Xinjiang Goldwind Science & Technology Co., Ltd

ENVIRONMENTAL PRODUCT DECLARATION

In compliance with ISO 14025

Product Name: Goldwind GW165-5.2/5.6/6.0 Wind Turbine

Site Plant: Dafeng, Jiangsu Province, China

Program Operator：	EPDItaly
Publisher：	EPDItaly

Declaration Number	3
Registration Number	EPDITALY0266

Issue Date	21/04/2022
Valid to	21/10/2023

www.epditaly.it

1. General information

Program Information

Program Operator	EPDItaly Via G. De Castillia, 10 20124 Milan, Italy www.epditaly.com
Applied Standards	ISO 14040 & ISO 14044 – Life cycle assessment ISO 14025 - Environmental labels and declarations - Type III environmental declarations - Principles and procedures
PCR Information	ELECTRICITY PRODUCED BY WIND TURBINES EPDItaly 013
CPC Code	UN CPC: 171 "Electrical energy"
Reference EPD System Document	Regulation of the EPDItaly Programme – rev. 5
Comparability	EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.
Liability	The owner of the declaration will be responsible for the information and supporting evidence. EPDItaly disclaims any liability regarding the manufacturer's information data.
LCA Consultant	IVL Swedish Environmental Research Institute www.ivl.se
External Audit	This declaration has been developed referring to EPDItaly, following the Regulation of the EPDItaly Programme; further information and the document itself are available at: www.epditaly.it. Independent verification of the declaration and data, according to EN ISO 14025:2010. ☐ INTERNAL ☒ EXTERNAL Third Party Verifier: ICMQ Via Gaetano De Castillia, 10 20124 Milan, Italy www.icmq.it Accredited by ACCREDIA

EPD Owner Information

EPD owner	Xinjiang Goldwind Science & Technology Co., Ltd. www.goldwind.com.cn
Company Address	No.8 Bo Xing Yi Road, Beijing Economic & Technological Development Zone, Yizhuang, Beijing 100176, P. R. China
Company Contact	Qiang WANG wangqiang27752@goldwind.com.cn
Product Name	Goldwind GW165-5.2/5.6/6.0 wind turbine
Production Site	Dafeng City, Jiangsu Province, China

2. Introduction

2.1 Company Information

Goldwind is the pioneer and witness in the growth and development of wind power industry in China. Today, with operations in strategic global markets, Goldwind is dedicated to leading clean energy development, energy conservation and environmental protection. As of year-end 2021, Goldwind has more than 81 GW of installed capacity of wind power, with more than 43,000 wind turbines operating worldwide. Goldwind Technology has been operating business in 6 continents and 32 countries and regions in the world, with more than 10,000 employees globally.

2.2 Scope and Type of EPD

Product name: The GW165-5.2/5.6/6.0 direct-drive permanent-magnet wind turbine
Product description: GW165-5.2/5.6/6.0 direct-drive permanent-magnet wind turbine has a design featuring horizontal axis, three blades, and upwind arrangement of rotor, variable-speed variable-pitch regulation, direct drive, and external rotor. This wind turbine has a 165-meter rotor combined with a 5.2/5.6/6.0 MW generator; the GW 165-5.2/5.6/6.0 is especially suited to Class IIIB/S wind sites. The general details of the wind turbine can be seen in the Table 1 below.

Table 1. The general details of the wind turbine GW165-5.2/5.6/6.0

General details		
Item	**Unit**	**Parameters**
Basic data of wind turbine		GW 165-5.2/5.6/6.0
Manufacturer/Model		Xinjiang Goldwind Science & Technology Co., Ltd GW 165-5.2/5.6/6.0

