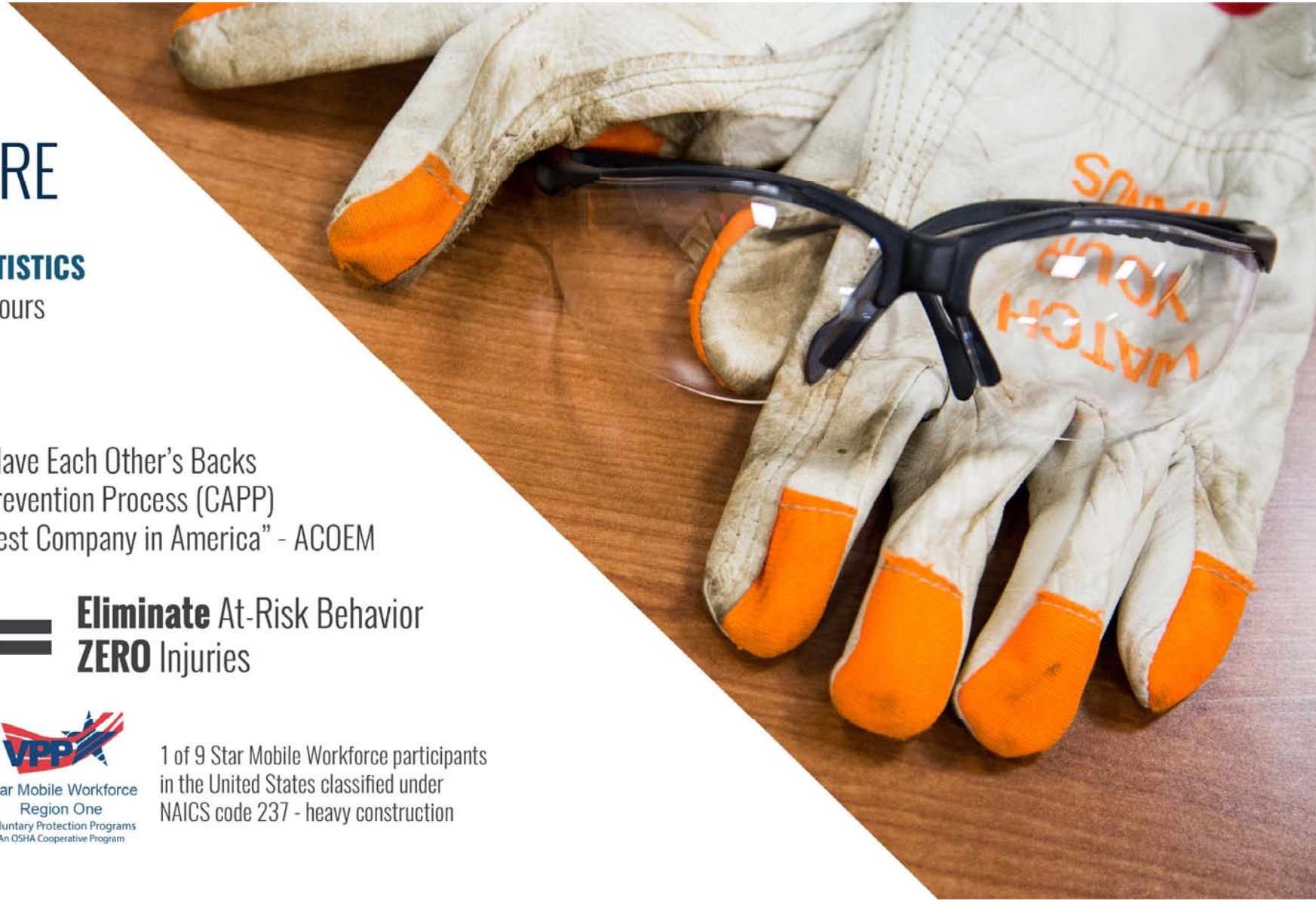
Exhibit 27.1

Exhibit 27.1

SECTION 5
SAFETY

CIANBRO

SAFETY CULTURE



2018 SAFETY STATISTICS

> 5.7 million work hours
RIR 0.90
EMR 0.51

Beyond Zero - We Have Each Other's Backs
Cianbro Accident Prevention Process (CAPP)
"Healthiest and Safest Company in America" - ACOEM

GOALS = **Eliminate** At-Risk Behavior
ZERO Injuries

2017 PINNACLE RECIPIENT ABC WINNER 28th Annual Excellence in Construction Awards NATIONAL SAFETY EXCELLENCE AWARDS

VPP Star Mobile Workforce Region One
Voluntary Protection Programs
An OSHA Cooperative Program

1 of 9 Star Mobile Workforce participants in the United States classified under NAICS code 237 - heavy construction

Safety Policy

Cianbro team members deserve a work environment that is free from injuries, illnesses, and at-risk behaviors.

