WIND POWER AT THENI

BY POWERICA LIMITED

India's Largest Carbon Credit Developer & Supplier

Document Prepared by EKI Energy Services Limited

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Project Title	Wind power project at Theni by Powerica Limited
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity involves an installation of 6 Wind Turbine Generators (WTG) of total generating capacity of 9.9 MW (6 units of Vestas make V82 WTG). The WTG units are installed in Theni district in the state of Tamilnadu, India. The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources and to contribute to climate change mitigation efforts. In the absence of the project activity, the electricity thus supplied would have been generated through fossil fuel based thermal power plants. The project activity thus contributes to reduction in specific emissions (emissions of pollutant) including GHG emissions. The project activity is also responsible for sustainable economic growth and conservation of environment through use of wind as a renewable source. The project is located in Tamil Nadu state and each WTG have separate feeder and separate meter.

The project activity is a Greenfield project for generation of electrical energy using wind which is a renewable source of energy. Thus, this project actually displaces the electricity grid which is essentially fossil-fuel based.

The start date of the project activity is 13-September-2010, which is the date of commissioning of the first WTG. The project has been operational since the commissioning and has contributed to reduction in greenhouse gas emissions.

The electricity generation from this project activity contributes to annual GHG reductions estimated at 22,735 tCO2e (tonnes of carbon dioxide equivalent) by displacing electricity of 24,138 MWh from fossil fuel based electricity grid.

1.2 Sectoral Scope and Project Type

Sectoral Scope 1: Energy Industries (renewable/non- renewable sources)

Project type: Renewable energy project (wind)

The project activity is not a grouped project.

1.3 Project Eligibility

The project activity involves installation and generation of electricity using wind energy resources i.e. by using the renewable sources replacing electricity supply from a fossil-fuel dominated electricity, thus leads to reductions of anthropogenic GHG emissions from atmosphere. Hence the

project activity is eligible Sectoral scope 1 i.e. energy industries (renewable/ non-renewable sources) under the scope of the VCS Program.

1.4 Project Design

The project activity involves setting up of 9.9 MW (6 units of Vestas make V82 WTG) in the state of Tamilnadu, India. Hence, the project has been designed to include a single installation of an activity and is not a grouped activity

Eligibility Criteria

Not applicable to this project activity as this is not a grouped project.

1.5 Project Proponent

Organization name	Powerica Limited
Contact person	Mr. Pradeep Gupta
Title	Head - Wind Energy Division
Address	9th Floor, Godrej Coliseum, Sion (E) Mumbai – 400022, Maharashtra, India
Telephone	+ 91 22 4001 2000
Email	pradeep.gupta@powericaltd.com

1.6 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Mr. Rahul Kulkarni

Title	Project Manager
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91-9028885805
Email	rahul.kukarni@enkingint.org

1.7 Ownership

As per VCS Program Definitions version 4, the project ownership is the legal right to control and operate the project activities.

Powerica Limited is the project proponent (PP) of project activity and they have the legal right to control and operate the project activities.

The project ownership has been demonstrated through below supporting document:

Power Purchase Agreement (PPA) – The Power Purchase Agreement (PPA) indicates that PP have the legal right to control and operate the project activities.

Based on above evidences, the project ownership is demonstrated and Powerica Limited is authorized project owner.

1.8 Project Start Date

The project start date is 13-September-2010 which is the date of commissioning of the first phase of the 9.9 MW wind power project.

1.9 Project Crediting Period

The length of first crediting period is 13-September-2010 to 12-September-2020.

The crediting period of the project activity is for 10 years (Renewable).

The length of the second crediting period is 13-September-2020 to 12- September-2030 (both dates inclusive).

As per VCS guideline, PP has applied for renewal of crediting period within 2 years from the last date of previous crediting period.

The current monitoring period is 01-January-2020 to 31-December-2020, (monitoring period that spans the two crediting periods[1]) i.e.

CP1 covering 01-January-2020 to 12-Septmber-2020

CP2 covering 13-September-2020 to 31-December-2020.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The project activity falls under small-scale project category since the annual average GHG emission reductions are less than 300,000 tCO_2e.i.e 22,735 tCO_2e.

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 2020-21	22,735
Year 2021-22	22,735
Year 2022-23	22,735
Year 2023-24	22,735
Year 2024-25	22,735
Year 2025-26	22,735

[1] PP is submitting herewith VERRA communication regarding the same.

Year 2026-27	22,735
Year 2027-28	22,735
Year 2028-29	22,735
Year 2029-30	22,735
Total estimated ERs	227,350
Total number of crediting years	10
Average annual ERs	22,735

1.11 Description of the Project Activity

It is to be noted that the project activity is a greenfield project for generation of electrical energy using wind which is a renewable source of energy. Thus, this project actually displaces the electricity grid which is essentially fossil-fuel based.

In wind energy generation, kinetic energy of the wind is converted into mechanical energy and subsequently into electrical energy. Wind turbines capture the wind's energy with three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind. As the wind blows through the blades of the windmill, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade towards it, causing the rotor to spin. The rotor turns the shaft that further spins the connected generator. The spinning of this generator produces the required electricity. Since power is generated from wind energy, no emissions are attributed to the project emissions and emissions due to fossil-fuel based grid has been displaced due to the project activity.

Emission reductions will be claimed on the net electrical energy that is supplied to grid which will be metered using main meter located at the electrical yard of the respective WTGs. These electrical energy meters are essentially electronic tri-vector meters of accuracy class 0.5. Since these meters are not designed to measure high voltages and currents as generated in the WTG, the WTG output is connected to these meters via transformers (CT/PT) for stepping down the generated voltage and current to ranges which the meters can record. As such, these meters have a multiplying factor which when multiplied to the meter reading provides the actual amount of electricity generated.

The technology providers for the project have additionally installed an LCS meter at the WTG controller.

V82_1.65 MW_50Hz:

Lifetime	20 years
Rated Power	1,650 kW
Rotor diameter	82 m
Swept area	5,281 m^2
No. of blades	3
Cut in wind speed	3.5 m/s
Cut out wind Speed	25 m/s
Rotor Speed	14.4 rpm
Regulation	Active-Stall
Hub Height	78 m
Generator Type	Asynchronous
Insulation	Class F

The WTGs are under operation since the date of commissioning and no event has been identified which may impact GHG emission reduction. The commissioning dates of all the WTGs are provided as below.

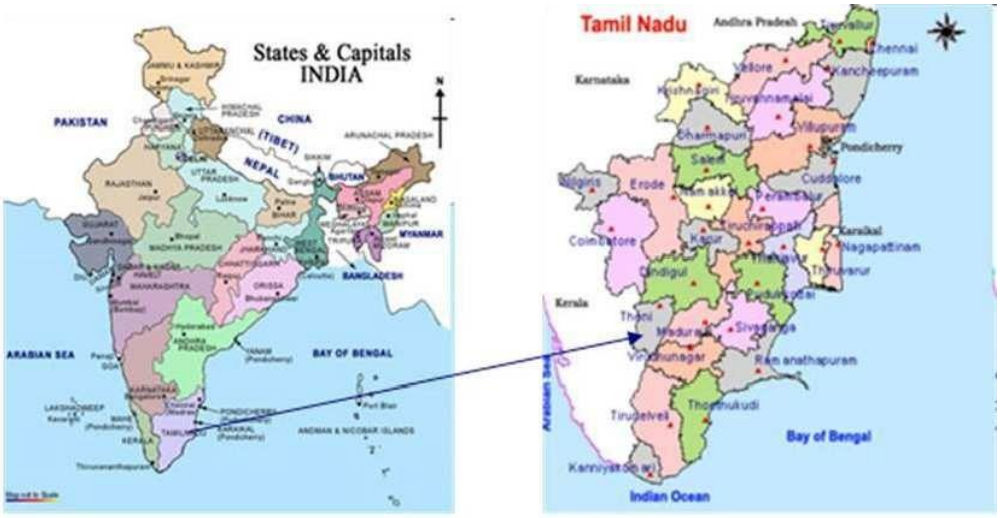
WTG No.	Location	Date of commissioning
TSSP 1255	Shanmuga-Sundarapuram	13-September-2010
TM 721	Mottanuthu	13-September-2010
TSSP 158	Shanmuga-Sundarapuram	13-September-2010
TM 41	Mottanuthu	17-September-2010
TGU 28	Usilampatti	13-September-2010
TSSP 174	Shanmuga-	13-September-2010

WTG No.	Location	Date of commissioning
	Sundarapuram	

1.12 Project Location

The project activity located in Taluka: Andipatti, District: Theni ,State: Tamilnadu.

The project location is attached in the figure below:



Note: Map not drawn to scale

The unique location information of the WTG is provided in the table below. The WTG numbers indicated in the table below are unique identification number provided by the state utility.

The geo-coordinates of each WTG are as follows:

WTG No.	HTSC No.	Latitude	Longitude	Village
TSSP1255	T-144	9° 59' 40"	77° 34'10"	Shanmuga-Sundarapuram
TM721	T-141	9° 58' 46"	77° 34'43"	Mottanuthu
TSSP158	T-142	9° 59' 08"	77° 34' 39"	Shanmuga-Sundarapuram

TM41	T-145	9° 58' 34"	77° 35' 24"	Mottanuthu
TGU28	T-139	9° 57' 03"	77° 33' 33"	Usilampatti
TSSP174	T-143	9° 59' 23"	77° 34' 43"	Shanmuga-Sundarapuram

1.13 Conditions Prior to Project Initiation

The project is a Greenfield wind power project and does not involve generation of GHG emissions for the purpose of their subsequent reduction, removal or destruction. Thus prior to project initiation, there was nothing at site. In absence of project activity, the continuation of current practice i.e. generation of equivalent amount electricity would have been generated from grid connected fossil fuel dominated power plants. Thus for project activity baseline scenario is 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.

Please refer to section B 3 and B 4 of PDD (version 5.1 dated 08/11/2019) of the UNFCCC registered CDM project with Ref No. 4572 through the web link:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received all the necessary approvals for development and commissioning for the proposed project from the State Nodal Agencies and is in compliance to the local laws and regulations.

The Project has received necessary approvals for development and commissioning for wind power project from the state Nodal agencies and is in compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006

As per Central Pollution Control Board (Ministry of Environment, Forest and Climate Change (MoEF & CC), Govt. of India), final document on revised classification of Industrial Sectors under Red, Orange, Green and White Categories (February 29, 2016).

The newly introduced White category of industries pertains to those industrial sectors which are practically non-polluting such as Biscuit trays etc. from rolled PVC sheet (using automatic vacuum forming machines), Cotton and woolen hosiers making (Dry process only without any dying/washing operation), Electric lamp (bulb) and CFL manufacturing by assembling only, Scientific and mathematical instrument manufacturing, Solar power generation through photovoltaic cell, wind power and mini hydel power (less than 25 MW).

There shall be no necessity of obtaining the Consent to Operate'' for White category of industries. An intimation to concerned SPCB / PCC shall suffice. Since project activity falls under white category and the non-polluting nature of project fulfils the compliance to the local laws and regulations.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project activity has also been registration with UNFCCC under Clean Development Mechanism (CDM) program, Registration reference number is 4572[2].

1.15.2 Projects Rejected by Other GHG Programs

The Project is not rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

India is Non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM and UNFCCC (Registration ID 4572). The project proponent (PP) has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. PP has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.16.2 Other Forms of Environmental Credit

[2] https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view

Project has been registered with UNFCCC under Clean Development Mechanism program. Registration reference number is 4572. Project Proponent has submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.17 Additional Information Relevant to the Project

Leakage Management

Not applicable to this project activity.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

The Designated National Authority (DNA) for the Government of India (GoI) on the Ministry of Environment and Forestry (MoEF)[3], called the National CDM Authority (NCDMA), has stipulated four indicators on sustainable development for Clean Development Mechanism (CDM) projects structured in India. The project participants' view on the contribution of this project activity towards sustainable development follows these four indicators as explained below:

Social well-being:

- **Generating Local Employment**: The installation of wind power project in rural areas will result in generating local employment opportunities and capacity building of the local employees. The project activity would create both direct and indirect employment throughout the life-cycle of the project activity.
- **Encouragement to entrepreneurs**: The project will provide encouragement to other entrepreneurs to invest into renewable energy sources.

Economic well-being:

- **Rural Development:** The installation of wind power project will result in rural and infrastructural development in the surrounding rural areas
- **Economic Development**: The generation of wind power will result in improvising the reliability of the NEWNE Grid and thereby enhance economic development in the region.

Environment well-being:

[3] Since June 2014, the name of DNA changed to Ministry of Environment, Forest and Climate Change (MoEFCC)

- **Reduction in the consumption of fossil fuels**: The installation of power plant generating electricity through renewable resource such as wind power, would lead to reduction in usage of fossil fuels e.g. Coal, oil, natural gas.
- **Reduction in GHG emissions**: The reduction in usage of fossil fuels for electricity generation will result in reduction of the release of associated GHG emissions (CO_2 and CH4 emissions).
- **Improvement of Air Quality**: The use of renewable energy for power generation will avoid the emission of air pollutants such as Suspended Particulate Matter (SPM), Sulphur Dioxide (SO_2) and Nitrogen Oxides (NO_x) thereby improvising the surrounding air quality
- **Conservation of Natural Resources**: Installation of wind power plant will result in conserving fast depleting natural resources such as coal, oil etc.

Technological well-being:

- **Advanced Technology:** The project activity involves installation and operation of state-of-art wind turbine generators (WTGs) of Vestas make. The implementation of these new technologies will help in increasing reliability of renewable energy generation and encourage development of even better technology in the future.
- **Safe and Sound Technology:** The project activity deploys the technology, which is environmentally safe and sound, as it does not produce greenhouse gases and any toxic or radioactive waste.

Further Information

There are no information or incidents that will have bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

Please refer to D 1 and D 2 of PDD (version 5.1 dated 08/11/2019) of the UNFCCC registered CDM project with reference no. 4572.

The web link of the same is given below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view

2.2 Local Stakeholder Consultation

Please refer to E 1 and E 2 of PDD (version 5.1 dated 08/11/2019) of the UNFCCC registered CDM project with reference no. 4572.

The web link of the same is given below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view

The process of local stakeholder consultation is continuous. During the current monitoring period, the project proponent has kept grievance register in plant site office and sought comments/grievances/suggestions from local stakeholders including local community, government agencies and NGOs. However, no major comments/grievances/suggestions have been received from the aforementioned stakeholders during the current monitoring period and all such minor suggestions have been take care by the PP, The same approached will be followed during second crediting period of the project activity.

2.3 Environmental Impact

Please refer to D 1 and D 2 of PDD (version 5.1 dated 08/11/2019) of the UNFCCC registered CDM project with reference no. 4572.

The web link of the same is given below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view

2.4 Public Comments

The Global Stakeholder Consultation commenting period had been completed before first crediting period. No comments had been received in the commenting period. Project got registered under CDM with reference no. 4572.

The web link of the same is given below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view

2.5 AFOLU-Specific Safeguards

Not Applicable

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Methodology Number: AMS –I.D.

Title: - "Grid connected renewable electricity generation", Version 18[4]

Sectoral scope: 1

The methodology AMS – I.D. also refers to the latest approved versions of the following tools:

- Tool to calculate the emission factor for an electricity system, (Version 07.0 ,EB 100, Annex 04)[5]

Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, (EB 66, version 03.0.1)[6]

Reference: Appendix B of simplified M&P for small scale project activities (UNFCCC, Recent norms)

As the project activity do not cause any project or leakage emissions from fossil fuel combustion, the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" has not been used in the PDD.

3.2 Applicability of Methodology

The project status is corresponding to the methodology AMS-I.D (version 18.0) and applicability of methodology AMS-I.D are discussed below:

Applicability Criterion (with para no. reference)	Project case

[4] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

1.This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid. (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 (a) i.e., "Supplying electricity to a national or a regional grid". Hence the project activity meets the given applicability criterion.
2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2[7]	The project displaces grid electricity consumption, hence the project activity meets the given applicability criterion.
3, This methodology is applicable to project activities that (a) install a Greenfield plant); (b) involve a capacity addition[8] in an existing plant(s); (c) involve a retrofit[9] of (an) existing plant(s); or (d)	The project is installation of new wind based electricity generation plants (not addition to existing system). Option "a" is applicable.

7

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a Contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid[6] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas.	√		

8 A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

9 Retrofit or modification is an investment to repair or modify existing operating power plants/units, with the purpose to increase the efficiency, performance or power generation capacity of the plants/units, without adding new power plants/units. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall

involve a rehabilitation[10] of (an) existing plant(s)/unit(s) (d) involve a replacement[11] of (an) existing plant(s).	
4.Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; •The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	The project is wind power project and thus the criterion is not applicable to this project activity.
5. 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 project activity is a 9.9 MW wind electricity generation. Unit does not co- fire fossil fuels. Hence the criterion is not applicable to the project activity.
6. Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is a renewable wind energy project and is not a combined heat and power system. Hence the criteria is not applicable to the project activity
7. In the case of project activities that involve the 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	The project activity is Greenfield and there is no existing power generation facility at the site. Hence the criteria is not applicable to the project activity

only include measures that involve capital investments and not regular maintenance or housekeeping measures.

[10] Rehabilitation is an investment to restore existing power plants/units that was severely damaged or destroyed due to foundation failure, excessive seepage, earthquake, liquefaction, or flood. The primary objective of rehabilitation or refurbishment is to restore the performances of the facilities. Rehabilitation may also lead to increase in efficiency, performance or power generation capacity of the power plants/units with/without adding new power plants/units;

[11] Replacement. involves investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The installed capacity of the new plant or unit is equal to or higher than the plant or unit that was replaced.

physically distinct[12] from the existing units.	
8. In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted or rehabilitated or replacement unit shall not exceed the limit of 15 MW.	Not applicable, the wind project is a Green field project activity and this project is not the enhancement or up gradation project.
9. In the case of landfill gas, waste gas, wastewater 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.	The project activity is a renewable wind energy project and is not a combined heat and power system. Hence the criteria is not applicable to the project activity
10. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	The project activity is a renewable wind energy project and is not a combined heat and power system. Hence the criteria is not applicable to the project activity

3.3 Project Boundary

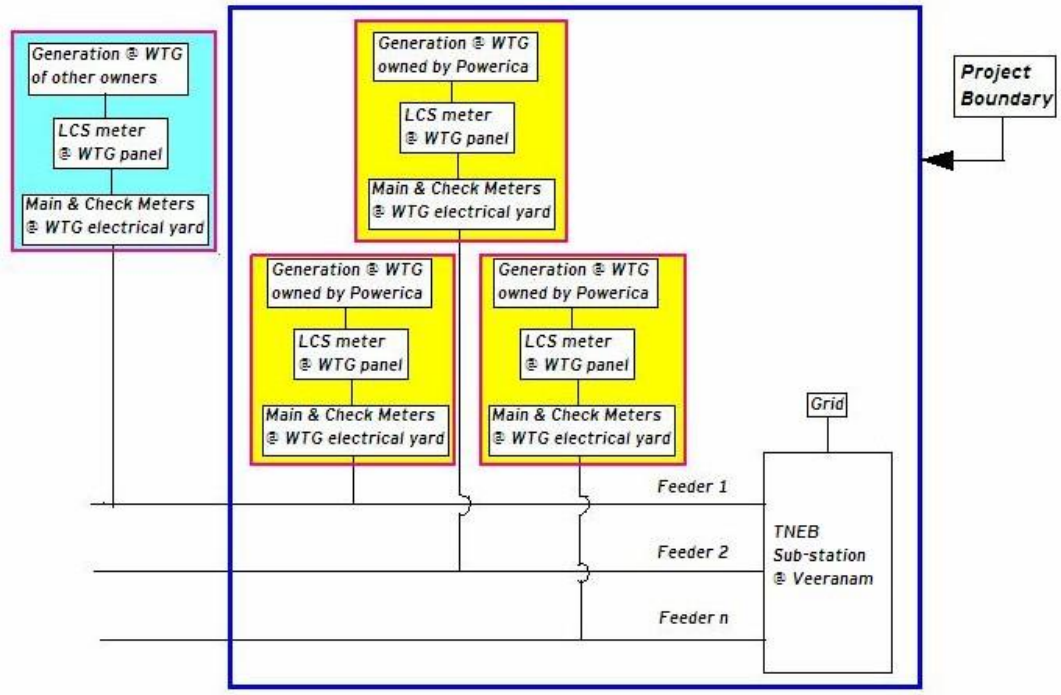
As per AMS-I.D Version 18, EB 81 - "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to".

The project boundary includes the wind turbine generator, sub-stations and grid. The proposed project activity will evacuate power to the INDIAN grid[13] (erstwhile Southern

[12] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

[13] Prior to January 2014, southern grid (that includes the state of Tamilnadu) was not connected to the then Nation grid (it then included Northern, Eastern, Western and North-Eastern regional grids), in the beginning of January 2014, Southern grid was connected to the national grid and all those regional grids including the Southern grid, together form the INDIAN grid

grid).Therefore the entire INDIAN grid and all connected power plants have been considered in the project boundary for the proposed CDM project activity. The project boundary is shown below:



The above metering arrangement is indicative , earlier there were check meters also installed as back up meters, however state electricity board had removed that check meters and only main meters are used for export, import values. Gases and sources considered in the project activity:

The table provided below shows the gases and sources considered in the project activity

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Source		**Gas**	**Included?**	**Justification/Explanation**
Project Activity	For dry or flash steam geothermal power plants, emissions of CH_4	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.

	and CO_2 from non-condensable gases contained in geothermal steam	N_2O	No	Not applicable as project activity is wind power project.
	For binary geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.

3.4 Baseline Scenario

Updated baseline for the second crediting period in line with the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by Project Standard version 4.0.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or Sectoral policies

The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or Sectoral policies.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was 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. Thus this project activity was a voluntary investment which intends to replace equivalent amount of electricity at grid from renewable source. PP was not bound to incur this investment; hence absence of project activity (i.e. the investment) does not lead to any continued baseline practice for PP within their scope whereas the continued operation of the project activity would continue to replace equivalent amount of electricity at grid. Hence, the same baseline as identified in the previous crediting period is still valid for the project. Therefore, the assessment of the changes in market characteristics is not required for the renewal of the project's crediting period under VCS.

Nevertheless, there is an impressive growth attained by the Indian Power Sector within the recent years, the installed capacity has grown from mere 1,713 MW in 1950 to 356,100.20 MW as on 31.03.2018, consisting of 226,279.34 MW Thermal, 77,641.63 MW Renew and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 1[14] that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO_2 emissions in the country by increased use of renewable energy sources.

Furthermore, project participant has considered the latest available CO_2 Baseline Database (CEA database, version 15) at the time of requesting renewal of the crediting period for establishing the baseline emission factor, which itself considered all the new circumstances. Hence, the new circumstances do not have an impact on the baseline emission. As per below table, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original.

Table 1: Sector- wise installed capacity (MW) as on 31/03/2019 (CEA Database version 15)

[14] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

Sector	Thermal				Nuclear	Hydro	RES	Total
	Coal	Gas	Diesel	Total				
State	65366.50	7118.71	363.93	72849.14	0.00	29878.80	2347.93	105075.86
Central	58820.00	7237.91	0.00	66057.91	6780.00	12126.42	1632.30	86596.63
Private	76518.00	10580.60	273.70	87372.30	0.00	3394.00	73661.40	164427.70
All India	200704.50	24937.22	637.63	226279.34	6780.00	45399.22	77641.63	356100.19

Thus, current baseline remain same and there is no impact if circumstances, existing at the time of requesting renewal of crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

As explained in step 1.2, the baseline scenario was the electricity import/generation from the power plants connected to the electricity grid. The project activity in green field project and there is no any baseline equipment or investment involved in project activity. Therefore this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that "Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the VCS project activity."

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database (version 15, Dec.19) available at the time of joint VCS PD and MR submission for renewal.

In line with the project standard version 4.0, the impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant EB guidance with regard to renewal of the crediting period at the time of requesting renewal of crediting period; and the correctness of the application of an approved baseline methodology for the determination of the

continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the existing laws. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the Enactment of the act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003 was in force at the time of the completion of the baseline study for the registered PDD.

Section 3 of the said act required the Central Government to prepare the national electricity policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. In accordance with the section 3 of the Electricity Act 2003, the Central Government notified the National Electricity Policy[15] on 12th February 2005 which was in force at the time of completion of the baseline study as stated in the registered PDD of the project activity. This policy has not been revised since then and is currently in force as well.

In addition to the above policies, State Electricity Regulatory Commissions (SERCs) have announced preferential tariffs and Indian Renewable Energy Development Agency (IREDA) provides term loan assistance towards establishing biomass power projects. All these fiscal and financial incentives were in force at the time of completion of the baseline study for the registered PDD of the project activity and still continue to exist.

The state electricity regulatory commission issues tariff order in respect of procurement of power generated wind generators and there is no mandatory national and/or sectoral policies have come into effect that would affect the compliance of the current baseline. Hence, it can be concluded the current baseline complies with all relevant mandatory national and/or sectoral policies that have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period.

However, in spite of the financial incentives given by the government to renewable power projects in India the generation from the low cost must run resources connected to the Southern Grid has not increased to such an extent that this would lead to more than 50% contribution from the low cost must run resources towards the total generation from the Southern Grid.

[15] http://www.cercind.gov.in/Act-with-amendment.pdf

The approved consolidated baseline methodology, AMS-I. D. (Version 18), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "Tool to calculate the emission factor for an electricity system" (version 07.0) has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

As per CEA database version 15, the fossil fuel dominated electricity is more than renewable sector and is continuing with same pattern. In light of the above discussion it is to be concluded that in accordance with relevant guidelines stipulated in the Project Standard version 4.0, national and/or sectoral policies and circumstances had been considered towards formulating the OM & BM baseline scenario. Hence the baseline scenario as applied for the present project activity remains justified.

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 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, as reflected in the combined margin (CM) calculations described in the "Tool 07: Tool to calculate the emission factor for an electricity system".

The project activity involves setting up of WTG's to harness power of wind to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants.

In the absence of the project activity, the equivalent amount of power would have been drawn from the Indian grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 15 is the latest available data at the time of joint PD & MR submission to VVB for validation, hence same is considered for emission factor calculations.

The combined margin of the Indian grid used for the project activity is as follows:

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9419 tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.25) & build margin (0.75) values, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9622 tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y	Calculated as the last 3 year (2016-17, 2017-18, 2018-19) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8811 tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 15.0, May 2019 published by Central Electricity Authority (CEA), Government of India

3.5 Additionality

Please refer to section B 5 of PDD (version 5.1 dated 08/11/2019) of the UNFCCC registered CDM project with reference no. 4572.

The web link of the same is given below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view

In India, there is no any regulation to install the wind projects and the project activity is a voluntary step taken by PP. In India, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original. As discussed in section 3.4 of joint VCS PD and MR, there is no any Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity and project activity is additional as per CDM Tool for the demonstration and assessment of additionality and as per VCS Program rules.

3.6 Methodology Deviations

There is no any methodology deviation applicable for the project activity.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

As per the approved consolidated Methodology ACM0002 (Version 20.0) para 39:

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired 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:

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

Where:

BE_y = Baseline emissions in year y (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

As per methodology, combined grid emission factor as per the "Tool to calculate the emission factor for an electricity system" version 07 is calculated as below.

CO_2 Baseline Database for the Indian Power Sector, Version 15, Dec 2019[16] published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

[16] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

As per Methodological tool: Tool to calculate the emission factor for an electricity system (Version 07.0, EB 100, Annex 4), following six steps have been followed:

(a) Step 1: Identify the relevant electricity systems;

(b) Step 2: Choose whether to include off-grid power plants in the project electricity system (optional);

(c) Step 3: Select a method to determine the operating margin (OM);

(d) Step 4: Calculate the operating margin emission factor according to the selected method;

(e) Step 5: Calculate the build margin (BM) emission factor;

(f) Step 6: Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

As described in tool "For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO_2 Baseline Database. As of 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala

Himachal Pradesh	West Bengal	Dadar& Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Puducherry
Rajasthan		Goa	Tripura	Lakshadweep
Uttar Pradesh				
Uttarakhand				

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The Project Participant has chosen only grid power plants in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

(a) Simple OM; or

(b) Simple adjusted OM; or

(c) Dispatch data analysis OM; or

(d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2014-15	2015-16	2016-17	2017-18	2018-19
India	16.8%	15.1%	14.6%	14.3%	14.5%

Data Source: Central Electricity Authority (CEA) database Version 15, Dec'2019[17]

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of the total generation. Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

[17] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

(a) **Ex-ante option:** if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

(b) **Ex-post option:** if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the joint PD & MR to the VVB for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor ($EF_{grid,OMSimple,y}$) according to the selected method

The operating margin emission factor has been calculated using a 3 year data vintage:

Net Generation in Operating Margin (GWh) (incl. Imports)			
	2016-17	2017-18	2018-19
INDIAN Grid	916,278	960,639	995,957

Simple Operating Margin (tCO2/MWh) (incl. Imports)			
	2016-17	2017-18	2018-19
INDIAN Grid	0.9636	0.9543	0.9685

Weighted Generation Operating Margin	
INDIAN Grid	0.9622

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 72:

In terms of vintage of data, project participants can choose between one of the following two options:

(a) **Option 1** - for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of Joint PD & MR submission to the VVB for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the VVB. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

(b) **Option 2** - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option

1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 as described above is chosen by PP to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of joint PD & MR and is fixed for the entire crediting period.

Build Margin (tCO2/MWh) (not adjusted for imports)	
	2018-19
INDIAN Grid	0.8811

Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid,CM,y}$)

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 81:

The calculation of the combined margin (CM) emission factor ($EFgrid,_{CM,}y$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

PP has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (t CO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (t CO_2/MWh)

W_{OM} = Weighting of operating margin emissions factor (per cent)

W_{BM} = Weighting of build margin emissions factor (per cent)

The following default values should be used for W_{OM} and W_{BM}:

Wind and solar power generation project activities: W_{OM}= 0.75 and W_{BM}= 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods. Since project activity is of wind power generation, the above weightage has been considered for OM and BM.

Therefore, $EF_{grid,CM,y}$ = 0.9622 * 0.75 + 0.8811 * 0.25

= 0.9419 t CO_2/MWh

Note: The Quantity of net electricity generation that is produced and fed into the grid is represented as $EG_{PJ,y}$. However in the registered PDD the same had been represented as $EG_{facility,y}$.

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Baseline emission factor (Combined Margin) (EF_y)

= 0.9419 tCO_2e/MWh

Annual electricity supplied to the grid by the Project (EG_y)

= 35,555 (MWh)

Annual Baseline Emissions Reduction:

$ER_y = EF_y * EG_y$

= 0.9419 tCO_2e/MWh * 24,138 MWh

= 22,735 tCO_2e/year

4.2 Project Emissions

According to the chosen baseline methodology AMS-I.D. , for wind energy based renewable energy project activities, PEy = 0.

4.3 Leakage

According to AMS-I.D., leakage emissions are considered only for biomass projects to quantify leakages pertaining to the use of biomass residues. As this project activity is a wind power project, no leakage emissions are considered. LEy= 0.

4.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2020-21	22,735	0	0	22,735
2021-22	22,735	0	0	22,735
2022-23	22,735	0	0	22,735
2023-24	22,735	0	0	22,735
2024-25	22,735	0	0	22,735
2025-26	22,735	0	0	22,735
2026-27	22,735	0	0	22,735
2027-28	22,735	0	0	22,735
2028-29	22,735	0	0	22,735
2028-29	22,735	0	0	22,735

Total	227,350	0	0	227,350

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[18]
Value applied:	0.9622
Justification of choice of data or description of measurement methods and procedures applied	Calculated as the last 3 year (2016-17, 2017-18, 2018-19) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[19]

[18] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf
[19] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

Value applied:	0.8811
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07" as per the latest data available for the most recent year 2018-19. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 15, published by the Central Electricity Authority, Ministry of Power, and Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[20]
Value applied:	0.9419
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$= Build margin CO_2 emission factor in year y (tCO_2/MWh) $EF_{grid,OM,y}$= Operating margin CO_2 emission factor in year y (tCO_2/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 75% W_{BM}= Weighting of build margin emissions factor (%) = 25%
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

[20] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

5.2 Data and Parameters Monitored

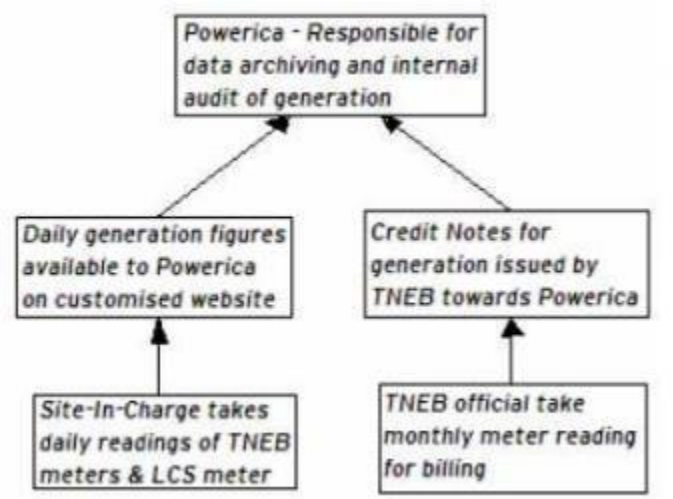
Data / Parameter	EG_y
Data unit	MWh/year
Description	Quantity of net electricity supplied to the grid in year y
Source of data	TNEB Statement
Description of measurement methods and procedures applied	Monitoring: Electrical Energy Meters which are electronic tri-vector meters Data type :Measured & Calculated Archiving: Paper & Electronic Recording Frequency: Monthly Responsibility: The O&M site-in-charge shall be responsible for the regular recording of data. Calibration Frequency: The meters shall be calibrated once every five years. as per CEA (installation and operation of meters) (Amendment) Regulations, 2019 Web-link https://cea.nic.in/regulations-category/metering-regulations/?lang=en
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value applied:	24,138
Monitoring equipment	**Monitoring Equipment:** Electrical Energy Meters which are electronic tri-vector meters. Accuracy: 0.2s Make: HPL Details of energy meters are given below:

	<table><tr><th>WTG No.</th><th>Meter Serial No.</th></tr><tr><td>TGU 28 SS(T-139)</td><td>627560</td></tr><tr><td>TM 41 SS(T-145)</td><td>624763</td></tr><tr><td>TSSP 158 SS(T-142)</td><td>624852</td></tr><tr><td>TSSP 174 SS(T-143)</td><td>627558</td></tr><tr><td>TM 721 SS(T-141)</td><td>627555</td></tr><tr><td>TSSP 1225 SS(T-144)</td><td>627553</td></tr></table>
QA/QC procedures applied	The amount of electricity exported to grid is cross-checked with the invoices for sale of power. Meter calibration shall be conducted once in every five years and internal audit system is in place. (Meter calibration details are available in Appendix -1)
Purpose of data	Calculation of baseline emissions
Calculation method	--
Comments	The Monitored Data to be kept for a minimum of two years after the end of the crediting period or the last issuance whichever is later.

5.3 Monitoring Plan

The monitoring methodology specified in the methodology requires that the project- monitoring plan to consist of metering the electricity generated by the renewable technology. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline emission to the project activity.

Since the baseline methodology is based on ex-ante determination of the baseline emission factor, the monitoring of baseline emission factor is not required. The sole parameter for monitoring is the electricity exported to the grid. The Project is operated and managed by Vestas Wind Technology India Private Limited (Vestas). Vestas will have a designated Site-In-Charge (O&M) on site who will be responsible for monitoring the electricity exported from the project activity. The overall flow of information has been depicted using the following hierarchical structure:



There are two points of monitoring:

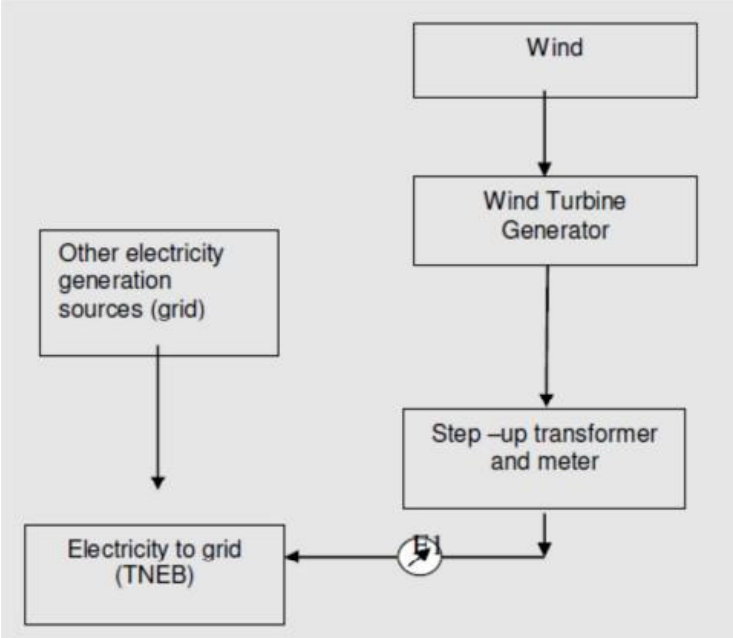
1. At the WTG panel by LCS meter provided by O&M service provider
2. At the WTG electrical yard substation using a TNEB owned electronic tri-vector meters

The net electricity exported to grid is calculated as the product of difference of current and previous TNEB meter readings multiplied with the multiplying factor of the meter. Additionally, all the WTGs at the site are connected to a central monitoring system located at that site only. This system captures daily generation figures which are later made available to Powerica on the customized website of Vestas.

Emergency Preparedness

In the context of the project activity, the meters will be kept in sealed by TNEB and all maintenance will be taken up by TNEB only. In case of failure of the main meter, generation value of controller meter would be considered. The previous month's transmission loss between the main meter and controller meter would be taken into account to determine net electricity supplied to grid. There was no any such instance occurred where main meter is failed during current monitoring period. The state electricity board has removed check meters, hence only main meters are part of project activity. The monitoring process is under control of state electricity board and PP do not have any control on it.

