Monitoring Report

CARBON OFFSET UNIT (CoU) PROJECT



Title: 5.25 MW bundled Wind power project in Gujarat, India.

Version 3.0

Date 13/05/2022

First CoU Issuance Period: 8 years Monitoring

Period: 01/01/2014 to 31/12/2021

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Monitoring Report (MR)
CARBON OFFSET UNIT (CoU) PROJECT

Monitoring Report	
Title of the project activity	5.25 MW bundled Wind power project in Gujarat, India.
UCR Project Registration Number	104
Version	3.0
Completion date of the MR	13/05/2022
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 01 Duration of this monitoring Period: (first and last days included (01/01/2014 to 31/12/2021)
Project participants	Creduce Technologies Private Limited (Representator) Metflow Cast Pvt. Ltd. (Developer) Avadh Infrastructure Pvt. Ltd. (Developer) Narmada Rings Pvt. Ltd (Developer) Captain Polyplast Pvt. Ltd. (Developer) Sheetal Cool Products Limited (Developer)
Host Party	India
Applied methodologies and standardized baselines	Applied Baseline Methodology: AMS-I. D: "Grid connected renewable electricity generation", version 18
Sectoral scopes	01 Energy industries (Renewable/Non-Renewable Sources)
Estimated amount of GHG emission reductions for this monitoring period in the registered PCN	2014: 6,961 CoUs (6,961 tCO2eq)
	2015: 8,483 CoUs (8,483 tCO2eq)
	2016: 8,870 CoUs (8,870 tCO2eq)
	2017: 8,507 CoUs (8,507 tCO2eq)
	2018: 8,685 CoUs (8,685 tCO2eq)
	2019: 8,467 CoUs (8,467 tCO2eq)
	2020: 6,374CoUs (6,374 tCO2eq)
	2021: 7,240 CoUs (7,240 tCO2eq)
Total:	63,587 CoUs (63,587 tCO2eq)

SECTION A. Description of project activity

A.1. Purpose and general description of project activity >>

The proposed project activity with title under UCR "5.25 MW Wind power project in Gujarat", is a grid connected renewable power generation activity which incorporates installation and operation of 6 Wind Turbine Generators (WTGs) having capacity of 3 x 800 kW, 1 x 750 kW, 1 x 600 kW, 1 x 1500 kW each with aggregated installed capacity of 5.25 MW. Three WTGs are manufactured and supplied by Enercon (India) Ltd, Two WTGs are manufactured and supplied by Suzlon Energy Ltd and One WTG is Manufactured and supplied by Pioneer Wincon Pvt ltd. They all are installed at Jamnagar and Kutch districts of Gujarat, India. The project is an operational activity with continuous reduction of GHG, currently being applied under "Universal Carbon Registry" (UCR).

a) Purpose of the project activity and the measures taken for GHG emission reductions >>

The project activity aims to harness kinetic energy of wind (renewable source) to generate electricity. The net generated electricity from the project activity is being wheeled to manufacturing facility of PP in Gujarat for captive consumption through NEWNE grid as per wheeling agreement signed between Gujarat Energy Transmission Corporation Limited (GETCO) and PP. Through In pre-project scenario the PP was importing the required electricity from the state utility i.e., PGVCL (Which is a part of regional grid, earlier known as NEWNE grid) to meet its captive requirement of electrical energy. Currently, NEWNE grid is connected to large numbers of fossil fuel-based power plants. Hence, project activity is displacing the gross electricity generation i.e., 70,650 MWh from the NEWNE grid, which otherwise would have been imported from the NEWNE grid.
The project activity doesn't involve any GHG emission sources. The annual and the total CO2e emission reduction by the project activity over the defined monitoring period is as per **Annexure I.**

b) Brief description of the installed technology and equipment>>

The project activity involves installation and operation of Wind Turbine Generator (WTGs) having capacity of 3 x 800 kW, 1 x 750 kW, 1 x 600 kW, 1 x 1500 kW each, which are manufactured and supplied by Suzlon Energy Limited, Enercon India Ltd and Pioneer Wincon Pvt. Ltd. The average life time of the generators are around 20 years as per the equipment supplier specification.
Wind is used to produce electricity using the kinetic energy created by air in motion. This is transformed into electrical energy using wind turbines or wind energy conversion systems. Wind first hits a turbine's blades, causing them to rotate and turn the turbine connected to them. That changes the kinetic energy to rotational energy, by moving a shaft which is connected to a generator, and thereby producing electrical energy through electromagnetism.
Below is the description of different components of a Wind Turbine Generator.

1. **Main Tower:** The main support tower is made of steel, finished in a number of layers of protective paint to shield it against the elements. The tower is tall enough to ensure the rotor blade does not interfere with normal day-to-day operations at ground level.

2. **Rotor Blades:** The rotor blades are the three (usually three) long thin blades that attach to the hub of the nacelle. These blades are designed to capture the kinetic energy in the wind as it passes, and convert it into rotational energy.

3. **Nacelle:** The nacelle is the 'head' of the wind turbine, and it is mounted on top of the support tower. The rotor blade assembly is attached to the front of the nacelle. It contains all the major

parts of the WEG.

4. **Hub:** The hub of the wind turbine is the component that connects the blades to the main shaft and ultimately to the rest of the tower. The hub transmits and withstand all the loads generated by the blades.