We will attain our goal of eliminating at-risk behaviors and achieving zero injuries by having each other's backs. We believe that teamwork is required to achieve a safe working environment.

All Cianbro managers are expected to provide an injury/illness free workplace for all team members and subcontractors. Supervisors must hold all team members, subcontractors and vendors accountable to high performance standards.

Action Items:
The following minimum action items have been established:

(1) Report all near misses daily. Expect your team to report near misses to you. This information, when acted upon, will improve our overall safety performance.

(2) Measure performance and progress towards our ultimate goal and develop improvement initiatives to be implemented.

(3) Use activity planning, frequent inspections of all work activities by competent persons, and other hazard recognition tools to identify and mitigate hazards.

(4) Implement a "Safety Health Awareness Raises Excellence" (SHARE) committee at all work locations. Focus on improving the overall project/department safety processes to include eliminating, isolating or controlling physical and environmental hazards, injury management activities, eliminating at-risk behaviors, promoting wellness initiatives, community involvement, and team member morale, etc.

(5) Support CAPP (Cianbro's Accident Prevention Process) at each project by allowing adequate time for team members to complete observations and provide immediate feedback to those observed.

(6) Train each team member appropriately before starting a new work assignment. This training will, at a minimum, include workplace orientation, team member mentoring, care and use of personal protective equipment, and lastly specific activity planning instructions including recognition and mitigation of hazards. In addition, team members must be qualified to properly operate tools and/or equipment in order to complete their work safely. Supervisors must ensure that new team members are partnered with experienced team members to help them work safely.

(7) Provide immediate medical attention from an established health care clinic or hospital to every injured team member.

(8) Investigate all accidents, injuries, at-risk behaviors, and near misses to find root causes. The results of the investigation will be used and communicated to prevent future occurrences.

(9) Pre-qualify subcontractors based on their safety performance and hold them accountable to comply with all federal, state, local, and Cianbro requirements. Monitor their safety performance and ensure that all injuries are investigated, documented and reviewed by project management.

We will communicate the Cianbro Safety Program to all Cianbro team members with innovation and effectiveness, while holding team members accountable to follow established safety initiatives.

The corporate, business unit/market and project safety managers will assist the project teams in developing, implementing, and monitoring their compliance with all safety programs, policies, and procedures.

CIANBRO

Health, Safety and Environmental Program Overview Index

Attachments (Click Here)

Beyond Zero Safety Reviews

Cianbro Accident Prevention Process (CAPP) Card

Counseling Report

Daily Activity Plan

First Report of Incident

Hazard Hunt Card

Hazardous Materials and Hazardous Waste Handbook

Health and Safety Recognition Policy

Incident Investigation Policy

Injury Management Policy

Lesson Learned Form

Life Saving Absolutes Policy

Progressive Discipline Policy

Project Environmental Plan

Project Management Plan (PMP) Outline

Recognition Report

Safety Inspection X-ray Program

Safety Monthly Topics Calendar

Safety Policy and Procedure Index

Safety Specialist's Job Responsibilities and Expectations

Subcontractors Best Practices at Jobsites Policy

Wellness Program Brochure

Work Activity Planning Policy

CIANBRO ACCIDENT PREVENTION PROCESS

CAPP

THE KEY TO SUCCESS

Overview

Cianbro implemented the Cianbro Accident Prevention Process (CAPP) program in 1997 as a behavior-based safety process that provides all team members with the opportunity to participate in safety improvement by performing observations that identify both safe and at-risk behavior in everyday work activities.

Vision

Continually improve our safety culture through management support of an employee owned and operated behavioral observation and feedback process that provides leadership and direction towards our goal of zero workplace injuries.

Mission

Implement Cianbro's Accident Prevention Process (CAPP) into our safety program to create an environment of safe behaviors that will result in zero workplace injuries.