The schematic line diagram of metering point are as below where project activity uses only main meter for determination of net electricity supplied to grid.



The project promoters have contracted the technology supplier for providing O&M services for the power project. The service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities. Additionally, spare meters would also be kept available at the site for replacement in case of failure of any of the monitoring equipment.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG_y
Data unit	MWh
Description	Quantity of net electricity supplied to the grid
Value applied:	01-January-2020 to 12-September-2020 – 12,595.79[21] 13-September-2020 to 31-December -2020 – 4,067.61[22] Total – 16,663.40
Comments	Calculation of baseline emissions

6.2 Baseline Emissions

The emission factor value has been fixed Ex-ante and the same shall be used for the monitoring period. Net Electricity Generated is obtained by deducting total import (from grid) from total export (to grid). These values are taken from the "Certificate for Share of Electricity Generated by Wind Farm" issued by state electricity board. This statement is issued on a monthly basis.

Baseline emissions are calculated by multiplying the Net electricity exported to the grid with net baseline emission factor, as given in the registered VCS PD.

$BE_y = EG_{,y} \text{ X } EF_{grid,CM,y}$

Where,

BE_y = Baseline Emissions (tCO_2/year)

[21] Net energy exported to the grid during this monitoring period and previous crediting period (13/09/2010 to 12/09/2020)

[22] Net energy exported to the grid during this monitoring period and current crediting period (13/09/2020 to 12/09/2030)

$EG_{,y}$ = Net electricity supplied to the grid in year y (MWh)

$EF_{grid,\ CM,\ y}$ = Baseline Emission Factor (Combined margin CO_2 emission factor for grid)

The calculation of yearly baseline emissions is provided below:

BE_y = 12,595.79 MWh * 0.9445[23] tCO_2/year = 11,893 (the value is rounded down) for the period 01-January-2020 to 12-September-2020.

BE_y = 4067.61 MWh * 0.9419CO_2/year = 3,828 (the value is rounded down) for the period 13-September-2020 to 31-December-2020.

BE_y = 15,721 tCO_2e (the value is rounded down)

Hence the baseline emission calculated for the reported monitoring period is 15,721 tCO_2

i.e. BE_y = 15,721 tCO_2e

6.3 Project Emissions

No project emissions are applicable to this wind electric power project, since the electricity generation is based on wind resources, which does not involve in combustion or generation of emissions from fossil fuels. Hence, these emission sources are neglected.

PEy = 0

6.4 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.

LEy = 0

6.5 Net GHG Emission Reductions and Removals

Quantify the net GHG emission reductions and removals achieved for this monitoring period, summarizing the key results using the table below. Specify breakdown of GHG emission reductions and removals by vintages where the intent is to issue each vintage separately in the VCS registry system.

The Formula used to calculate the net emission reduction for the project activity is

[23] Grid emission factor applied as per CEA data base version 5.0, Nov.2009 , for monitoring period under previous crediting period (i.e. CPA 1)

ERy = BEy – PEy – LEy

Where,

ERy = Emission Reduction in tCO2/year

BEy = Baseline emission in tCO2/year

PEy = Project emissions in tCO_2/year

LEy = Leakage Emissions in tCO_2/year

For the project activity during the current monitoring period, as per section 6.2,

BEy = 15,721 tCO_2e, PEy = 0 tCO_2e , LEy = 0 tCO_2e.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01/01/2020 to 31/12/2020	15,721	0	0	15,721
Total	15,721	0	0	15,721

During this monitoring period under previous crediting period – 01-January-2020 to 12-September-2020.

The actual ER is about 25.01% lower than the estimated VCUs. This variation is majorly due to the variations in wind flow pattern, grid availability and other parameters which are not in the control of PP.

During this monitoring period under current crediting period – 13-September-2020 to 31-December-2020.

The actual ER is about 44.13% lower than the estimated VCUs. This variation is majorly due to the variations in wind flow pattern, grid availability and other parameters which are not in the control of PP.

APPENDIX 1: METER CALIBRATION DETAILS

WTG No.	Meter Serial No.	Make	Accuracy class	Last Calibration date	Next due date of Calibration
TGU 28 SS(T-139)	627560	HPL	0.2S	17-May-2017	16-May-2022
TM 41 SS(T-145)	624763	HPL	0.2S	17-May-2017	16-May-2022
TSSP 158 SS(T-142)	624852	HPL	0.2S	17-May-2017	16-May-2022
TSSP 174 SS(T-143)	627558	HPL	0.2S	17-May-2017	16-May-2022
TM 721 SS(T-141)	627555	HPL	0.2S	17-May-2017	16-May-2022
TSSP 1225 SS(T-144)	627553	HPL	0.2S	17-May-2017	16-May-2022

Earlier there were check meters also installed as back up meters, however state electricity board had removed that check meters and only main meters are used for export, import values. Hence that main meters are mentioned in above table.

As per registered CDM PDD, the calibration frequency is once in every two years. The calibration of meters is not in control of PP and same is done by state electricity board. The state electricity board does not follow any fixed calibration frequency, hence deviation is requested for change in calibration frequency as once in five years and this deviation request was approved during the previous verification. This calibration frequency is as per CEA notification, CEA (installation and operation of meters) (Amendment) Regulations, 2019

https://cea.nic.in/regulations-category/metering-regulations/?lang=en

Based on once in five year calibration frequency as per requested deviation, there is no any delay in calibration and no error factor is applicable for current monitoring period.