5. **Main Shaft:** It is a piece of metal in the form of a tube which constitutes the most important spinning constituent since it conveys the energy from the wind turbine blades to the other parts of the wind turbine.

6. **Gear Box:** A gearbox is often used in a wind turbine to increase the rotational speed from a low-speed main shaft to a high-speed shaft connecting with an electrical generator. Gears in wind turbine gearbox are subjected to severe cyclic loading due to variable wind loads that are stochastic in nature.

7. **Brake:** A wind turbine rotor brake is a brake placed next to the gearbox that reduces the rotational speed of the blade assembly, fixes the blade so that it does not rotate in the case of power transmission maintenance or power generator rest, and in an emergency.

8. **Turbine generator:** The turbine generator is the component that turns the rotational energy in the high-speed output shaft from the gearbox into an electrical current. The electrical principle of electromagnetic induction shows that while a magnet is moving past a coil of wire, an electric current is created (or "induced") in the wire.

c) Relevant dates for the project activity (e.g., construction, commissioning, continued operation periods, etc.)>>

The duration of the crediting period corresponding to the monitoring period is covered in this monitoring report.

UCR Project ID: 104

Company Name	Commissioning date	District	Capacity
Metflow Cast Pvt Ltd.	30/03/2013	Jamnagar	1 * 800 kW
	30/03/2010	Jamnagar	1 * 600 kW
Narmada Rings Pvt. Ltd.	31/03/2013	Jamnagar	1 * 800 kW
Avadh Infrastructure Pvt. Ltd.	03/04/2013	Jamnagar	1 * 800 kW
Captain Polyplast Pvt Ltd.	16/05/2013	Jamnagar	1*750 kW
Sheetal Cool Products Limited.	05/03/2014	Kutch	1*1500kW

d) Total GHG emission reductions achieved or net anthropogenic GHG removals by sinks achieved in this monitoring period>>

The total GHG emission reductions achieved in this monitoring period is as follows:

Summary of the Project Activity and ERs Generated for the Monitoring Period	
Start date of this Monitoring Period	01/01/2014
Carbon credits claimed up to	31/12/2021
Total ERs generated (tCO2eq)	63,587 tCO2eq
Leakage	0

e) Baseline Scenario>>

As per the approved consolidated methodology AMS-I.D. Version 18, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following: "The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise, been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