Objectives

Identify safe and at-risk behaviors by observing work in progress

Provide immediate feedback to the person doing the work on what was observed safe and at-risk

Discuss alternatives to any at-risk behaviors to determine barriers that may exist to safely perform the work

Collect data to use in problem solving potential solutions

Develop action plans to eliminate barriers that may exist

Implement action plans and start the process over again

CIANBRO

DNV·GL

CONFORMITY STATEMENT

Statement No.:
DE-DNVGL-SE-0074-04979-0

Issued:
2019-06-07

Issued for:

Design Evaluation

of

Vestas V136-4.0 MW / V136-4.2 MW

Specified in Annex 1

Issued to:

Vestas Wind Systems A/S

Hedeager 42
8200 Aarhus N
Denmark

According to:

DNVGL-SE-0074:2018-01 Type and component certification of wind turbines according to IEC 61400-22

Based on the document:
ER-DE-DNVGL-SE-0074-04979-0 Evaluation Report, dated 2019-06-07

Changes of the system design are to be approved by DNV GL.

Hellerup, 2019-06-07

For DNV GL Renewables Certification

Bente Vestergaard
Service Line Leader Type Certification

DAkkS Deutsche Akkreditierungsstelle D-ZE-11053-01-00

By DAkkS according DIN EN IEC/ISO 17065 accredited Certification Body for products. The accreditation is valid for the fields of certification listed in the certificate.

Hamburg, 2019-06-07

For DNV GL Renewables Certification

Ramakrishna Parasarampuram
Project Manager

DNV·GL

CONFORMITY STATEMENT – ANNEX 1

Basic standard	IEC 61400-1 ed. 3 + A1
General	
Wind Turbine class	IEC 2B (V136-4.0 MW) IEC S (V136-4.2 MW)
Power regulation	pitch-controlled
Rotor orientation	Upwind
Rotor tilt	6.0°
Cone angle	4.0°
Rated power	4000 kW / 4200 kW
Rated wind speed v_r	10.7 m/s (V136-4.0 MW) 11.0 m/s (V136-4.2 MW)
Rotor diameter	136 m
Hub height(s)	112 m
Hub height operating wind speed range v_{in} - v_{out}	3 – 27 m/s (HWO disabled) 3 – 32 m/s (HWO enabled)
Design life time	20 years
Software version	2017.09.126
Wind conditions	
Turbulence intensity I_{ref} at v_{hub} = 15 m/s	0.14
Annual average wind speed at hub height v_{ave}	8.5 m/s (V136-4.0 MW) 8.0 m/s (V136-4.2 MW)
Reference wind speed v_{ref}	42.5 m/s
Mean flow inclination	8°
Hub height extreme wind speed v_{e50}	59.5 m/s
Electrical network conditions	
Normal supply voltage and range	720 V 19.1-36 kV ± 10 %
Normal supply frequency and range	50 or 60 Hz ± 6 % Hz
Voltage imbalance	IEC 61000-3-6 TR max 2 %
Maximum duration of electrical power network outages	Two 3 months periods
Number of electrical network outages	Max 52 per year
Other environmental conditions	
Standard temperature ranges	Normal: -20°C to +40°C* Extreme: -20°C to +50°C (*de-rating strategy above +30°C for V136-4.0 MW *de-rating strategy above +20°C for V136-4.2 MW)
Relative humidity of the air	100% (max 40% of time) and 90% (rest of life time)
Air density	1.225 kg/m^3 (for normal operation) 1.273 kg/m^3 (for low temperature operation)
Solar radiation	1000 W/m^2
Description of lightning protection system	Designed acc. to IEC 61400-24, Protection Level 1 and IEC 61312-1

DNV·GL

CONFORMITY STATEMENT – ANNEX 1

Major components

Blade	Type	Hybrid/Infused
	Manufacturer	Vestas
	Material	Hybrid: Glass fibre pre-preg / dry glass "hybrid" and pvc core with Carbon and T pultrusions Infused: dry glass together with Carbon and T pultrusions
	Blade length	66.65 m
	Air brake	3
	Drawing / Data sheet / Part no.	V136 blade: 0055-0068 Rev. 6 Aero add-ons: 0059-6671, Rev. 0 – V136 STE kit 0056-5767, Rev. 1 - V136 Vortex Generator Assembly
Blade bearing	Type	Double row four-point contact ball bearing
	Manufacturer	Laulagun/Rollix/Liebherr/TMB
	Drawing / Data sheet / Part no.	29058368, Rev.1
Pitch system	Type	Hydraulic power unit
	Manufacturer	LJM/Glual/Hine/Liebherr
	Hydraulic Cylinder (140/90x922)	29060554, Rev. 2
	Type	Pitch Actuation Module
	Manufacturer	Vestas Wind Systems A/S
	Drawing / Data sheet / Part no.	29113714, Rev.1
Main shaft	Type	Cast iron
	Material	EN-GJS-500-14
	Drawing / Data sheet / Part no.	29085300, Rev. 4
Main bearing	Type	Spherical Roller Bearing
	Manufacturer	SKF/FAG
	Drawing / Data sheet / Part no.	SKF - 240/950 CA/C3LW 33VQ113 FAG - F-582562.PRL-WPO
Gearbox	Type	2 stage planetary and helical stage gearbox
	Manufacturer	ZF (EH1052A)
	Gear ratio	1:137
	Drawing / Data sheet / Part no.	096-EH1052A001, Rev. A
Yaw system	Drive type	8 x 2.7 kW, 400 V, 50 Hz asynchronous motors
	Drive manufacturer	Lafert
	Drawing / Data sheet / Part no.	MZ10/A4A-55337
	Drive type	8 x 3.2 kW, 400 V, 60 Hz