Rated power	kW	5,200 (GW 165-5.2) 5,600 (GW 165-5.6) 6,000 (GW 165-6.0)
Class of wind zone		IIIB/S
Design service life	year	⩾ 20
Altitude of area where wind turbine is installed	m	0-2,000 (included)
Blades		
Manufacturer/Model		GW81
Material of blade		Glass fiber reinforced resin
Swept area of wind turbine rotor	m2	21,382
Generator		
Manufacturer		Xinjiang Goldwind Science & Technology Co.,Ltd
Generator type		Permanent magnet
Rated power	kW	5,500 (GW 165-5.2) 5,900 (GW 165-5.6) 6,300 (GW 165-6.0)
Rated voltage	V	950V
Frequency range of generator	Hz	5.133~8.866 (GW 165-5.2) 5.133~9.613 (GW 165-5.6) 5.133~9.987 (GW 165-6.0)
Protection class		IP54
Tower		
Type		Tapered steel tower (equipped with ladders and fall protection inside).
Anti-corrosion class		Internal: C3; external: C4
Electrical control system		
Type of control unit		PLC
Control type		Distributed control
Main switch cabinet		Beijing Etechwin Electric Co.,Ltd
Converter		
Number of phases	phases	3
Converter type		Full power converter
Main materials for the wind turbine production		
Fiberglass, Resin (polyester), Resin (Voltacast 3200), Basha wood		
Stainless steel, Cast iron, Aluminium alloy, Alloy steel (42CrMo4), Q235-A steel, S355/S325 low alloyed steel, Copper, 65WH600 silicon steel sheet, Galvanized steel sheet.		

Geographical scope:
The study reflects production of GW165-5.2/5.6/6.0 in China. The country grid average "CN: Electricity grid mix 1kV-60kV (China electric power yearbook)" of electricity applied for the manufacturing and assembling activities. The data for the production of electricity applied represent the country average, Chinese grid mix, for the reason that the raw materials are produced in China. The data are based on the Gabi database and the mix of energy sources are presented in Figure 1.

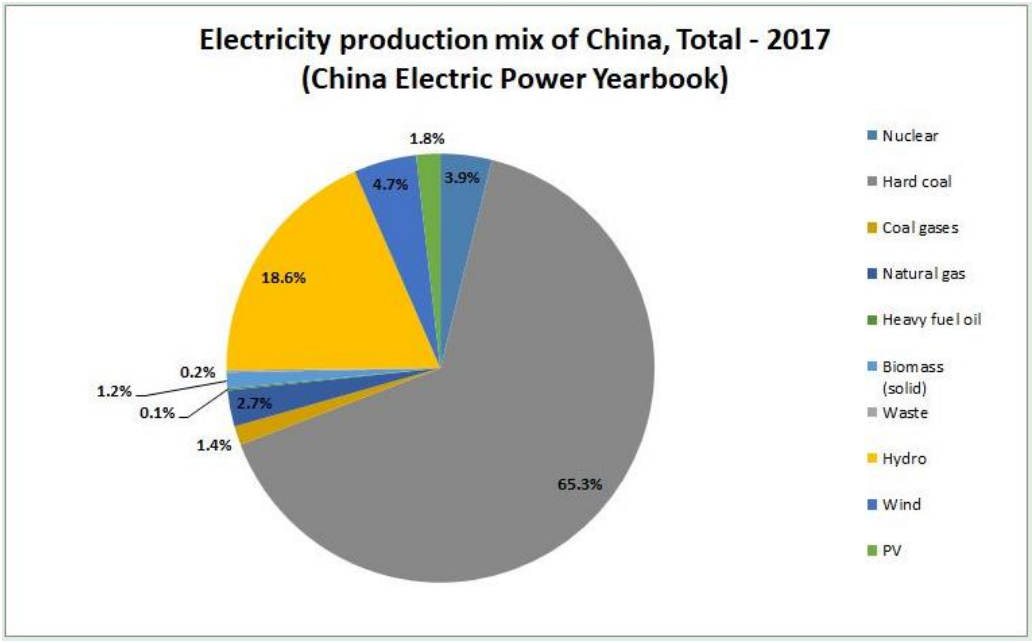

Figure 1 Mix of energy sources for electricity production.

The installation and operation site were chosen as the wind farm located in an exemplary Uzbekistan scenario, while the purpose of this EPD is mainly to give an overall picture of the wind power production, which is the direct business of Goldwind, rather than focus on any particular wind farm location. For the power output, it is based on the theoretical calculation of the selected Uzbekistan wind farm.

The Goldwind GW165-5.2/5.6/6.0 wind turbine has been designed to operate under low to medium wind conditions (IIIB/S) and for this study, medium wind conditions have been selected as the baseline scenario, as Goldwind predicts medium wind sites to be the main world market. The GW165-5.2/5.6/6.0 is a newly designed wind turbine by Goldwind. The target markets meet North America, South America, Europe, Asia, Africa, and Australia. The Uzbekistan wind farm is an exemplary scenario, which has been analyzed for mean WTG results and hub heights, which optimizes the produced energy.

Time representativeness: The reference year for this study is from October 2020 to October 2021. The data collected in the production process of each wind turbine components was

based on the data of factory production in the whole year from October 2020 to October 2021.

Database(s) and LCA software used: The LCA-systems are modelled in the Gabi LCA software, with Gabi ts data base and professional Ecoinvent database.

Product system description

This study is a cradle-to-grave LCA, assessing the potential environmental impacts associated with electricity generated from a GW165-5.2/5.6/6.0 wind turbine installed in a 500 MW inland wind farm. An overview of the life cycle stages included in the LCA study are presented in the flow chart.

Product flow chart

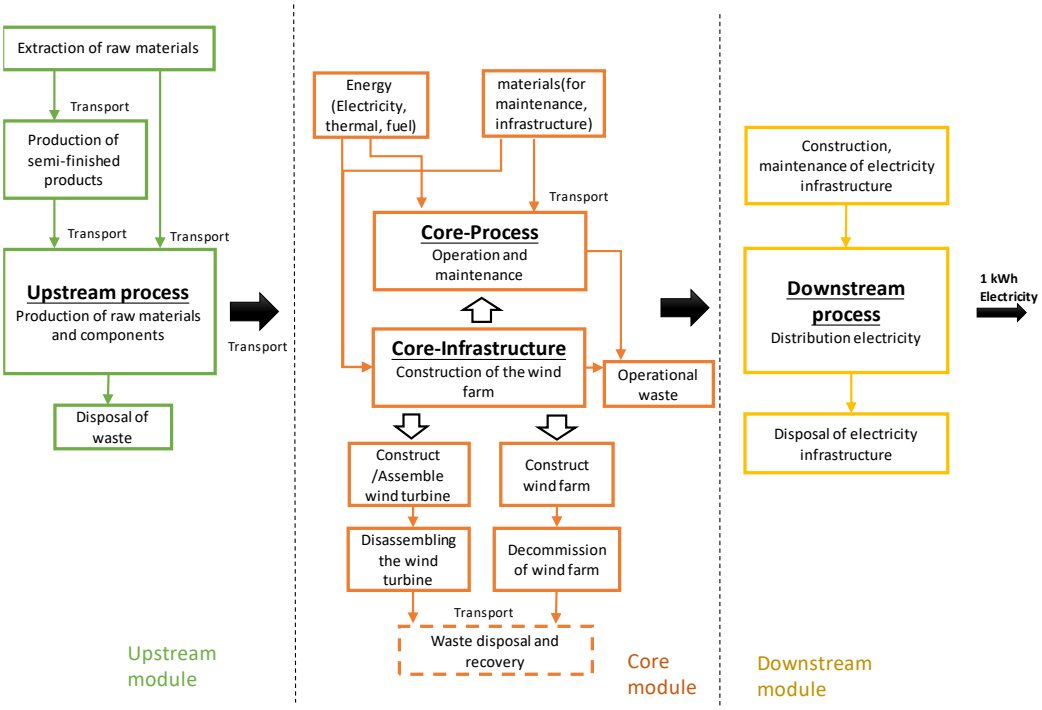

Figure 2. The flow chart of the LCA study

Function Unit:

The functional unit of this LCA study is defined as:

1 kWh of electricity generated through an inland wind farm of GW165-5.2/5.6/6.0 wind turbines, located in an exemplary Uzbekistan scenario and operating under medium wind condition (IIIB/S), and thereafter distributed to a 220 kV Uzbekistan electrical grid.

Total reference flow is 484,800MWh for GW165-5.2, 509,800MWh for GW165-5.6, and 535,970MWh for GW165-6.0**,** they have been used to refer all the inputs and outputs of the system to 1 single kWh. This reference flow represents the whole net electricity generation from one GW165-5.2/5.6/6.0 WTG under medium wind (8.6 m/s) during its reference service

life (RSL). In order to ensure that the EPDs based on this PCR can be compared, a constant fixed RSL of 20 years was set.

Cut-off rules:
In this study, the cut-off criteria have been controlled of no more than 1% of materials and energy flows within the system controlled by the EPD holder. It follows the regulation of PCR and EPDItaly system.

3. Environmental performance

In the result table below, it is possible to see the environmental performance of all categories. Each impact category result is presented in Table 2. The results are categorized into "Upstream module", "Core module-process", "Core module-infrastructure", "Downstream module-process", "Downstream module -infrastructure".
The column named "Total generated" is the sum of upstream module and core module results.
The column named "Total distributed" is the overall results.

Table 2. Results stated the environmental impacts of declared unit (per kWh)[3].

GW165-5.2

Indicator	Unit per declared unit	Upstream	Core process	Core infrastructure	Total generated	Downstream process	Downstream infrastructure	Total distributed
Climate Change - total	kg CO2 eq	4.11E-03	2.23E-05	1.47E-03	5.60E-03	2.40E-04	4.04E-04	6.25E-03
Climate Change - fossil	kg CO2 eq	4.12E-03	2.23E-05	1.47E-03	5.61E-03	2.41E-04	4.04E-04	6.26E-03
Climate Change - biogenic	kg CO2 eq	-1.18E-05	1.45E-08	-4.16E-06	-1.60E-05	-6.44E-07	-1.43E-07	-1.67E-05
Climate Change - land use and land use change	kg CO2 eq	3.06E-06	2.58E-08	5.42E-06	8.51E-06	3.62E-07	5.30E-07	9.40E-06
Ozone depletion	kg CFC-11 eq	2.91E-11	2.81E-12	7.75E-12	3.97E-11	2.85E-12	3.16E-11	7.41E-11
Acidification	mole H+ eq	1.61E-05	5.73E-07	6.89E-06	2.36E-05	1.03E-06	2.25E-06	2.68E-05
Eutrophication of water	kg P eq	1.59E-07	1.46E-08	2.15E-07	3.88E-07	2.13E-08	1.43E-07	5.53E-07
Photochemical ozone formation	kg NMVOC eq	9.58E-06	2.21E-07	5.35E-06	1.52E-05	6.73E-07	1.69E-06	1.75E-05
Consumption of abiotic resources - minerals and materials	kg Sb eq	1.22E-07	4.85E-09	6.26E-08	1.90E-07	8.33E-09	1.76E-08	2.16E-07
Consumption of abiotic resources - fossil resources	MJ	4.99E-02	6.44E-04	1.68E-02	6.73E-02	2.88E-03	4.64E-03	7.49E-02
Water consumption	m3	1.05E-02	1.33E-05	1.12E-03	1.16E-02	4.69E-04	1.52E-04	1.22E-02
Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE)	MJ	4.57E-03	3.84E-05	9.91E-04	5.60E-03	2.35E-04	2.85E-04	6.12E-03
Use of renewable primary energy resource used as raw material (PERM)	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (PERT)	MJ	4.57E-03	3.84E-05	9.91E-04	5.60E-03	2.35E-04	2.85E-04	6.12E-03

Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE)	MJ	5.00E-02	6.44E-04	1.68E-02	6.74E-02	2.88E-03	4.64E-03	7.50E-02
Use of non-renewable primary energy resource used as raw material (PENRM)	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (PENRT)	MJ	5.00E-02	6.44E-04	1.68E-02	6.74E-02	2.88E-03	4.64E-03	7.50E-02
Use of secondary raw material (MS)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m3	2.46E-04	3.20E-07	2.65E-05	2.73E-04	1.10E-05	3.55E-06	2.87E-04
Hazardous landfill waste (HWD)	kg	8.12E-11	8.25E-09	2.19E-11	8.35E-09	3.34E-10	0.00E+00	8.69E-09
Non-hazardous waste disposed (NHWD)	kg	3.19E-04	1.02E-07	1.10E-04	4.30E-04	1.72E-05	0.00E+00	4.47E-04
Radioactive waste disposed (RWD)	kg	3.23E-07	4.41E-09	2.06E-08	3.48E-07	1.39E-08	0.00E+00	3.62E-07
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MFR)	kg	0.00E+00	0.00E+00	1.21E-03	1.21E-03	4.84E-05	0.00E+00	1.26E-03
Material for energy recovery (MER)	kg	INA	INA	INA	INA	INA	INA	INA
Exported electrical energy (EEE)	MJ	INA	INA	INA	INA	INA	INA	INA
Exported thermal energy (ETE)	MJ	INA	INA	INA	INA	INA	INA	INA

(1) "Total generated" represented the environmental impacts generated from "Upstream", "Core process", "Core infrastructure". The impacts from downstream module was not included.

(2) "Total distributed" represented the environmental impacts from the whole life cycle stage of the WTG during the RSL. It was the sum of "Upstream", "Core process", "Core infrastructure", "Downstream process", "Downstream infrastructure".

(3) This table presented the impacts value which have been scaled to 1 kWh as the declared unit.

(4) Input data from databases, trade organizations etc. do NOT distinguish between resources used as material and energy, even though there is a difference in practice.

(5) "INA" represent the indicator has not been evaluated the output.

GW165-5.6

Indicator	Unit per declared unit	Upstream	Core process	Core infrastructure	Total generated	Downstream process	Downstream infrastructure	Total distributed
Climate Change - total	kg CO2 eq	3.90E-03	2.12E-05	1.45E-03	5.37E-03	2.31E-04	3.84E-04	5.99E-03
Climate Change - fossil	kg CO2 eq	3.92E-03	2.12E-05	1.45E-03	5.38E-03	2.31E-04	3.84E-04	6.00E-03
Climate Change - biogenic	kg CO2 eq	-1.12E-05	1.38E-08	-3.99E-06	-1.52E-05	-6.14E-07	-1.36E-07	-1.60E-05
Climate Change - land use and land use change	kg CO2 eq	2.91E-06	2.45E-08	5.31E-06	8.25E-06	3.51E-07	5.04E-07	9.11E-06
Ozone depletion	kg CFC-11 eq	2.77E-11	2.67E-12	7.94E-12	3.83E-11	2.73E-12	2.99E-11	7.10E-11
Acidification	mole H+ eq	1.53E-05	5.45E-07	6.80E-06	2.27E-05	9.89E-07	2.14E-06	2.58E-05
Eutrophication of water	kg P eq	1.51E-07	1.38E-08	2.20E-07	3.85E-07	2.09E-08	1.36E-07	5.42E-07
Photochemical ozone formation	kg NMVOC eq	9.11E-06	2.10E-07	5.26E-06	1.46E-05	6.47E-07	1.61E-06	1.68E-05
Consumption of abiotic resources - minerals and materials	kg Sb eq	1.16E-07	4.61E-09	6.43E-08	1.85E-07	8.08E-09	1.67E-08	2.10E-07
Consumption of abiotic resources -	MJ	4.74E-02	6.12E-04	1.65E-02	6.46E-02	2.76E-03	4.41E-03	7.18E-02

fossil resources								
Water consumption	m3	9.94E-03	1.27E-05	1.11E-03	1.11E-02	4.49E-04	1.45E-04	1.17E-02
Use of renewable primary energy excluding renewable primary energy resources used as raw material (PERE)	MJ	4.35E-03	3.65E-05	9.84E-04	5.37E-03	2.25E-04	2.71E-04	5.86E-03
Use of renewable primary energy resource used as raw material (PERM)	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (PERT)	MJ	4.35E-03	3.65E-05	9.84E-04	5.37E-03	2.25E-04	2.71E-04	5.86E-03
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE)	MJ	4.75E-02	6.12E-04	1.65E-02	6.47E-02	2.77E-03	4.41E-03	7.19E-02
Use of non-renewable primary energy resource used as raw material (PENRM)	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy	MJ	4.75E-02	6.12E-04	1.65E-02	6.47E-02	2.77E-03	4.41E-03	7.19E-02

resources (PENRT)								
Use of secondary raw material (MS)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m3	2.34E-04	3.04E-07	2.65E-05	2.61E-04	1.06E-05	3.37E-06	2.74E-04
Hazardous landfill waste (HWD)	kg	7.72E-11	7.85E-09	2.23E-11	7.95E-09	3.18E-10	0.00E+00	8.26E-09
Non-hazardous waste disposed (NHWD)	kg	3.04E-04	9.73E-08	1.08E-04	4.11E-04	1.65E-05	0.00E+00	4.28E-04
Radioactive waste disposed (RWD)	kg	3.07E-07	4.20E-09	2.01E-08	3.32E-07	1.33E-08	0.00E+00	3.45E-07
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MFR)	kg	0.00E+00	0.00E+00	1.16E-03	1.16E-03	4.62E-05	0.00E+00	1.20E-03
Material for energy recovery (MER)	kg	INA	INA	INA	INA	INA	INA	INA
Exported electrical energy (EEE)	MJ	INA	INA	INA	INA	INA	INA	INA
Exported thermal energy (ETE)	MJ	INA	INA	INA	INA	INA	INA	INA

(1) "Total generated" represented the environmental impacts generated from "Upstream", "Core process", "Core infrastructure". The impacts from downstream module was not included.

(2) "Total distributed" represented the environmental impacts from the whole life cycle stage of the WTG during the RSL. It was the sum of "Upstream", "Core process", "Core infrastructure", "Downstream process", "Downstream infrastructure".

(3) This table presented the impacts value which have been scaled to 1 kWh as the declared unit.

(4) Input data from databases, trade organizations etc. do NOT distinguish between resources used as material and energy, even though there is a difference in practice.

(5) "INA" represent the indicator has not been evaluated the output.

GW165-6.0

Indicator	Unit per declared unit	Upstream	Core process	Core infrastructure	Total generated	Downstream process	Downstream infrastructure	Total distributed
Climate Change - total	kg CO2 eq	3.72E-03	2.02E-05	1.42E-03	5.16E-03	2.21E-04	3.66E-04	5.74E-03
Climate Change - fossil	kg CO2 eq	3.73E-03	2.02E-05	1.42E-03	5.17E-03	2.21E-04	3.66E-04	5.75E-03
Climate Change - biogenic	kg CO2 eq	-1.07E-05	1.31E-08	-3.84E-06	-1.45E-05	-5.86E-07	-1.30E-07	-1.52E-05
Climate Change - land use and land use change	kg CO2 eq	2.77E-06	2.33E-08	5.21E-06	8.00E-06	3.40E-07	4.80E-07	8.82E-06
Ozone depletion	kg CFC-11 eq	2.64E-11	2.54E-12	8.09E-12	3.70E-11	2.62E-12	2.86E-11	6.82E-11
Acidification	mole H+ eq	1.46E-05	5.19E-07	6.71E-06	2.18E-05	9.56E-07	2.03E-06	2.48E-05
Eutrophication of water	kg P eq	1.44E-07	1.32E-08	2.24E-07	3.81E-07	2.05E-08	1.29E-07	5.31E-07
Photochemical ozone formation	kg NMVOC eq	8.67E-06	2.00E-07	5.16E-06	1.40E-05	6.23E-07	1.53E-06	1.62E-05
Consumption of abiotic resources - minerals and materials	kg Sb eq	1.11E-07	4.39E-09	6.54E-08	1.80E-07	7.84E-09	1.59E-08	2.04E-07
Consumption of abiotic resources - fossil resources	MJ	4.51E-02	5.82E-04	1.63E-02	6.20E-02	2.65E-03	4.20E-03	6.89E-02
Water consumption	m3	9.46E-03	1.20E-05	1.11E-03	1.06E-02	4.29E-04	1.38E-04	1.12E-02
Use of renewable primary energy excluding renewable primary energy	MJ	4.14E-03	3.47E-05	9.71E-04	5.14E-03	2.16E-04	2.58E-04	5.62E-03

resources used as raw material (PERE)								
Use of renewable primary energy resource used as raw material (PERM)	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (PERT)	MJ	4.14E-03	3.47E-05	9.71E-04	5.14E-03	2.16E-04	2.58E-04	5.62E-03
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material (PENRE)	MJ	4.52E-02	5.82E-04	1.63E-02	6.21E-02	2.65E-03	4.20E-03	6.90E-02
Use of non-renewable primary energy resource used as raw material (PENRM)	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (PENRT)	MJ	4.52E-02	5.82E-04	1.63E-02	6.21E-02	2.65E-03	4.20E-03	6.90E-02
Use of secondary raw material (MS)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m3	2.22E-04	2.89E-07	2.64E-05	2.49E-04	1.01E-05	3.21E-06	2.62E-04
Hazardous landfill waste (HWD)	kg	7.34E-11	7.47E-09	2.26E-11	7.56E-09	3.03E-10	0.00E+00	7.86E-09
Non-hazardous waste disposed (NHWD)	kg	2.89E-04	9.26E-08	1.05E-04	3.94E-04	1.58E-05	0.00E+00	4.10E-04
Radioactive waste disposed (RWD)	kg	2.92E-07	3.99E-09	1.96E-08	3.16E-07	1.26E-08	0.00E+00	3.29E-07
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Materials for recycling (MFR)	kg	0.00E+00	0.00E+00	1.10E-03	1.10E-03	4.41E-05	0.00E+00	1.15E-03
Material for energy recovery (MER)	kg	INA	INA	INA	INA	INA	INA	INA
Exported electrical energy (EEE)	MJ	INA	INA	INA	INA	INA	INA	INA
Exported thermal energy (ETE)	MJ	INA	INA	INA	INA	INA	INA	INA

(1) "Total generated" represented the environmental impacts generated from "Upstream", "Core process", "Core infrastructure". The impacts from downstream module was not included.

(2) "Total distributed" represented the environmental impacts from the whole life cycle stage of the WTG during the RSL. It was the sum of "Upstream", "Core process", "Core infrastructure", "Downstream process", "Downstream infrastructure".

(3) This table presented the impacts value which have been scaled to 1 kWh as the declared unit.

(4) Input data from databases, trade organizations etc. do NOT distinguish between resources used as material and energy, even though there is a difference in practice.

(5) "INA" represent the indicator has not been evaluated the output.

As data shown in the above, the upstream has the greatest contribution to the climate change, which is responsible for about 70% of the total CO_2 and other greenhouse gas emissions in terms of global warming potential. The second largest environmental factor is the core infrastructure.

Among all the environmental impacts for downstream infrastructure, the photochemical ozone formation and eutrophication of water have the largest impact. The core process and downstream process has relatively low environmental impact.

4. references

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World Steel Association (worldsteel) is an industry association, with members in every major steel-producing country, representing steel producers, national and regional steel industry associations, and steel research institutes.

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