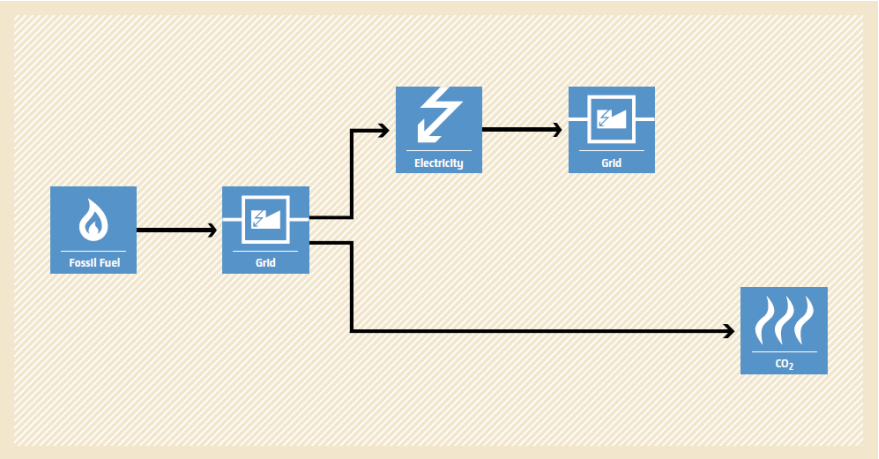


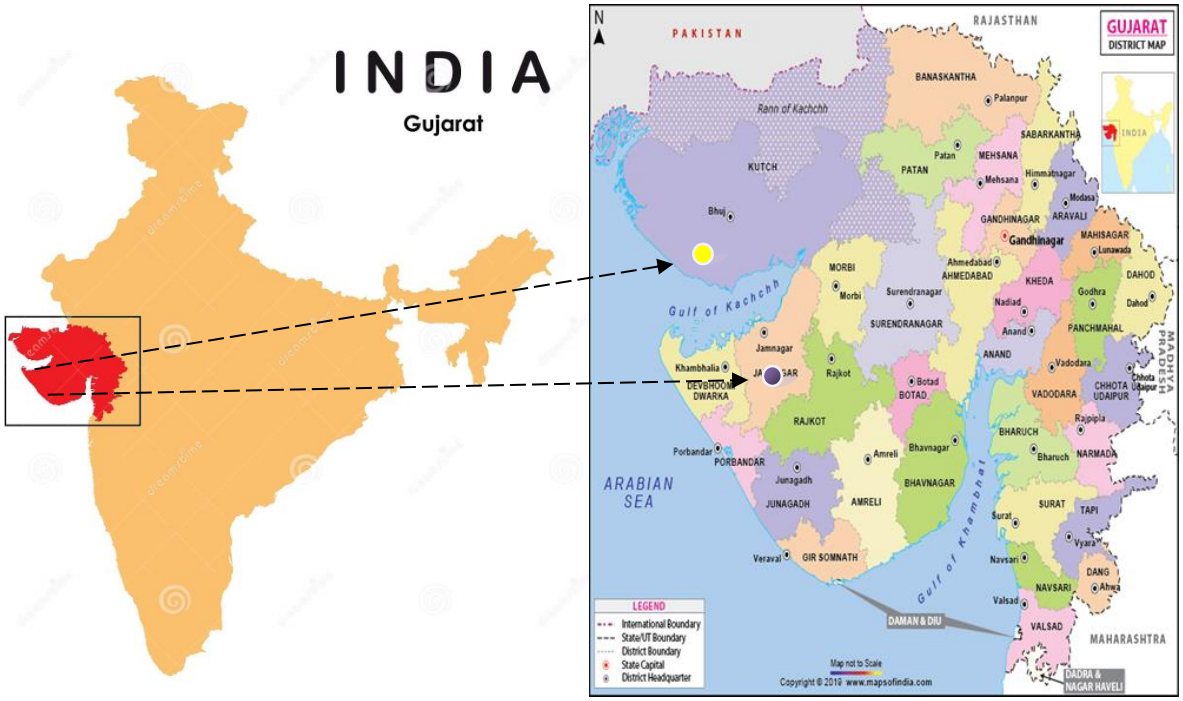
Figure 1 Baseline Scenario

A.2. Location of project activity>>

The project location is situated at Jamnagar and Kutch District in the state of Gujarat. The nearest airport is in Jamnagar and Kutch. The project site is well connected by district and village roads to the nearest town. The geographic co-ordinates of the project locations have been provided below.

WTG	Latitude and Longitude	Village	Tehsil	District
800 kW	22°11'7.87" N 69°50'21.56" E	Tebhda	Lalpur	Jamnagar
800 kW	22°06'14.65" N 69°56'22.30" E	Babarzar	Lalpur	Jamnagar
800 kW	22°11'15.69" N 69°52'19.27" E	Babarzar	Lalpur	Jamnagar
750 kW	22°21'0.63" N 70°15'03.63" E	Nani Matli	Nani Matli	Jamnagar
1500 kW	22°54'28.40" N 69°06'01.30" E	Bhambadai	Mandavi	Kutch
600 kW	21°52'01.30" N 69°19'43.20" E	Lamba	Jamnagar	Jamnagar

The representative location map is included below:



Project Location

A.3. Parties and project participants >>

Party (Host)	Participants
India	**Creduce Technologies Private Limited (Representator)** Contact person: Shailendra Singh Rao Mobile: +91 9016850742, 9601378723 Address: 2-O-13,14 Housing Board Colony, Banswara, Rajasthan - 327001, India. **M/S Metflow Cast Pvt. Ltd. (Developer)** Address: Sr. No. 79, NH-27, Near Goldcoin foam.B/h Archer Metals, Village - Shapar, Dist.Rajkot- 360024, Gujarat - India. **M/S Avadh Infrastructure Pvt. Ltd. (Developer)** Address: "Avadh House" 57 – Jay Park, Nanamava Main Road, Rajkot, 360001, Gujarat - India. **M/S Narmada Rings Pvt. Ltd. (Developer)** Address: Vrundavan Industial Estate, Survey No. 13, Shapar main Road (Veraval), Dist. Rajkot,360024 Gujarat - India. **M/S Captain Polyplast Ltd. (Developer)** Address: Upper Level - 25, Royal Complex, Dhebar Road, Bhutkhana Chowk, Rajkot - 360001. Gujarat – India **M/S Sheetal Cool Products Limited. (Developer)** Address: Plot No – 78,79 & 80, GIDC Estate Amreli,365601 Gujarat- India.

A.4. References to methodologies and standardized baselines >>

SECTORAL SCOPE - 01 Energy industries (Renewable/Non-Renewable Sources)

TYPE - Renewable Energy Projects

CATEGORY - AMS-I. D: "Grid connected renewable electricity generation", version 18

A.5. Crediting period of project activity >>

Company Name	Starting date of crediting Period
Metflow Cast Pvt Ltd.	01/01/2014
Narmada Rings Pvt. Ltd.	01/01/2014
Avadh Infrastructure Pvt. Ltd.	01/01/2014
Captain Polyplast Pvt Ltd.	01/01/2014
Sheetal Cool Products Limited.	05/03/2014

Length of the crediting period corresponding to this monitoring period are as below:

1. Sheetal Cool Products Limited. : 7 years 10 months i.e., 05/03/2014 to 31/12/2021
2. Metflow cast Pvt ltd, : 8 years, i.e., 01/01/2014 to 31/12/2021
3. Narmada Rings Pvt ltd, : 8 years, i.e., 01/01/2014 to 31/12/2021
4. Avadh Infrastructure Pvt ltd, : 8 years, i.e., 01/01/2014 to 31/12/2021
5. Captain Polyplast Pvt Ltd. : 8 years, i.e., 01/01/2014 to 31/12/2021

A.6. Contact information of responsible persons/entities >>

Name : Shailendra Singh Rao
Contact No : +91 9016850742, 9601378723
E-Mail : shailendra@creduce.tech

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity >>

a) Provide information on the implementation status of the project activity during this monitoring period in accordance with UCR PCN>>

The project consists of 6 WTGs with capacity of 5.25 MW each installed in Two District. These Commissioned project by Gujarat Energy Development Agency (GEDA) are Mentioned below in table:

Company Name	GEDA WTG ID No.	Commissioning date
Metflow Cast Pvt Ltd. (0.8 MW)	EIL/800/12-13/3062	30/03/2013
Metflow Cast Pvt Ltd. (0.6 MW)	SEL/600/9-10/1675	30/03/2010
Narmada Rings Pvt. Ltd.	EIL/800/12-13/2985	31/03/2013
Avadh Infrastructure Pvt. Ltd.	EIL/800/12-13/2982	03/04/2013
Captain Polyplast Pvt Ltd.	PW/750/12-13/3137	16/05/2013
Sheetal Cool Products Limited.	SEL/1500/13-14/3412	05/03/2014

The project generates clean energy by utilizing the kinetic energy of flowing wind.

b) For the description of the installed technology, technical process and equipment, include diagrams, where appropriate>>

Wind Turbines are manufactured and supplied by Suzlon Energy Limited, Enercon India ltd, and Pioneer Wincon Pvt. Ltd with an aggregate installed capacity of 5.25 MW. The connectivity of all the WTGs is to a Central Monitoring Station (CMS) through high-speed WLAN modem or fibre optic cable which helps in providing real time status of the turbine at CMS with easy GUI (Graphical User Interface) and ability to monitor the functioning of the turbine from CMS. The life time of the WTG is 20 years as per manufacturer specifications.

Technical details for WTG Machine manufactured by Enercon Energy are as follows:

Turbine model	Enercon (E- 53)
Rated power	800 kW
Rotor diameter	53 m
Hub height	75 m (Concrete)
Turbine Type	Direct Driven, Upwind, Horizontal axis wind turbine with variable rotor speed
Power regulation	Independent pitch system for each blade
Cut in wind speed	3.0 *m/s*
Rated wind speed	12 *m/s*
Cut-out Wind speed	28-34 m/s
Extreme Wind Speed	59.5 *m/s*
Rated rotational speed	29 rpm
Operating range rot. Speed	12-29 rpm
Orientation	Upwind
Gear Box type	Gear Less
Generator Type	Synchronous generator
Breaking	Aerodynamic
No of Blades	3
Yaw System	Active yawing with 4 electric yaw drives with brake motor
Blade Material	Fiber Glass Epoxy reinforced

Tower	74 m (concrete)
Output Voltage	400 V

Technical details for WTG Machine manufactured by Suzlon Energy are as follows:

Product No.		S52_600kW_50 Hz
Main Data	Turbine type	Horizontal axis Wind Turbine
	Rated Power	600 kw
	Hub Height	75 m
	Rotational Speed	24.19 rpm (fix speed machine, max over speed 28.29 rpm)
	Rotor Diameter	52 m
	Swept Area	2,124 m2
Main Frame	Frame type	Box frame
	Material	Cast Iron as per EN-GJS-400-18-LT and DIN EN 1563 : 2003
	Corrosion Protection	Corrosion Proof painting
Rotor	No of Blades	3
	Rotor Cone Angle	4.4^{o}
	Tip Speed (at rated Power)	66m/sec
	Rotor axis tilt angle	5^{o} w.r.t horizontal
	Power Regulation	Active pitch regulated
	Rotor orientation	Upwind
Generator	Frequency	50 Hz
	Type	Induction generator with slip rings
Rotor Blades	Rotor Blade type	AE 25 (with Vortex)
	Blade Length	25 m
	Material	Epoxy bonded fiber glass
	Type of rotor air brake	Pitch / Full blade
	Blade profiles	TU delft family
Pitch System	Pitch Type	Electrical
	Drive	Consists of one electric motor with gearbox & electrically operated brake for each blade
	Backup system	1 battery set per blade
	Pitch angle full range	-5^{o} to +90^{o}
	Pitch Speed (angular)	0.1 -10^{o}/sec
Hub	Hub Type	Spherical hub
	Material	Cast iron as per EN-GJS-400-18U-LT and DIN EN 1563 :2003
	Corrosion Protection	Corrosion Proof Painting
Main Bearing	Bearing Type	Spherical roller bearing
	Quantity	1
Main bearing House	Bearing housing mounting	Foot cum flanged
	Quantity	1
Gear Box	Type of Gear Box	1 planetary stage / 2 helical stages
	Material for gear Box housing	Cast iron – GGG 40.3
	Rotor	1:63.6

	Power	660 kW
	Shafts seals	Maintenance – free labyrinth
Oil Pump	Type of cooling	Forced oil cooling lubrication system
	Oil Pump motor voltage	3 phase – 690 V AC
	Oil Pump motor rating	4 kW
	Oil Pump Flow Rate	54 lit/min
Coupling	Coupling Type	Aprex Coupling, Constant speed
Generation System	Generator type	Induction generator (asynchronous), air cooled
	Rated Power	600 kW
	Rated Voltage	690 V AC (phase to phase)
	Frequency	50 HZ
	Number of poles	4
	Synchronous speed	1500 rpm
	Speed at rated power	1539 rpm
	Full Load power factor	0.89 approx. (uncompensated)
	Full load current	560 A
	Star winding connection	Delta
	Rotor	Squirrel cage
	Enclosure (Generator)	IP 56
	Insulation Glass	Class H
Yaw system – Bearing	Yaw Bearing Type	Polyamide Slide Bearing
Yaw System – yaw gear and Motors	Yaw Motor & gear type	Active electric yaw drive having electric motor with brake, gearbox and pinion
	Number of Units	2
	Yaw Speed	23.6^{o}/ min
	Voltage	3 phase – 690 V AC
Tower	Tower Type	Lattice tower with bolted steel structure.
	Lattice Tower material	High tensile steel – S355JR as per DIN EN 10025 alternatively Grade 50B as per BS 4360
	Lattice tower Height	73.0 m
	Corrosion Protection	Hot dip galvanized, coating thickness 120 microns (Minimum)
	Access method	Ladder with safety harness
	Top dimensions	2.149 m * 2.149 m
	Foot Print Area	11.414 * 11.414 M
Wind Turbine main panel/ CPU panel	Capacitor Bank Voltage	3 Phase – 690 V AC
	Frequency	50 HZ
	Cut – in System	Soft- Starters using thyristors
Operational parameters	Wind Speed- Start	4 m/sec
	Wind Speed – stop	25 m/sec
	Re-start point, after high wind stop	23 m/sec
Electric Grid Connection	Voltage fluctuation	± 15%
	Frequency variations	-5 % to +4%
	Maximum asymmetric current	10 % of nominal current
	Maximum asymmetric voltage for 60 sec	2 %
	Maximum short circuit	15kA at 690 V AC(phase to phase)

	current	
Mechanical brake (For maintenance purposes only)	Brake Type	Electro- mechanical disc brake + mechanical rotor lock
	Brake Disc	Steel disc, mounted on high speed shaft
	Brake Caliper	1

Technical details for WTG Machine manufactured by Suzlon Energy (S82 – 1.5 MW) are as follows:

Turbine Model	S_82 – 1.5MW	
Operating Data	Rated Power	1500 kW
	Cu-in wind Speed	4 m/s
	Rated wind speed	12 m/s
	Cut-off Wind Speed	20 m/s
	Survival Wind Speed	52.5 m/s
Rotor	Type	3 blades, upwind/Horizontal axis
	Diameter	82 m
	Rotational Speed at rated power	15.6 to 16.3 rpm
	Rotor Blade material	Epoxy bonded fiber glass
	Swept area	5,281 m^2
	Power regulation	Active pitch regulation
Gear Box	Type	One planetary and two helical stages
	Ratio	1:95.24 (Hansen) & 1:95:1601(Winergy)
	Nominal Load	1,650kW
	Type of Cooling	Forced oil cooling lubrication System
Generator	Type	Induction generator with slip rings, variable rotor resistances via Suzlon Flexi Slip System
	Speed at rated power	1,511 rpm (with rotor short circuited)
	Rated power	1,500 kW
	Rated voltage	690 V AC (phase to phase)
	Frequency	50 Hz
	Insulation	Class H
	Enclosure	IP 54 / IP 23 (slip ring unit)
	Cooling system	Air cooled (IC 616)
Tower	Type	Tubular tower with welded steel plates
	Tower height	76.1m
	Hub height (including foundation)	76.8m
BRAKING SYSTEM	Aerodynamic braking	3 Independent systems with blade pitching
	Mechanical braking	Hydraulic disc brake activated by hydraulic pressure
YAW SYSTEM	Type	Electric asynchronous motor,

		electric motor brake (spring applied); 5 - stage planetary gear box with output pinion
	Bearing	Polyamide slide bearing with gear ring & automatic greasing system
	Protection	Cable twist sensor, proximity sensor
PITCH SYSTEM	Type	3 independent blade pitch control with battery backup for each blade
	Operating range	0° to 90°
	Resolution	0.1° to 8 ° per sec
CONTROLLER	Suzlon Control System with following salient features:	
	- Park slave - Reactive power control - Weather measurement - Statistics	- Power output control / limitation - Grid measurement - Time synchronization
	Wind Class	III a
	Certification & standards	TC-GL-003B-2010, Rev. 1
	Quality system	ISO 9001:2008

Technical details for WTG Machine manufactured by Pioneer Wincon Pvt. Ltd are as follows:

Turbine Model	P750/49 WTG	
General Data	Nominal power	750 kW
	Rotor Diameter	49 m
	Swept area	1886.5 m^2
Operational data	Cut- in wind speed	3.0 m/s
	Rated wind speed	15.0 m/s
	Cut-out wind speed	25.0 m/s
	Survival wind speed for 2 sec max.	>52.5 m/s
Rotor	No. of blades	3
	Rotor position	Up wind
	Rotor speed	22.36 rpm
	Rotor diameter	49 m
	Swept area	1886.5 m^2
	Tip Speed, blade	58.0 m/s
	Weight, rotor	14000 Kg.
Blade	Type	HT 24
	Profile data	NACA 63 -4xx y FFA-W3
	Length	24.0 m
	Material	Fibre glass reinforced polyester
	Weight	3400 Kg

Gear Box	Type	Helical -cum-planetary
	Ratio	1:67.68
	Lubrication	Forced circulation
	Oil Volume	157b lts
Generator	Type	6 - pole / 4 - pole induction
	Rated power	200 KW / 750 KW
	Voltage	690 V, 3 phase, AC
	Frequency	50 / 60 Hz
	Synchronous speed	1000 / 1500 RPM
	Insulation class	H
	Protection class	IP 55
	Weight	4500 Kgs
Tower	Type	Lattice/tubular
	Height	61.1 m
	Surface Treatment	Hot dip Galvanized

B.2 Do no harm or Impact test of the project activity>>

Indian economy is highly dependent on "Coal" as fuel to generate energy and for production processes. Thermal power plants are the major consumers of coal in India and yet the basic electricity needs of a large section of population are not being met. This results in excessive demands for electricity and places immense stress on the environment.