DNV·GL

CONFORMITY STATEMENT – ANNEX 1

		asynchronous motors
	Drive manufacturer	Lafert
	Drawing / Data sheet / Part no.	MZ10/A4A-55338
	Drive type	8 x 2.7 kW, 400 V, 50 Hz asynchronous motors
	Drive manufacturer	ABB
	Drawing / Data sheet / Part no.	3GZF500810-23 A 14 AA 100 A
	Drive type	8 x 3.2 kW, 400 V, 60 Hz asynchronous motors
	Drive manufacturer	ABB
	Drawing / Data sheet / Part no.	3GZF500810-23 A 14 AA 100 A
	Drive type	8 x 2.7 kW, 400 V, 50 Hz asynchronous motors
	Drive manufacturer	Bonfiglioli
	Drawing / Data sheet / Part no.	CD00006614-02
	Drive type	8 x 3.2 kW, 400 V, 60 Hz asynchronous motors
	Drive manufacturer	Bonfiglioli
	Drawing / Data sheet / Part no.	CD00007013-01
	Gear type	Bevel stage and three planetary stages, i = 952.3
	Gear manufacturer	Bonfiglioli
	Drawing / Data sheet / Part no.	I7090T010300
	Gear type	Bevel stage and three planetary stages, i = 935
	Gear manufacturer	Comer
	Drawing / Data sheet / Part no.	N07297_01
	Bearing type	Preloaded sliding bearing, PETP pads
	Bearing manufacturer	Vestas Wind Systems A/S
	Drawing / Data sheet / Part no.	29104726, Rev. 0
Generator	Type	DASG 560/6M, Induction generator
	Manufacturer	Vestas Nacelles Deutschland (VND)
	Rated power	4450 kW
	Rated frequency	74 Hz
	Rated speed	1485 rpm
	Rated voltage	800 V
	Rated current	3650 A
	Insulation class	H
	Degree of protection	IP54

DNV·GL

CONFORMITY STATEMENT – ANNEX 1

Converter	Type	Full quadrant IGBT
	Manufacturer	Vestas Wind Systems A/S
	Rated voltage machine/grid	720 Vrms / 800 Vrms
	Rated current	3200 A
	Degree of protection	IP54
	Drawing / Data sheet / Part no.	0069-2805, Rev. 0
Transformer	Type	Cast-Resin transformer 4GY6781-1EY
	Manufacturer	Siemens
	Rated voltage	33 / 0.72 V
	Degree of protection	IP00
	Drawing / Data sheet / Part no.	0073-7914, Rev. 0
	Type	Cast-Resin transformer DTTH1N 4000/30
	Manufacturer	SGB
	Rated voltage	33 / 0.72 V
	Degree of protection	IP00
	Drawing / Data sheet / Part no.	0073-7915, Rev. 0
Tower	Type	Conical steel
	Number of sections	5
	Length	109.60 m (HH 112 m)
	Drawing / Data sheet / Part no.	0072-0565, Rev. 0
Manuals	O&M manual	0040-6996, Rev. 14
	Transport manual	0040-6996, Rev. 14
	Installation / Commissioning manual	0040-6996, Rev. 14

6.8 Lights

The turbine is equipped with lights in the tower, nacelle and hub.

There is emergency light in case of the loss of electrical power.

6.9 Emergency Stop

There are emergency stop buttons in the nacelle, hub and bottom of the tower.

6.10 Power Disconnection

The turbine is equipped with breakers to allow for disconnection from all power sources during inspection or maintenance. The switches are marked with signs and are located in the nacelle and bottom of the tower.

6.11 Fire Protection/First Aid

A handheld 5-6 kg CO_2 fire extinguisher, first aid kit and fire blanket are required to be located in the nacelle during service and maintenance.

