100 MW GRID CONNECTED WIND POWER PROJECT IN JAMNAGAR GUJARAT, INDIA

Document Prepared by Infinite Solutions

Project Title	100 MW grid connected Wind Power project in Jamnagar Gujarat, India
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Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity involves the establishment of a wind farm of 100 MW installed capacity enabling generation of electricity by state-of-art 2 MW capacity Wind Turbine Generators (WTGs) (One of the latest available technologies in the country developed by Inox wind in the state of Gujarat. The electricity generation from this wind farm contributes to annual GHG reductions estimated at 213,365 tonnes of carbon dioxide equivalent). The project activity is expected to evacuate approximately 227,760 MWh of renewable power annually to the Central Grid of the country. In the absence of the project activity, the accordant amount of electricity would have been delivered through the grid, which to a large extent is fed by fossil sources, leading to carbon dioxide emissions.

Purpose of the project

The project activity involves the establishment of a wind farm of 100 MW installed capacity deploying Wind Turbine Generators (WTGs) (One of the latest available technologies in the country developed by Inox wind.

In the absence of the project activity, the accordant amount of electricity would be delivered through the grid, which to a large extent is fed by fossil sources, leading to carbon dioxide emissions. Demand for electricity in Gujarat is growing quickly, therefore the additional capacities are necessary. There is a deficit in energy supply and in peak power demand in Gujarat. This supply demand gap is likely to be met through the fossil fuelled power stations. PP do not have any prior experience of installation of similar wind mills.

Salient Features of the project activity

The main purpose of the project activity is to generate electrical energy through sustainable renewable energy means using wind power and feed the generated output to the local grid in Gujarat and contribute to climate change mitigation efforts.

Apart from generation of renewable energy based electricity, the project has also been conceived for the following:

- To enhance the propagation of commercialisation of wind power generation in the region
- To contribute to the sustainable development of the region, socially, environmentally and economically
- To reduce the prevalent policy & regulatory risks for this wind park through revenues from the CDM

View of project participants on the contribution of the project to sustainable development

Social well being - The proposed projects will provide employment opportunities in the context of building infrastructure, installation and maintenance & managing the wind farm. Thus, project activity helps in improving the quality of life of the people.

Economic well being- The proposed project activity leads to alleviation of poverty by establishing direct and indirect employment benefits accruing out of infrastructure development of wind farms, installation work, operation and management of wind farm, providing daily needs, etc. The infrastructure in and around the project area will also improve due to project activity. This includes development of road network and improvement of electricity quality, frequency and availability as the electricity is fed into a deficit grid.

The project activity leads to an investment to a developing region which otherwise would not have happened in the absence of project activity. The generated electricity is fed into the Indian Grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development. The project activity also leads to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

Environmental well being -
The project utilizes wind energy for generating electricity which otherwise would have been generated through alternate fuels (most likely – fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions. As wind power projects produce no end products in the form of solid waste (ash etc.), they address the problem of solid waste disposal encountered by most other sources of power. Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus, the project causes no negative impact on the surrounding environment and contributes to environmental well-being.

On the area assigned for turbine foundation the natural vegetation will be removed. The vegetation that will be removed is common for wild areas, therefore it is implausible, that the species will vanish. Only the biomass loss will occur.

Technological well being- The project activity leads to the promotion of WTGs into the region, demonstrating the success of wind turbines, which feed the generated power into the nearest sub-station, thus increasing energy availability and improving quality of power under the service area of the substation. Hence the project leads to technological well being.

As the project developer is a Indian company using the self developed wind power technology, there is no transfer of technology in the project activity.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope : 01 - Energy industries (renewable / non-renewable sources)

Project Type : I - Renewable Energy Projects

Methodology : ACM0002: Grid-connected electricity generation from renewable sources - Version 19[1]

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	M/s Verdant Renewables Pvt Ltd
Contact person	Ms Shweta Singh

[1] https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDEO2VN6LYM30K41HFPRQ

Title	Senior Manager - Corporate
Address	507-508, Ashok estate, 24 Barakhamba Road, New Delhi - 110001
Telephone	+ 91 8447677111
Email	shweta.singh@sitacre.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the project	Project Consultant
Contact person	Mr Jimmy Sah
Title	Head-Sustainability
Address	611, Chetak Centre Main, 12/2 RNT Marg, Indore- 452001
Telephone	+91 9589804304
Email	jimmy@infisolutions.org

1.5 Project Start Date

Project Start Date: 23/12/2019;
The project start date is the proposed commissioning date of the turbines.

1.6 Project Crediting Period

Project crediting period: The project is proposed to be commissioned by 23/12/2019. The crediting period shall be from 23/12/2019 to 22/12/2029.

Total number of years: 10 years which shall be renewed twice.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	√

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	213,365
Year 2	213,365
Year 3	213,365

Year 4	213,365
Year 5	213,365
Year 6	213,365
Year 7	213,365
Year 8	213,365
Year 9	213,365
Year 10	213,365
Total estimated ERs	21,33,650
Total number of crediting years	10
Average annual ERs	213,365

1.8 Description of the Project Activity

Description of project activity
The proposed project will be commissioned by the December 2019.

Description of technology/measure employed:
In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy.

Wind has considerable amount of kinetic energy when blowing at high speeds. The kinetic energy passes through the blades of the wind turbines is converted into mechanical energy and rotates the turbine. When the wind blades rotate, the connected generator rotor also rotates, thereby producing electricity. The technology is a clean technology since there are no GHG emissions associated with the electricity generation.

The project installs Inox wind make WTGs of individual capacity 2 MW. The salient Features of WTG are as Follows: -

1. Unique Micro pitch system
2. Unmatched flexislip mechanism
3. Advanced control system
4. High quality power generation
5. well balanced design
6. ISO-certified vendors confirm high quality components
7. ISO 9001:2000 for Design, Development, Manufacture and Supply of Wind Turbines
8. ISO 9001:2000 certification for Installation, Commissioning, Operation and Maintenance

Wind energy presents various environmental benefits compared to other primary energy sources: wind energy does not result in emissions of pollutants into the atmosphere nor does it emit residuals that can have a negative impact on soil, water etc. As a renewable energy source wind energy can be used without putting the supply of primary energy sources into danger for future generations. The proposed project will also contribute to a reduction in other emissions than GHG related to conventional electricity generation, like emissions of sulphur dioxide, nitrogen oxides and particulates.

Scenario existing prior to the start of the project activity:
The project activity is installation of 100 WTGs (New) of 2 MW each. The project activity installs the wind farm at a barren land. The WEGs planned to be installed are new.

Scope of activities/measures that are being implemented within the project activity:
The project activity involves the establishment of a wind farm of 100 MW installed capacity at the project location. This involves installation of WTGs, transformers, laying down the transmission lines/cables, establishment of a control room, etc.

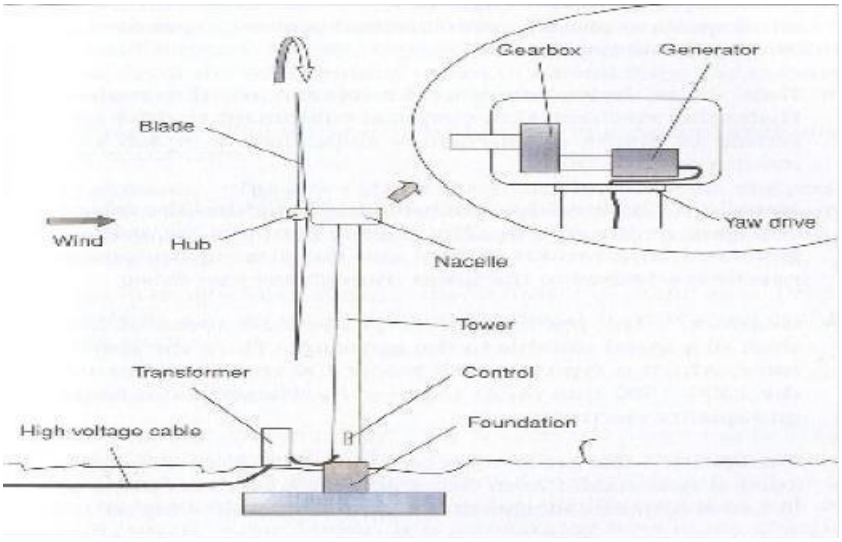
Baseline Scenario
In the absence of the project activity, the accordant amount of electricity would be delivered through the grid, which to a large extent is fed by fossil sources, leading to carbon dioxide emissions. The electricity generation from this wind farm will contribute to GHG reductions estimated at 213,365 tCO_{2e} (tonnes of carbon dioxide equivalent) during the crediting period

The technical details of WTG are detailed below in the table:

Parameter	**Specifications**
	2 MW -Inox wind
Rotor	
Installed electrical output	2000 kW
Diameter	82.0 m
Cut-in wind speed	4 m/s
Rated wind speed	14 m/s
Cut-out wind speed	20 m/s
Rotor swept area	5281 m2
Rotational speed	16.30 RPM
Regulation	Pitch
Generator	
Type	Asynchronous, 4 Poles
Rated output	2000 kW
Rotational speed	1511 RPM
Operating voltage	690 V
Frequency	50 Hz
Insulation class	H
Cooling system	Air cooled
Gear Box	
Gear Ratio	02:35.1

Yaw system	
Drive	Active electrical yaw motors
Bearing	Polyamide slide bearing
Safety system	
Aerodynamic brake	3 independent systems with blade pitching
Mechanical brake	Hydraulic disc brake

Figure 1: Wind turbine setup overview diagram.



Wind energy presents various environmental benefits compared to other primary energy sources: wind energy does not result in emissions of pollutants into the atmosphere nor does it emit residuals that can have a negative impact on soil, water etc. As a renewable energy source wind energy, can be used without putting the supply of primary energy sources into danger for future generations. The project contributes to a reduction in other emissions than GHG related to conventional electricity generation, like emissions of sulphur dioxide, nitrogen oxides and particulates.

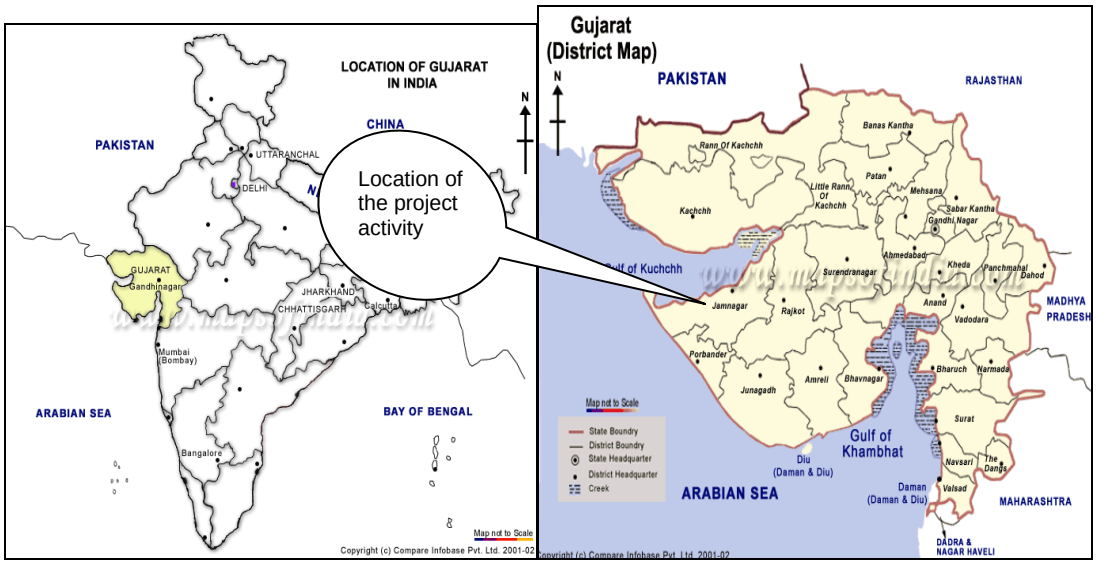
1.9 Project Location

The WTGs installed by the project proponent are distributed across the Jamnagar in the villages of Mavapar, Bhadra, Lakhtar, Keshiya, Meghpar, Tarana, Balambha, taluk:Jodiya.

The coordinates for Jamnagar location are as follows; Latitude 22° 28' 14.52" N, Longitude 70° 3' 27.83" E

The geographical location of the projects can be depicted from the maps on the following page.

Figure 1: Location of Gujarat in India **Figure 2: State Map of Gujarat showing Districts**



1.10 Conditions Prior to Project Initiation

The pre project scenario is same as baseline scenario. Please refer section 2.4 for the description of baseline scenario.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Project complies with all relevant local, regional and national laws, statutes and regulatory frameworks and meets all local laws and regulation of India. All necessary NOCs, commissioning certificates, loan approval documents have been submitted to DOE.

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

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

The Project activity conforms to all the applicable laws and regulations in India:

- Power generation using Wind energy is not a legal requirement or a mandatory option.
- There are state and sectoral policies, framed primarily to encourage Wind power projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.
- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
- There is no legal requirement on the choice of a particular technology for power generation

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The ownership of the Project and its right to use is completely with the project proponent and the necessary approvals shall be submitted to the DOE.

- Power Purchase Agreements signed with the Grid
- Purchase orders issued for the project WTGs

1.12.2 Emissions Trading Programs and Other Binding Limits

The project is not participating in any other program.

1.12.3 Other Forms of Environmental Credit

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

1.12.4 Participation under Other GHG Programs

The Project has not participated in any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is not a grouped project activity. Thus, this section is not applicable for this project

Leakage Management

Project does not involve any leakage emissions other than methodology requirement for Biomass power project. Hence there are no any extra Leakage Management Plan and risk mitigation measures are required.

Commercially Sensitive Information

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

Sustainable Development

Legislative:

The project participants obtained all clearances from stakeholders hence no legal risks are anticipated.

Socio-economic well being:

- Project activity has generated direct and indirect employment for skilled and unskilled manpower during construction phase as well as during operational stage and thus helped in controlling migration from the region and alleviation of poverty.

- The project activity's contribution of power supply towards the Indian grid is helping in the upliftment of the social life of the people by ensuring a sustainable and reliable source of power for the region.
- The Project activity has improved the infrastructural facilities like water availability, road, and medical facilities etc in the region.

Environmental well being:

- The project activity generates clean and green power thus causing negligible emissions of greenhouse gases. By building and operating the power project, much pollution is avoided. In the absence of the project activity, equivalent power would have been generated based on the fossil fuels resulting in more Green House Gas emissions into the atmosphere.
- The project activity has reduced the dependence on fossil fuels for power generation thus conserving the natural reserves. The project has led to greenhouse gas emission reduction and hence contributed in mitigating climate change.

Technological well being:

The project activity has increased awareness and interest among the private players to make investments in similar areas. The project activity envisages installation of high efficiency turbines and generators and the power will be transmitted at high voltage to ensure low losses. Moreover, the technology being used is well established, most updated and environmentally safe.

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 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

For Previous Crediting Period:

The approved consolidated baseline and monitoring methodology ACM0002 Version 19 has been used. The titles of these baseline and monitoring methodologies is "Consolidated Baseline Methodology for grid connected electricity generation from renewable sources"

For Current Crediting period:

Methodology:
ACM0002: Grid-connected electricity generation from renewable sources --- Version 19.0, Sectoral Scope: 01, EB 100, Annex 6
https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD

The project activity also takes reference from following Tools from the tools prescribed by applied methodology:
1. Tool for the demonstration and assessment of additionality --- Version 07.0.0, EB 70, Annex 8
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

2. Tool to calculate the emission factor for an electricity system --- Version 07.0, EB 100, Annex 4
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

2.2 Applicability of Methodology

The following steps will show the applicability of the project under this methodology

Applicability Criterion (with Para number reference)		Project Case
1.	This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	The Project activity is installation of Greenfield Wind Power Project. Hence the project activity satisfies this applicability criterion of the methodology.
2.	The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation	The option (a) of applicability criteria 1 is applicable as project activity is generation of electricity through Wind Power Plant which is renewable energy power plant. Hence the project activity satisfies this applicability criterion of the methodology

	of the project activity.	
3.	In case of hydro power plants, one of the following conditions shall apply:[2] (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (3), is greater than 4 W/m^2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	The project activity is wind power project thus this condition is not applicable
4.	In the case of integrated hydro power projects, project proponent shall:	The project activity is wind power project thus this condition

[2] Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

	(a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	is not applicable
5.	The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units.	The project activity is wind power project thus this condition is not applicable
6.	In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The proposed project activity is a Greenfield project; thus, this criterion is not applicable.
7.	In addition, the applicability conditions included in the tools referred to below apply.[3]	The project applies the following

[3] The condition in "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" that all potential alternative scenarios to the proposed project activity must be available options to project participants; does not apply to this methodology, as this methodology only refers to some steps of this tool.

		tools and is in compliance to the same; • "Tool to calculate the emission factor for an electricity system";

2.3 Project Boundary

According to the methodology, For emissions sources, only CO2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.

The spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the project power plant is connected to.

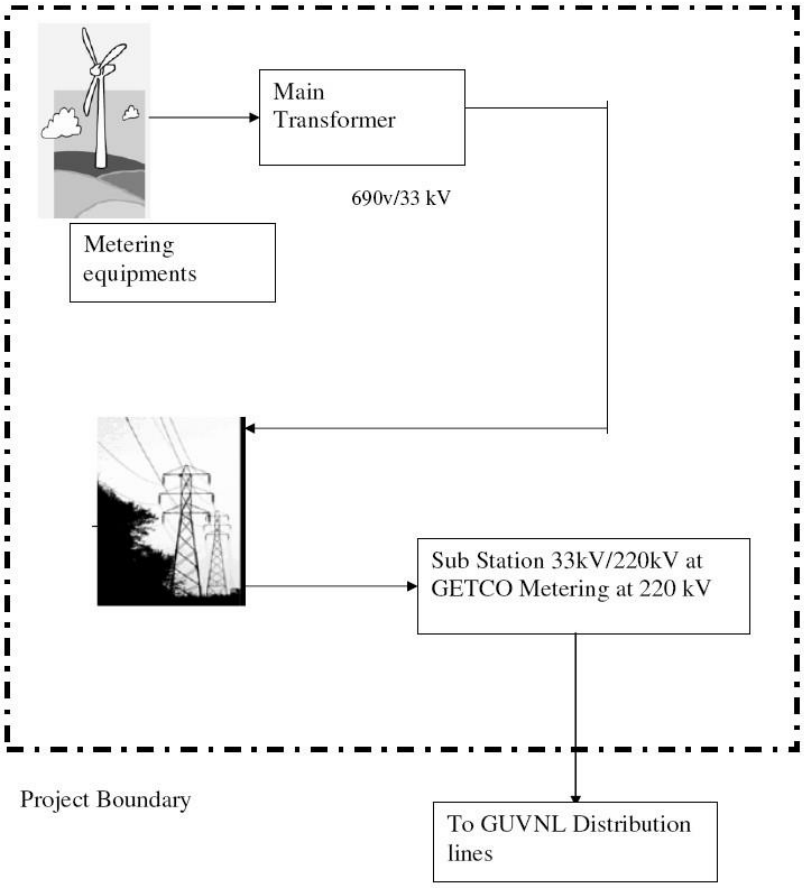
The proposed project would be feeding the electricity in the National grid. The proposed project would have marginal impact on all the generation facilities in the grid. Thus, all the power generation facilities connected to this grid form the project boundary for the purpose of baseline estimation.

Table: Baseline and project emission sources

	Source	**Gas**	**Included?**	**Justification / Explanation**
Baseline	Power Generation in the Regional Electricity Grid	CO_2	Yes	Main emission source
		CH_4	No	Not applicable as per ACM0002
		N_2O	No	Not applicable as per ACM0002
Project Activity	On site fossil fuel consumption due to project activity	CO_2	No	Electricity generation through wind does not lead to emission of greenhouse gases. The CO2 emission through fossil fuels are neglected.
		CH_4	No	Electricity generation through wind does not lead to emission of greenhouse gases.
		N_2O	No	Electricity generation through wind does not lead to emission of greenhouse gases.

The project boundary is composed of the Wind Energy Generators, main transformers, grid, transmission lines, sub station and the metering equipment for each generator and substation, and the grid which is used to transmit the generated electricity.

The project boundary is shown in as below:



2.4 Baseline Scenario

As Baseline for the project activity at the time of validation shall be established according to ACM0002 version 19. Since the project activity was commissioned as a greenfield power project generating electricity through wind energy and supplying the same to the grid, it was demonstrated that the electricity delivered to the grid by the project 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. The same baseline scenario is applicable in line with ACM0002 Version 19, i.e. generation of electricity in the connected grid.

The details of CM Emission Factor calculation are reported under the section 3.1 of this report.
The values of the parameters are also reported under the section 4.1

2.5 Additionality

In line with VCS Standard version 3.7, the additionality of the Project activity is ascertained in line with the applicable guidance from the UNFCCC. The demonstration of additionality for the proposed Project activity is being carried out in accordance with the additionality tool provided by the UNFCCC i.e. “Tool for demonstration and assessment of Additionality” Version 07.0.0,. The tool provides a step-wise approach to demonstrate additionality which is displayed below:

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

The proposed project activity is not the first-of-its-kind. Hence not applicable.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

As per the applied methodology ACM0002 version 19; Para 22, "*If the project activity is the installation of a Greenfield power plant, 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 plant and by the addition of new generation sources*".

Outcome of Sub-step 1a: As the baseline scenario is prescribed by applied methodology for Greenfield Project, hence no further analysis is carried out to identify alternatives

Sub-step 1b: Consistency with mandatory laws and regulations:
The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This sub-step does not consider national and local policies that do not have legally-binding status.).

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

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

The Project activity conforms to all the applicable laws and regulations in India:

- Power generation using wind energy is not a legal requirement or a mandatory option.
- There are state and sectoral policies, framed primarily to encourage wind power projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.
- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
- There is no legal requirement on the choice of a particular technology for power generation.

Outcome of Sub-step 1b: Hence, both the alternatives discussed (i.e. continuation of electricity generation in the grid and project activity without carbon revenues) are found to comply with the mandatory laws and regulations taking into account the enforcement of the legislations in the region or country and EB decisions on national and/or sectoral policies and regulations. However, Alternative 1 (i.e. continuation of electricity generation in the grid) has been selected as the appropriate baseline alternative for this project activity.

Step 2: Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, without the revenue from

the sale of emission reductions credits. To conduct the investment analysis, use the following sub-steps:

Sub-step 2a: Determine appropriate analysis method

As per Tool for demonstration and assessment of Additionality; Sub-step 2a, Paragraph (1), as the project activity is selling the generated electricity & getting financial benefits other than CDM benefits hence, Option- I (Apply simple cost analysis) is not applicable under this situation. Also as per EB-62, Annex 05, clause no.19 "If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate". Hence Option-II (Apply investment comparison analysis) is also not applicable under this situation. So the project promoter has chosen Option- III or benchmark analysis as an appropriate analysis method to demonstrate the investment barrier.

This method determines the attractiveness of the project activity for the investors, as well as provides a measure of the viability of the investment to generate revenues during its operation, as compared with other avenues and investment options. Hence, the Benchmark analysis method is to be employed for analysis of the said project.

Sub-step 2b (Option III): Apply benchmark analysis

The investment analysis using Benchmark analysis approach (Option III) has been chosen. Further, this method illustrates the evaluation of the Project by the PP before the decision to undertake the project was taken and management approval granted.

Choice of Financial Indicator:

According to the "Tool for demonstration and assessment of Additionality", *the financial indicator can be based either on (1) project IRR or (2) equity IRR. There is no general preference between the approaches (1) or (2). The benchmark chosen for analysis shall be fully consistent with the choice of approach.* Therefore, in accordance with the guidance, the relevant financial indicator for project activity has been chosen as Project IRR.

Benchmark estimation:

The Cost of Equity has been considered using the "Methodological tool: Investment analysis" available at the time of decision making as well as the latest available value. As a conservative approach, the minimum value of benchmark has been considered as calculated using these 2 approaches.

Table under Appendix in EB85, Annex 12 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.10%**[4]

Table under Appendix in EB97, Annex 8 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **10.73%**[5]

Thus, minimum cost of equity considered for calculation of Benchmark = 08.73%

Inflation Forecast for India as per RBI website[6] and corresponding benchmark values:

[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v1.pdf

[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v8.pdf

[6] https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16980

*As a conservative approach, benchmark of **15.16%** has been selected for this project activity.*

Sub-step 2c: Calculation and comparison of financial indicators

The Project IRR is evaluated for the entire lifetime of the project activity, i.e. 25 years. It is calculated based on the cash outflows from and cash inflows into the project activity. The project IRR is 9.3%.

Key Assumptions supporting financial projections:

Input values are based on publicly available data sources which can be clearly validated by the DOE, thus it complies with guidance 13 of EB 62, Annex 5.

This substantiates that the investment is not financially attractive (Project IRR for the project activity is less than the Benchmark). Thus, it can be easily concluded that project activity is additional & is not business as usual scenario.

Sensitivity Analysis:

As per Guidance 20 and 21 of EB 62 Annex 5, the sensitivity analysis of the project parameters which may substantially influence the Project IRR is carried out to assess the robustness of the conclusion. The results of the sensitivity analysis are presented below:

Factor	% Change	Remarks
Generation	+10%	This is lower than Benchmark
	-10%	This is lower than Benchmark
O&M cost	+10%	This is lower than Benchmark
	-10%	This is lower than Benchmark
Tariff Rate	+10%	This is lower than Benchmark
	-10%	This is lower than Benchmark
Project Cost	+10%	This is lower than Benchmark
	-10%	This is lower than Benchmark

Thus, based on the sensitivity analysis it can be conclude that the project is financially not business as usual scenario.

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice Analysis

Sub-step 4a: Analyze other activities similar to the proposed Project activity:

The common practice analysis is carried out step by step as per “Methodological tool: Common Practice, version 03.1” para 5. Stepwise approach for common practice are as follows:

Step (1): *calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.*

Range	Capacity	Unit
+50%	150	MW
Capacity of the proposed project activity	100	MW
-50%	50	MW

Step (2): identify similar projects (both CDM/VCS and non-CDM/VCS) which fulfil all of the following conditions:

(a) The projects are located in the applicable geographical area;

(b) The projects apply the same measure as the proposed project activity;

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Identification of the similar projects (CDM/VCS and non-CDM/VCS) is carried out as per sub-steps of Step (2) as follows:

a. Project is located in host country - India. Therefore, Project is located India have been chosen for analysis.
b. The project activity is a green-field wind power project and uses measure (b) *"Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies"*.
   Therefore, all projects applying same measure (b) as the proposed project activity are candidates for similar projects.
c. The energy source used by the project activity is wind. Hence, only wind energy projects have been considered for analysis.
d. The project activity produces electricity; therefore, all power plants that produce electricity are candidates for similar projects.
e. The capacity range of the projects is within the applicable capacity range from 150 MW to 50 MW.
f. The start date of the project activity is 23-Dec-19, therefore projects, which had started commercial operation between before Dec 2019, have been identified.

Numbers of Similar projects (CDM/VCS and non-CDM/VCS) identified, which fulfil above-mentioned conditioned are:

Particulars	No. of Projects	Source
N_{Wind}	22	Central Electricity Authority: CO_2 Baseline Database version 14.0

Sources: CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE Version 14

Refer Common Practice Analysis Excel Sheet for Project Details & Analysis

Step (3): *within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number* N_{all}.

Out of the projects identified in step-2, 7 projects are either registered or project activities submitted for registration, or project activities undergoing validation

Thus, N_{all} = 22

Step (4): *within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number* N_{diff}.

From the projects identified above, those projects which employ "**different technologies**" have been excluded and the number of such projects has been identified as N_{diff}.

With reference to Methodological tool: Common Practice, version 03.1 para 12 (d) (iv); Investment climate has been considered for identifying Different technologies, as each state in India has different set of policies and legal regulations. The project activity is located in the state of Karnataka of India and the policies and legal regulations applicable for the project is regulated by Karnataka Government. Therefore, it can be assumed that the policies and legal regulations are different in different states and hence projects installed in other states have been considered in N_{diff}.

From the identified projects in N_{all} (step 3) located in states other than Karnataka come under different investment climate and have been considered under N_{diff}.

As N_{all} = 22; thus N_{diff} = 22

Step (5): *calculate factor* $F=1-N_{diff}/N_{all}$ *representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity*

Calculate $F=1-N_{diff}/N_{all}$

As N_{all} =22 thus, $N_{all}-N_{diff}$ = 0; is less than 3

Outcome of Step 5:

As,

i. F = 0; is less than 0.2

ii. N_{all}-N_{diff} = 0; is less than 3

Thus, the proposed project activity is not a "common practice" within a sector in the applicable geographical area.

The above discussions show that wind power development is not a common practice and the project activity is not financially attractive; hence the project activity is additional.

2.6 Methodology Deviations

There is no methodology deviation.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As per the various baseline scenarios identified in approved methodology ACM0002 version 19, the emission reductions have been identified using the following steps:

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* (t CO_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 CDM 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" (t CO_2/MWh)

Calculation of $EG_{PJ,y}$

If the project activity is the installation of a Greenfield power plant, then:

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

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

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

$$EG_{PJ,y} = EG_{facility,y}$$

Calculation of $EF_{grid,CM,y}$

The methodology ACM0002 (Version 19.0) requires that the combined margin for the grid be calculated in accordance with the procedure provided in the *"Tool to calculate the emission factor for an electricity system".*
As per "Tool to calculate the emission factor for an electricity system, Version 7.0.0";
The baseline emission factor ($EF_{grid,y}$) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

The methodology provides following approaches for emission factor calculations:

(a) *Combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology "Tool to calculate the emission factor for an electricity system".*

OR

(b) *The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.*

Option (a) has been considered to calculate the grid emission factor as per the 'Tool to calculate the emission factor for an electricity system' since data is available from an official source i.e.

CO_2 Baseline Database for the Indian Power Sector, Version 14, December 2018[7], published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

As per the "Tool to calculate the emission factor for an electricity system" Version 07.0, EB 100, Annex 4, the following steps have been followed.

STEP 1: Identify the relevant electricity systems;
STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional);
STEP 3: Select a method to determine the operating margin (OM);
STEP 4: Calculate the operating margin emission factor according to the selected method;
STEP 5: Calculate the build margin (BM) emission factor;

[7] http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

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

STEP 1: Identify the relevant electricity power systems

The tool defines that "*for determining the electricity emission factors, identify the relevant 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, all the 5 zones have now been synchronized and called as Indian Grid.

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)
Project participants have the option of choosing 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) method

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 or Dispatch data analysis is not possible due to lack of availability of this activity data to the project developers. The choice of other two options for calculating the operating margin emission factor depends on the 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)

	2013-14	2014-15	2015-16	2016-17	2017-18
India	18.6%	16.8%	15.1%	14.6%	14.3%

Data Source: Central Electricity Authority (CEA) database Version 14, Dec'2018

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of three most recent years) for the Indian grids is less than 50 % of the total generation. Thus the average emission rate 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 CO2 emissions per unit net electricity generation (t CO2/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:

- **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

- **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 the calculation of OM with 3 years generation weighted average of the most recent years available at the time of submission of CDM-PDD to the DOE 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 ($EF_{grid,OM,y}$) according to the selected method

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

Net Generation in Operating Margin (MWh) (incl. Imports)			
	2015-16	**2016-17**	**2017-18**
Indian Grid	871,753	916,278	960,693

Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
	2015-16	**2016-17**	**2017-18**
Indian Grid	0.9655	0.9636	0.9543

Weighted Generation Operating Margin	
Indian Grid	**0.9610**

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

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 CDM-PDD submission to the DOE 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 DOE. 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 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 PDD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
	2017-18
Indian Grid	**0.8644**

STEP 6: Calculate the combined margin (CM) emissions factor

Combined Margin – The combined margin is the weighted average of the simple operating Margin and the build margin. In reference to para 81 (b) of the Tool to calculate the emission factor for an electricity system, Version 07.0.0, 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;

The baseline emission factor is calculated using the combined margin approach as described in the following steps:

Calculation of Baseline Emission Factor ($EF_{grid,y}$)

The baseline emission factor $EF_{grid,y}$ is calculated as the weighted average of the Operating Margin emission factor **($EF_{grid,OM,y}$)** and the Build Margin emission factor **($EF_{grid,BM,y}$)**:

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

Where,

w_{OM}	75% weight of operating margin emissions factor (%)
w_{BM}	25% weight of build margin emissions factor (%)
$EF_{grid,OM,y}$	Build margin CO_2 emission factor of a particular grid in year y; calculated as described in Steps 3&4 above (tCO_2/MWh)

$EF_{grid,BM,y}$	Build margin CO_2 emission factor of a particular grid in year y; calculated as described in Steps 5 above (tCO_2/MWh)

Baseline Emission factor (Indian Grid)

$EF_{Grid,CM,y}$ = 0.75*0.9610 + 0.25*0.8644
= 0.9368 tCO_2/MW

Therefore, Baseline Emissions:

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

BE_y**= 227,760 x 0.9368 = 213,365 tCO_2**

BE_y = 213365 tCO_2

3.2 Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence, according to the methodology ACM0002, Version 19.0, there will be no project emissions, i.e. PEy = 0.

3.3 Leakage

As per the methodology ACM0002, Version 19.0, no leakage has been considered, therefore, $LE_y = 0$.

3.4 Net GHG Emission Reductions and Removals

The procedure for quantification of net GHG emission reductions and removals including all relevant equations has mentioned in the above section 3.3.

As per para 61 of ACM0002 version19; Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e/yr)

BE_y = Baseline emissions in year *y* (t CO_2/yr)

PE_y = Project emissions in year *y* (t CO_2e/yr)

Therefore, Net GHG Emission Reductions and Removals are calculated as follows:

$$ER_y = BE_y - PE_y$$

ER_y = **213,365 – 0 = 213,365 tCO_2**

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)
Year 1	213,365	-	-	213,365
Year 2	213,365	-	-	213,365
Year 3	213,365	-	-	213,365
Year 4	213,365	-	-	213,365
Year 5	213,365	-	-	213,365
Year 6	213,365	-	-	213,365
Year 7	213,365	-	-	213,365
Year 8	213,365	-	-	213,365
Year 9	213,365	-	-	213,365
Year 10	213,365	-	-	213,365
Total	21,33,650	-	-	21,33,650

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 14[8]
Value applied:	0.9610 (Indian Grid)
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 07.0.0" as 3-year generation weighted average using data for the years 2015-16, 2016-17 & 2017-18. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 14.0, published by the Central Electricity Authority, Ministry of Power, 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	$EF_{BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 14

[8] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_14.zip

Value applied:	0.8644 (Indian Grid)
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 07.0.0" as 3-year generation weighted average using data for the years 2017-18. The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 14.0, published by the Central Electricity Authority, Ministry of Power, 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	$EF_{CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 14
Value applied:	0.9368 (Indian Grid)
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.

4.2 Data and Parameters Monitored

Data / Parameter	EG_y
Data unit	MWh
Description	Electricity supplied to GUVNL
Source of data	Certificate for share of electricity generated by the wind farm.
Description of measurement methods and procedures to be	Net electricity generated will be calculated at the main meter connected to the incoming feeder of GUVNL. The procedures for metering will be as per the provisions of the power purchase agreement. The WEGs of a single customer (BLP in this case) at

applied	a particular site are connected to a Vacuum Circuit Breaker metering yard (VCB) which inturn connects to a feeder that ultimately leads to the main GETCO meter at the substation maintained by Inox wind. Data monitoring takes place at the VCB metering yard and GETCO meter at the substation. The electricity metered at the GETCO meter is proportionally divided among the customers connected to the meter on the basis of the prorata readings taken at the VCB end. The emission reduction calculations are done on the basis of the GETCO Main meter reading (net electricity exported to the grid) after deducting imports from the grid as mentioned in the share certificate issued on monthly basis. The electricity measurements at VCB meter and GETCO meter are continuous and recorded on monthly basis.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied	**226760 MWh**
Monitoring equipment	Electricity Meters of 0.2s Class
QA/QC procedures to be applied	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The data will be cross checked with sales receipts.
Purpose of data	Calculation of Baseline emissions
Calculation method	N/A
Comments	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of VERs for this project activity, whichever occurs later.

Data / Parameter	$EG_{y,\ Export}$
Data unit	MWh
Description	Quantity of Electricity exported to GUVNL facility
Source of data	Share certificate issued based on the main GETCO meter
Description of measurement methods and procedures to be applied	Electricity exported to GUVNL will be measured at the main meter connected to the incoming feeder of GUVNL. The procedures for metering will be as per the provisions of the power purchase agreement.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied	**226760 MWh**
Monitoring equipment	Electricity Meters of 0.2s Class

QA/QC procedures to be applied	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The data will be cross checked with sales receipts.
Purpose of data	Calculation of Baseline emissions
Calculation method	N/A
Comments	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of VERs for this project activity, whichever occurs later.

Data / Parameter	EG_{WEG}
Data unit	MWh
Description	Electricity generated by each WEG
Source of data	Daily generation reports provided by Inox wind
Description of measurement methods and procedures to be applied	Each WEG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through communication cables. The generation data of individual WEG can be monitored as a real-time entity at CMS. This data for each individual WEG will be recorded daily.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied	This data will not be used for the calculation of emission reductions per say but would act as a backup data for the net electricity generated.
Monitoring equipment	The meter is a software-based meter integrated with the control panel of the WEG.
QA/QC procedures to be applied	The meter is a software-based meter integrated with the control panel of the WEG. In case of any fault in the system, the control panel shall shutdown the WEG until the error is rectified.
Purpose of data	This data will not be used for the calculation of emission reductions per say but would act as a backup data for the net electricity generated
Calculation method	N/A
Comments	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of VERs for this project activity, whichever occurs later.

4.3 Monitoring Plan

The monitoring plan is being devised as per approved consolidated monitoring methodology ACM0002 - ***"Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources".***

The methodology requires monitoring of the following parameters:
- Electricity generation from the proposed project activity;

Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);

- Data needed to recalculate the build margin emission factor, if needed, consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);

For the project activity to establish its creditable emission reduction, it has to record the actual electricity generation, which would displace equivalent units of electricity at the operating and build margin of the grid. Since the simple OM emission factor is calculated based on a 3 year average, based on the most recent statistics available at the time of PDD preparation, its updation based on ex post monitoring is not required. For BM calculation, option 1 (refer ACM 0002) has been chosen, which is calculated ex ante based on the most recent information, hence its monitoring is also not required.

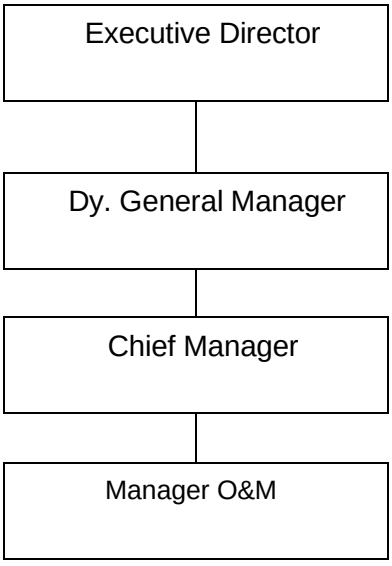
Hence, under the monitoring protocol for the project it is required to: Monitor and record the electricity generated and exported by the wind farm to the National grid.

To ensure trouble free operations and efficient generations through all the wind turbines, PP has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines for a period of 20 years. The contractor Inox wind, under the O&M contract with PP would be responsible for the operation and maintenance of the project activity for the entire crediting period.

The authority and responsibility of project management as well as registration, monitoring, measurement and reporting lies with PP.

PP has formulated a Project Team to ensure proper and continuous monitoring of the performance of turbines and generation of power.

The same has been outlined as follows:



Responsibilities
Executive Director: To be responsible for overall project management.

Dy. General Manager: To be responsible for generation data CDM related monitoring, internal verification and presenting the same to the Executive director. To verify if the monitored data is normal. To calculate the emission reductions regularly and write the monitoring report.

Chief Manager: To conduct the monitoring task strictly based on the monitoring manual and registered PDD. To record required monitored parameters. To report the monitoring results to the Dy. General Manager.

Manager O&M. For O&M monitoring and coordinate with the O&M contractor for smooth functioning of the wind farm. To assess regular maintenance of monitoring equipment.

The O&M personnel of are qualified engineers and are well trained.

Metering layout

a) The pooling meters at substation of GETCO main meter (M) and check meter (M') are installed at 220 KV side at the substation.
b) The meters at WTG (m) are bidirectional meters recording the electricity export and import to the grid. The net electricity exported to the grid is calculated as difference of electricity exported minus the electricity imported.
c) Data monitoring takes place at the GETCO main meter at substation (M), GETCO Check meter at substation (M'), and WTGs (m1, m2, m3,…..m100).
d) The electricity metered at the GETCO meter (M) is proportionally divided among the customers connected to the meter on the basis of the prorata readings taken at the individual WTG meter (m).

There is a transmission loss between the individual WTGs and the substation. This loss is proportionally divided among the WTGs connected to the meter on the basis of the prorate readings taken at the individual WTG meter (m). The final share certificate issued to the project proponent is based on the electricity generated minus the line losses.

Metering and related issues
1. As the WTGs are owned by more than one investor at the site, the ABT compliant meter at the pooling sub-station will be installed by GETCO on 33/220 KV side. A tri vector meter shall be installed in the VCB metering yard. At the end of the month, in respect of PP, a statement of active energy injection and reactive energy drawal of their WEGs is issued. This statement will be the final measurement of the energy supplied to the GUVNL/DISCOM by the company for the preceding month for the purpose of payment.

2. Net electricity generated will be calculated at the main meter connected to the incoming feeder of GUVNL. The procedures for metering will be as per the provisions of the power purchase agreement. The WEGs of a single customer (PP in this case) at a particular site are connected to a Vacuum Circuit Breaker metering yard (VCB) which inturn connects to a feeder that ultimately leads to the main GETCO meter at the substation maintained by Inox wind. Data monitoring takes place at the VCB metering yard and GETCO meter at the substation. The electricity metered at the GETCO meter is proportionally divided among the customers connected to the meter on the basis of the prorata readings taken at the VCB end. The emission reduction calculations are done on the basis of the GETCO Main meter reading (net electricity exported to the grid) after deducting imports from the grid as mentioned in the share certificate issued on monthly basis.

3. Whenever there is a major difference between the readings of the Main meter (GETCO meter and the 33kV feeder at Sub station / VCB meter at wind farm end ,the following steps shall be taken.
    i. Checking of CT and PT connections
    ii. Testing of accuracy of meters at site and at GETCO meter

If the difference exists even after such checking or testing, then the defective meter shall be replaced with a correct meter.

4. In case of conspicuous failures like burning of meter and erratic display of metered parameters and when the error found in testing of meter is beyond the permissible limit of error provided in the relevant standard, the meter shall be immediately replaced with a correct meter.

5. Sealing and maintenance of meters:
    i. The GETCO meter shall be sealed in the presence of representatives of BLP / Inox wind, GEDA and GETCO.
    ii. Any meter seal(s) shall be broken only by the GEDA /GETCO/ representative in the presence of PPs representative whenever the main metering system or the 33kV metering system is to be inspected, tested, adjusted, repaired or replaced.
    iii. The GETCO meter at the substation will be calibrated once in a year . The calibration of the meters installed in VCB yard will take place on yearly basis.

6. Records: PP will maintain an accurate and up-to-date operating log at the project site with records of:

    i. 24 Hours logs of real and reactive power generation, frequency, transformer tap position, bus voltage(s), Main meter and other meter readings and any other data mutually agreed.
    ii. Any unusual conditions found during operation/inspections
    iii. All the records will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

7. The billing will be on monthly basis. PP shall raise invoice and submit to GUVNL for payment based on joint meter reading as certified at the end of each month for the energy supplied

8. The electronic data will be archived for 2 years or up to the end of the crediting period, whichever late.

Billing and meter failure related issues:

a) The billing will be on monthly basis. PP shall raise invoice and submit to GUVNL for payment based on joint meter reading as certified at the end of each month for the energy supplied

b) Billing for the failure period:

    i. In the event that any GETCO meter fails to register or upon being tested is found not to be accurate within ±0.2s of the energy injected in the grid, shall for the period be measured on the basis of the value registered by the corresponding meter at the feeder end.
    ii. In the event that both GETCO meter and the corresponding check meter at the substation fail to register, or upon being tested, be found not to be accurate within ±0.2 / 0.5s the energy injected in the grid, shall for the period be adjusted by immediately restoring and recalibrating the GETCO meter and the corresponding check meter at the

substation end and the correction applied to the consumption registered by the GETCO meter.

iii. The period referred to in the two points above is the actual period during which inaccurate measurements were made if such period can be determined or, if not readily determinable, the shorter of:

- The period since the immediately preceding test of the relevant Main meter; or
- One hundred and eighty (180) days immediately preceding the test at which the relevant Main meter was determined to be defective or inaccurate.

5 SAFEGUARDS

5.1 No Net Harm

There were no harm identified form the project and hence no mitigations measures are applicable.

5.2 Environmental Impact

According to Indian regulation, the implementation of the wind park does not require an environmental impact assessment. The Ministry of Environment and Forests (MoEF), Government of India notification dated September 2006 regarding the requirement of environment Impact Assessment (EIA) studies as per the Environment Protection Rule, any project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list[9]. Wind parks are not included in this list and thus an EIA is not required.

5.3 Local Stakeholder Consultation

The following stakeholders were involved during and after implementation of the project.

1. Local villagers and representatives of village governing body
2. Gujarat Energy Development Agency
3. Supplier of WTG
4. Local villagers and representatives of village governing body including NGOs

The varied sections of the local population, village panchayat / NGO & local elected body of representatives administering the local area are a true representative of the local population in a democracy like India. Hence, their consents / permissions to set the project are necessary.

GEDA – the state level nodal agency has leased out land for implementation of the project. The major portion of the project has been executed on GEDA leased land. The agency is responsible for promotion of renewable energy technologies in the state. After confirming the inherent wind potential at the sites specified by MNES and the EPC contractor, the land was leased out for execution of project.

GUVNL is responsible for providing evacuation facility for the generated electricity. GUVNL has entered into power purchase agreement with the project proponent for transmission of power and sale to grid. The state electricity utility was contacted by the EPC contractor on behalf of the

[9] S.O. 1533, Notification dated 14th September 2006. http://envfor.nic.in/

project proponent, and all the necessary modalities and procedures were followed and agreement for power purchase.

PP has organized a stakeholder consultation meeting with the local villagers on 10th and 11th August 2019 to inform them on the environmental and social impacts of the project activity and discuss their concerns regarding the project activity. The meeting was organized in six different locations (Suthari, Arikhana, Rapargarh, Jakhau, Lathedi, and Chachhi) at on the above specified dates. People from nearby villages at these locations were also called. Villagers were informed through oral (dhidhora) and written announcements about the meeting. The oral (dhidhora) announcements were made on 7th July 2019 to inform the villagers about the agenda of the stakeholder meeting. Written notices were also pasted on the main gate of the project site on 7th July 2019 for the stakeholder meeting. The oral (Dhindhora) announcements were also made on the day of the stakeholder meeting to call the stakeholders on the venue.

All participants were informed in their local language about the salient features and environmental benefits of the project activity. The stakeholder consultation was widely announced by means of written notifications in town hall and of oral announcements, so that every interested person could attend the meeting.

No major issues were identified for the project. All the minor issues were addressed and also the concerned departments are keeping a tight vigil for assessing any changes likely that may take place.

5.4 Public Comments

The project shall be listed for 30 days period. In case any comments are received they shall be incorporated during the validation.