Changing coal consumption patterns will require a multi-pronged strategy focusing on demand, reducing wastage of energy and the optimum use of renewable energy (RE) sources. This project is a greenfield activity where grid power is the baseline. The renewable power generation is gradually contributing to the share of clean & green power in the grid; however, grid emission factor is still on higher side which defines grid as distinct baseline.

The Government of India has stipulated following indicators for sustainable development in the interim approval guide lines for such projects which are contributing to GHG mitigations. The Ministry of Environment, Forests & Climate Change, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. It has been envisaged that the project shall contribute to sustainable development using the following ways:

Social well-being: The project would help in generating direct and indirect employment benefits accruing out of ancillary units for manufacturing towers for erection of the Wind Turbine Generator and for maintenance during operation of the project activity. It will lead to development of infrastructure around the project area in terms of improved road network etc. and will also directly contribute to the development of renewable infrastructure in the region.

Environmental well-being: The project utilizes Wind energy for generating electricity which is a clean source of energy. The project activity will not generate any air pollution, wind pollution or solid waste to the environment which otherwise would have been generated through fossil fuels. Also, it will contribute to reduction GHG emissions. Thus, the project causes no negative impact on the surrounding environment contributing to environmental well-being.

Economic well-being: Being a renewable resource, using Wind energy to generate electricity contributes to conservation precious natural resources. The project contributes to the economic

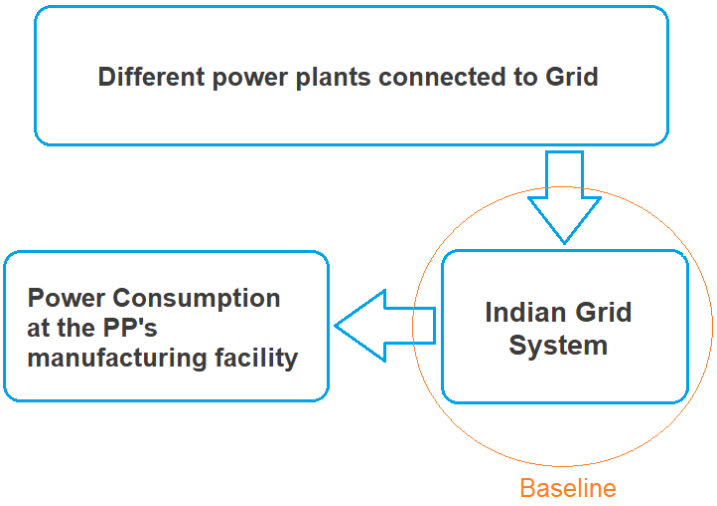
sustainability through promotion of decentralization of economic power, leading to diversification of the national energy supply, which is dominated by conventional fuel based generating units. Locally, improvement in infrastructure will provide new opportunities for industries and economic activities to be setup in the area. Apart from getting better employment opportunities, the local people will get better prices for their land, thereby resulting in overall economic development.

Technological well-being: The project activity leads to the promotion of 5.25 MW Wind Turbine Generators into the region and will promote practice for small scale industries to reduce the dependence on carbon intensive grid supply to meet the captive requirement of electrical energy and also increasing energy availability and improving quality of power under the service area. Hence, the project leads to technological well-being.

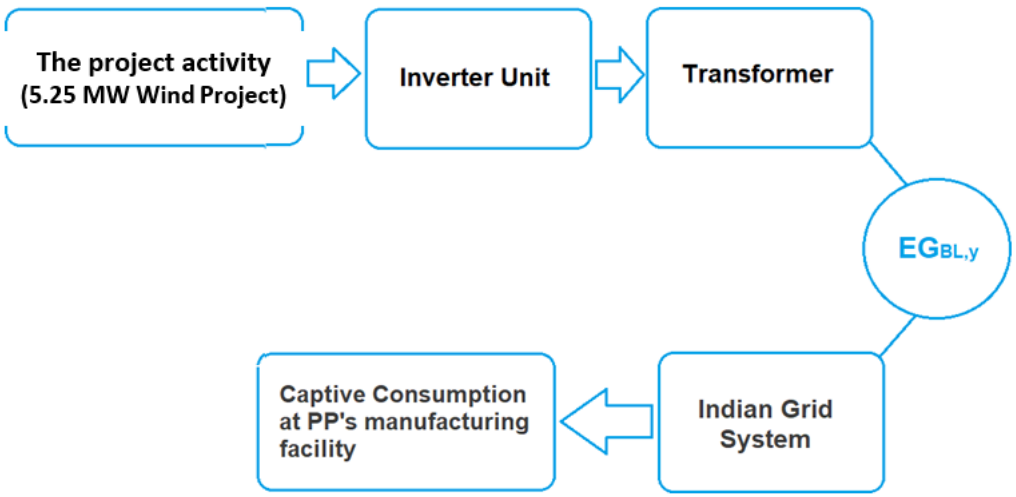
B.3. Baseline Emissions>>

In the absence of the project activity, the equivalent amount of electricity would have been imported from the regional grid (which is connected to the unified Indian Grid system (NEWNE Grid)), which is carbon intensive due to predominantly sourced from fossil fuel-based power plants.

Baseline Scenario:



Project Scenario



Thus, this project activity was a voluntary investment which replaced equivalent amount of electricity from the Indian grid. The project proponent was not bound to incur this investment as it was not mandatory by national and sectoral policies. Thus, the continued operation of the project activity would continue to replace fossil fuel-based power plants and fight against the impacts of climate change. The Project Proponent hopes that carbon revenues from 2014-2021 accumulated as a result of carbon credits generated will help repay the loans and help in the continued maintenance of this project activity.

B.4. Debundling>>

This project activity is not a de-bundled component of a larger project activity.

SECTION-C: Application of methodologies and standardized baselines

C.1. References to methodologies and standardized baselines >>

Sectoral Scope: 01 Energy industries (Renewable/Non-Renewable Sources)

TYPE I – Renewable Energy Projects
Applied Baseline Methodology: AMS-I. D: "Grid connected renewable electricity generation", version 18

C.2. Applicability of methodologies and standardized baselines >>

The project activity involves generation of grid connected electricity from the construction and operation of a new Wind power-based project and to use for captive purpose via grid interface by wheeling through state electricity board i.e., Paschim Gujarat Vij Company Limited (PGVCL) under the Power Purchase Agreement (PPA) signed between the Project Proponent (PP) and the utility.
The project activity has installed 6 WTGs of aggregated capacity of 5.25 MW each which will qualify for a small- scale project activity under Type-I of the Small-Scale methodology. The project status is corresponding to the methodology AMS-I.D., version 18 and applicability of methodology is discussed below:

Applicability Criterion	Project Case
1. This methodology comprises renewable energy generation units, such as photovoltaic, Wind, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activity is a Renewable Energy Project i.e., wind power project which falls under applicability criteria option 1 (b) i.e., "using electricity for captive consumption" Hence the project activity meets the given applicability criterion as well as satisfies the applicability illustration mentioned in Appendix of AMS-ID Table 1 – Scope of AMS-I.D. version 18.

2. This methodology is applicable to project activities that: (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s); or involve a replacement of (an) existing plant(s).	The Project activity involves the installation of new WTGs at a site where there was no renewable energy power plant operating prior to the implementation of the project activity. Thus, Project activity is a Greenfield plant and satisfies this applicability condition (a).
3. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in existing reservoir, with no change in the volume of the reservoir; or (b) The project activity is implemented in existing reservoir, where the volume of the reservoir(s) is increased and the power density as per definitions given in the project emissions section, is greater than 4 W/m^2 . (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, (e) is greater than 4 W/m2	As the project activity is a Wind Turbine Generator, this criterion is not relevant for the project activity.
4. If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The rated capacity of the project activity is 5.25 MW with no provision of Co-firing fossil fuel. Hence, meeting with this criterion.
5. Combined heat and power (co-generation) systems are not eligible under this category	This is not relevant to the project activity as the project involves only Wind power generating units.
6. In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	There is no other existing renewable energy power generation facility at the project site. Therefore, this criterion is not applicable.
7. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement power plant/unit shall not exceed the limit of 15 MW.	The project activity is a new installation, it does not involve any retrofit measures nor any replacement and hence is not applicable for the project activity.

8. In the case of landfill gas, waste gas, waste water treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid, then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS I. C.: Thermal energy production with or without electricity" shall be explored.	This is not relevant to the project activity as the project involves only Wind power generating units.
9. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	Not biomass is involved, the project is only a wind power project and thus the criterion is not applicable to this project activity.

C.3 Applicability of double counting emission reductions >>

The project was not applied under any other GHG mechanism. Hence project will not cause double accounting of carbon credits (i.e., COUs).

C.4. Project boundary, sources and greenhouse gases (GHGs)>>

As per applicable methodology AMS-I.D. Version 18, "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system." Thus, the project boundary includes the Wind Turbine Generators and the Indian grid system.

Source		Gas	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	**CO_2**	**Yes**	**CO2 emissions from electricity generation in fossil fuel fired power plants**
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	No	No other GHG emissions were emitted from the project
Project	Greenfield Wind Power Project Activity	CO_2	No	No CO_2 emissions are emitted from the project
		CH_4	No	Project activity does not emit CH_4
		N_2O	No	Project activity does not emit N_2O
		Other	No	No other emissions are emitted from the project

C.5. Establishment and description of baseline scenario (UCR Protocol) >>

As per para 19 of the approved consolidated methodology AMS-I.D. Version 18, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

"The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

The project activity involves setting up of a new Wind Turbine Generator to harness the green power from Wind energy and use it for personal requirement (captive consumption). In the absence of the project activity, the equivalent amount of power would have been generated by the operation of grid-connected fossil fuel-based power plants and by the addition of new fossil fuel-based generation sources into the grid. The power produced at grid from the other conventional sources which are predominantly fossil fuel based. Hence, the baseline for the project activity is the equivalent amount of power produced at the Indian grid.

A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO_2/MWh for the 2014-2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Also, for the vintage 2021, the combined margin emission factor calculated from CEA database in India results into same emission factors as that of the default value. Hence, the same emission factor has been considered to calculate the emission reduction.

Net GHG Emission Reductions and Removals

$ERy = BEy – PEy – LEy$

Where:

ER_y = Emission reductions in year y (tCO_2/y)
BE_y = Baseline Emissions in year y ($t CO_2/y$)
PE_y = Project emissions in year y (tCO_2/y)
LE_y = Leakage emissions in year y (tCO_2/y)

Baseline Emissions

Baseline emissions include only CO_2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,y}$$

Where:

BE_y = Baseline emissions in year y ($t CO_2$)
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of this project activity in year (MWh).

$EF_{grid,y}$ = UCR recommended emission factor of 0.9 tCO_2/MWh has been considered, this is conservative as compared to the combined margin grid emission factor which can be derived from Database of Central Electricity Authority (CEA), India. (Reference: General Project Eligibility Criteria and Guidance, UCR Standard, page 4)

Hence, BE = 70,650 x 0.9 = 63,587 tCO2eq

Project Emissions

As per paragraph 39 of AMS-I.D. (version 18, dated 28/11/2014), for most renewable energy project activities emission is zero.

Hence, PEy = 0

Leakage Emissions

As per paragraph 42 of AMS-I.D. version-18, all projects other than Biomass projects have zero leakage.

Hence, LEy= 0

Total Emission reduction by the project for the current monitoring period is calculated as below:

Hence, ERy= 63,587 – 0 – 0 = 63,587 CoUs

C.6. Prior History>>

The project was not applied under any other GHG mechanism. Hence project will not cause double accounting of carbon credits (i.e., COUs).

C.7. Monitoring period number and duration>>

First Monitoring Period: 8 years

01/01/2014 to 31/12/2021 (inclusive of both dates)

C.8. Changes to start date of crediting period >>

Crediting period start date is 01/01/2014.

C.9. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

There are no permanent changes from registered PCN monitoring plan and applied methodology

C.10. Monitoring plan>>

The project activity essentially involves generation of electricity from wind, the employed Wind Turbine Generator can only convert Wind energy into electrical energy and cannot use any other input fuel for electricity generation, thus no special ways and means are required to monitor leakage from

the project activity. The recording of the electricity fed to the state utility grid is carried out jointly at the incoming feeder of the state power utility (GETCO).

Data / Parameter	UCR recommended emission factor
Data unit	tCO_2 /MWh
Description	A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO_2/MWh for the 2014- 2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Hence, the same emission factor has been considered to calculate the emission reduction under conservative approach.
Source of data	https://a23e347601d72166dcd6-16da518ed3035d35cf0439f1cdf449c9.ssl.cf2.rackcdn.com//Documents/UCRStandardJan2022updatedVer3_180222035328721166.pdf
Value applied	0.9
Measurement methods and procedures	-
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For the calculation of Emission Factor of the grid
Additional Comment	The combined margin emission factor as per CEA database (current version 16, Year 2021) results into higher emission factor. Hence for 2021 vintage UCR default emission factor remains conservative.

Parameter	$EG_{PJ,y}$
Data unit	MWh
Description	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of this project activity in year y.
Source of data Value(s) applied	Wind Energy Certificates issued by GETCO
Procedures	The Net electricity generation by the Wind Turbine Generator is recorded by the Energy meter installed at the substation. At the end of every month, Wind Energy Certificates are issued by GETCO for each substation which indicates the total monthly electricity exported to the grid.
Monitoring frequency	Monthly
Purpose of data	To Calculate Baseline Emission
Additional Comment	The combined margin emission factor as per CEA database (current version 16, Year 2021) results into higher emission factor. Hence for 2021 vintage UCR default emission factor remains conservative.

ANNEXURE I (Emission Reduction Calculation)

5.25 MW bundled Wind power project in Gujarat , India

Month - Wise Energy Delivered to Grid (in kWh)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	5,19,898	3,16,615	4,62,266	4,63,729	9,28,153	13,13,708	12,93,298	7,42,811	3,91,039	2,44,254	3,03,132	7,55,282
2015	6,17,895	4,74,835	5,01,581	7,12,323	11,04,078	9,72,410	16,57,097	11,99,985	5,19,682	3,62,198	6,08,571	6,94,323
2016	3,78,451	5,46,372	5,60,530	6,57,049	13,03,342	15,23,140	15,83,202	13,77,568	8,40,606	2,99,788	3,05,721	4,79,596
2017	6,06,248	6,05,472	6,42,876	8,80,376	12,24,314	10,81,817	14,45,164	10,52,626	3,68,007	3,34,819	4,60,267	7,50,374
2018	3,90,146	3,88,379	5,45,664	6,08,928	10,47,146	15,60,398	16,50,370	14,13,172	7,20,630	2,60,554	3,34,342	7,30,217
2019	6,35,526	5,99,522	6,27,171	7,47,856	10,45,719	12,42,740	16,66,179	8,39,159	3,87,377	3,52,819	4,33,866	8,29,880
2020	5,82,073	5,59,593	6,38,529	5,51,895	10,75,517	5,57,008	5,36,512	9,36,499	2,64,236	2,95,340	5,48,796	5,35,976
2021	5,27,762	3,43,888	3,79,866	4,28,977	8,99,550	11,00,315	15,68,478	10,01,285	4,92,431	2,52,896	4,55,372	5,93,080

Year-Wise Emission reduction calculation for the project activity

Year	Total No. of Electricity delivered in MWh	Recommended emission factor	Total CoUs generated
2014	7,734	0.9	6,961
2015	9,425	0.9	8,483
2016	9,855	0.9	8,870
2017	9,452	0.9	8,507
2018	9,650	0.9	8,685
2019	9,408	0.9	8,467
2020	7,082	0.9	6,374
2021	8,044	0.9	7,240
Total CoUs to be issued for the first monitoring period (Year: 2014 to 2021)			63,587