- A handheld 5-6 kg CO_2 fire extinguisher is required only during service and maintenance activities, unless a permanently mounted fire extinguisher located in the nacelle is mandatorily required by authorities.
- First aid kits are required only during service and maintenance activities.
- Fire blankets are required only during non-electrical hot work activities.

6.12 Warning Signs

Warning signs placed inside or on the turbine must be reviewed before operating or servicing the turbine.

6.13 Manuals and Warnings

The Vestas Corporate OH&S Manual and manuals for operation, maintenance and service of the turbine provide additional safety rules and information for operating, servicing or maintaining the turbine.

7 Environment

7.1 Chemicals

Chemicals used in the turbine are evaluated according to the Vestas Wind Systems A/S Environmental System certified according to ISO 14001:2004. The following chemicals are used in the turbine:

- Anti-freeze to help prevent the cooling system from freezing.
- Gear oil for lubricating the gearbox.
- Hydraulic oil to pitch the blades and operate the brake.
- Grease to lubricate bearings.
- Various cleaning agents and chemicals for maintenance of the turbine.

**The control system includes: the turbine controller (VMP8000), HV switchgear functions, and remote control system.*

***Requires upgrade of the 230V UPS for control system with extra batteries.*

****Requires upgrade of the 230V UPS for internal light with extra batteries.*

*****Requires upgrade of the 24V DC UPS with extra batteries.*

NOTE For alternative backup times, consult Vestas.

5 Turbine Protection Systems

5.1 Braking Concept

The main brake on the turbine is aerodynamic. Stopping the turbine is done by full feathering the three blades (individually turning each blade). Each blade has a hydraulic accumulator to supply power for turning the blade.

In addition, there is a mechanical disc brake on the high-speed shaft of the gearbox with a dedicated hydraulic system. The mechanical brake is only used as a parking brake and when activating the emergency stop buttons.

5.2 Short Circuit Protections

Breakers	Breaker for Aux. Power.	Breaker 1 for Converter Modules	Breaker 2 for Converter Modules
Breaking Capacity Icu, Ics	TBD	TBD	TBD
Making Capacity Icm	TBD	TBD	TBD

Table 5-1: Short circuit protection data

5.3 Overspeed Protection

The generator rpm and the main shaft rpm are registered by inductive sensors and calculated by the wind turbine controller to protect against overspeed and rotating errors.

The safety-related partition of the VMP8000 control system monitors the rotor rpm. In case of an overspeed situation, the safety-related partition of the VMP8000 control system activates the emergency feathered position (full feathering) of the three blades independently of the non-safety related partition of VMP8000 control system.

Overspeed Protection	
Sensors Type	Inductive
Trip Level (variant dependent)	12.0-17.5 rpm / 2000 (generator rpm)

Table 5-2: Overspeed protection data

5.4 Arc Detection

The turbine is equipped with an Arc Detection system including multiple optical arc detection sensors placed in the HV transformer compartment and the converter cabinet. The Arc Detection system is connected to the turbine safety system ensuring immediate opening of the HV switchgear if an arc is detected.

5.5 Smoke Detection

The turbine is equipped with a Smoke Detection system including multiple smoke detection sensors placed in the nacelle (above the disc brake), in the transformer compartment, in main electrical cabinets in the nacelle and above the HV switchgear in the tower base. The Smoke Detection system is connected to the turbine safety system ensuring immediate opening of the HV switchgear if smoke is detected.

5.6 Lightning Protection of Blades, Nacelle, Hub and Tower

The Lightning Protection System (LPS) helps protect the wind turbine against the physical damage caused by lightning strikes. The LPS consists of five main parts:

- Lightning receptors. All lightning receptor surfaces on the blades are unpainted, excluding the Solid Metal Tips (SMT).
- Down conducting system (a system to conduct the lightning current down through the wind turbine to help avoid or minimise damage to the LPS itself or other parts of the wind turbine).
- Protection against overvoltage and overcurrent.
- Shielding against magnetic and electrical fields.
- Earthing system.

Lightning Protection Design Parameters			Protection Level I
Current Peak Value	i_{max}	[kA]	200
Impulse Charge	$Q_{impulse}$	[C]	100
Long Duration Charge	Q_{long}	[C]	200
Total Charge	Q_{total}	[C]	300
Specific Energy	W/R	[MJ/Ω]	10
Average Steepness	di/dt	[kA/μs]	200

Table 5-3: Lightning protection design parameters

NOTE The Lightning Protection System is designed according to IEC standards (see section 8 Design Codes, p. 28).

5.7 EMC

The turbine and related equipment fulfils the EU Electromagnetic Compatibility (EMC) legislation: