Project design document form

(Version 11.0)

BASIC INFORMATION	
Title of the project activity	150 MW grid connected Wind Power based Electricity generation project in Gujarat, India
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	05
Completion date of the PDD	22/10/2019
Project participants	1. BLP Vayu (Project 1) Private Limited 2. Sweden: Asian Development Bank, as Trustee of the Future Carbon Fund; 3. Sweden: Swedish Energy Agency
Host Party	India
Applied methodologies and standardized baselines	ACM0002 Version 20: Grid-connected electricity generation from renewable sources
Sectoral scopes	Sectoral Scope 01 - Energy industries (renewable/ non-renewable sources)
Estimated amount of annual average GHG emission reductions	326,203[1] tCO_{2e}

[1] Please refer ER sheet for detailed calculation.

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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This is a registered CDM project activity (UNFCCC Ref No:2347[2]) with a renewable crediting period. The first crediting period from 18/06/2009 to 17/06/2016 has been completed successfully. The PP is hereby submitting the project document for renewal of its second crediting period.

Purpose of the project

The project activity involves the establishment of a wind farm of 150 MW installed capacity enabling generation of electricity by state-of-art 1.5 MW capacity Wind Turbine Generators (WTGs) (One of the latest available technologies in the country developed by Suzlon Energy Limited) in the state of Gujarat. The electricity generation from this wind farm contributes to annual GHG reductions estimated at 326,203 tCO_{2e} (tonnes of carbon dioxide equivalent). The project activity is expected to evacuate approximately 348,210 MWh of renewable power annually to the Indian Grid.

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. Sector- wise installed capacity (MW) given under the latest CEA[3] database version 14.

India	Thermal				Other Source			
	Coal	Gas	Diesel	Total	Nuclear	Hydro	RES	Total
	197171.50	24897.46	837.63	222906.59	6780.00	45293.42	69022.39	344002.39

It is evident from Table 1 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 way of fuel substitution, increased use of **renewable energy sources**, and also by improving the thermal efficiency of power generation.

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 regional 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 –

Ministry of Environment and Forests, Govt. of India has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects:

Social well-being: *The CDM project activity should lead to alleviation of poverty by generating additional employment, removal of social disparities and contribution to provision of basic amenities to people leading to improvement in quality of life of people.*

[2] https://cdm.unfccc.int/Projects/DB/BVQI1229917560.71/view

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

The project activity 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 CDM project activity should bring in additional investment consistent with the needs of the people.*

The 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 of about INR 8833 million 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 regional 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: *This should include a discussion of impact of the project activity on resource sustainability and resource degradation, if any, due to proposed activity; bio-diversity friendliness; impact on human health; reduction of levels of pollution in general.*

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.

Birds often strike the high-tension lines and windows, however they rarely collide with the wind turbines. Turbines will influence the birds flying routes. In case of wind turbines of 60m diameter, the routes are shifted of approx. 100- 200m. The high-tension lines connecting the wind farm are more dangerous that the wind station itself.
Since the project is located on coastal and undulated site, the birds flying routes can easily comply with this topography and adopt the turbine shapes.

Technological well-being- *The CDM project activity should lead to transfer of environmentally safe and sound technologies with a priority to the renewables sector or energy efficiency projects that are comparable to best practices in order to assist in upgradation of technological base*.

The project activity leads to the promotion of 1.5 MW 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 an Indian company using the self-developed wind power technology, there is no transfer of technology involved in the project activity.

The starting date of the project activity was on 07/09/2007. All WTGs were commissioned before 31/03/2008. Since then all WTGs have been in continuous operation.

The project is registered with VCS registry as well (Project ID no.292).

A.2. Location of project activity

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The WTGs installed by the project proponent are distributed across the Kutch region in the villages of Lathedi, Jakhau, Nani Sindhodi, Moti Sindhodi, Chachhi, Sandhan, Budhia, Ranpar, Rapargarh, Sayra, Suthari, Vanku, and Dhutai of Gujarat state.

The latitude and longitude details have been attached in Appendix 5.

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**

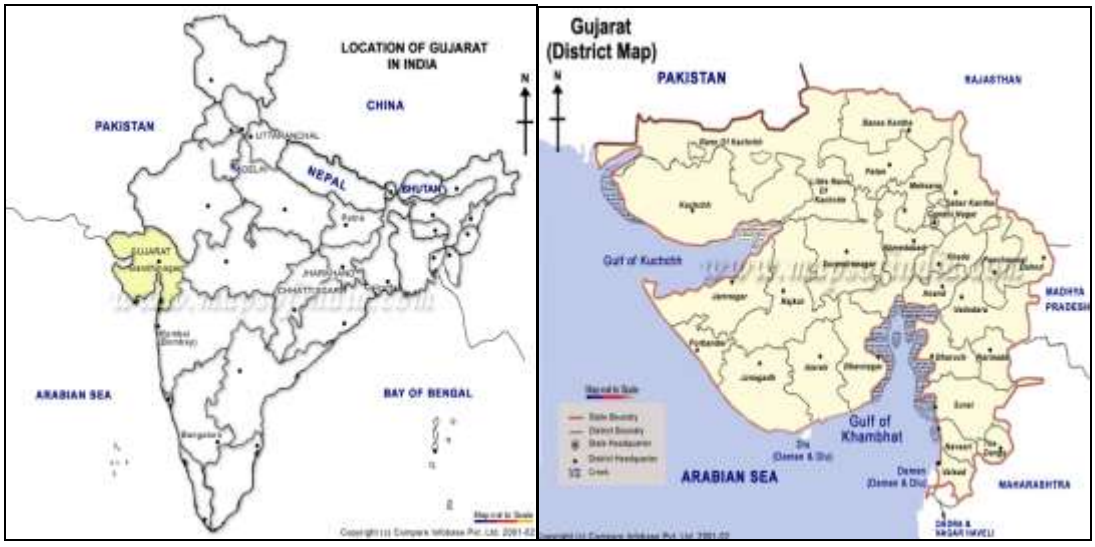

Figure 3: District Map Kachchh

A.3. Technologies/measures

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The project has been operational barring from routine shut down for maintenance of WTGs, no significant incident or downtime has been observed to be taken place during the previous crediting period.

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 Suzlon make WTGs of individual capacity 1.5 MW. The salient Features of Suzlon S-82-1.5 MW 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
9. Type certification by Germanischer Lloyd, Germany
10. Approved by the Ministry of Non-Conventional Energy Sources (MNES)5
11. Rated Voltage 690 V, 3 phase AC

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 1.5 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 150 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 3,262,030 tCO_{2e} (tonnes of carbon dioxide equivalent) during the crediting period. The project activity will evacuate approximately 300 Million units of renewable power annually to the Western regional Grid. The expected PLF of the WEGs is of the order of 26.5%.

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

Parameter	**Specifications**
	1.5 MW -Suzlon
Rotor	
Installed electrical output	1500 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	1500 kW
Rotational speed	1511 RPM
Operating voltage	690 V
Frequency	50 Hz
Insulation class	H
Cooling system	Air cooled
Gear Box	
Type	3 stage gear box; 1 planetary and 2 helical
Manufacturer	Winergy/Hansen
Gear Ratio	02:35.1
Nominal Load	1650 kW
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.

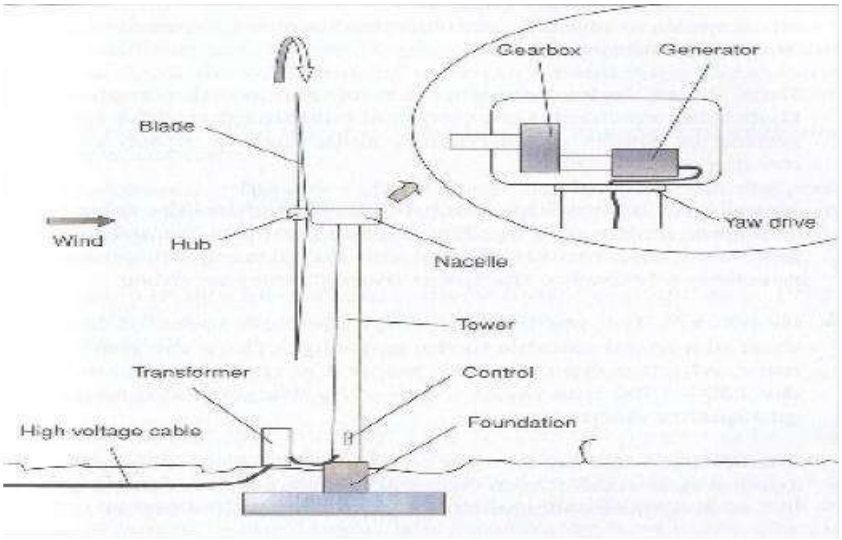
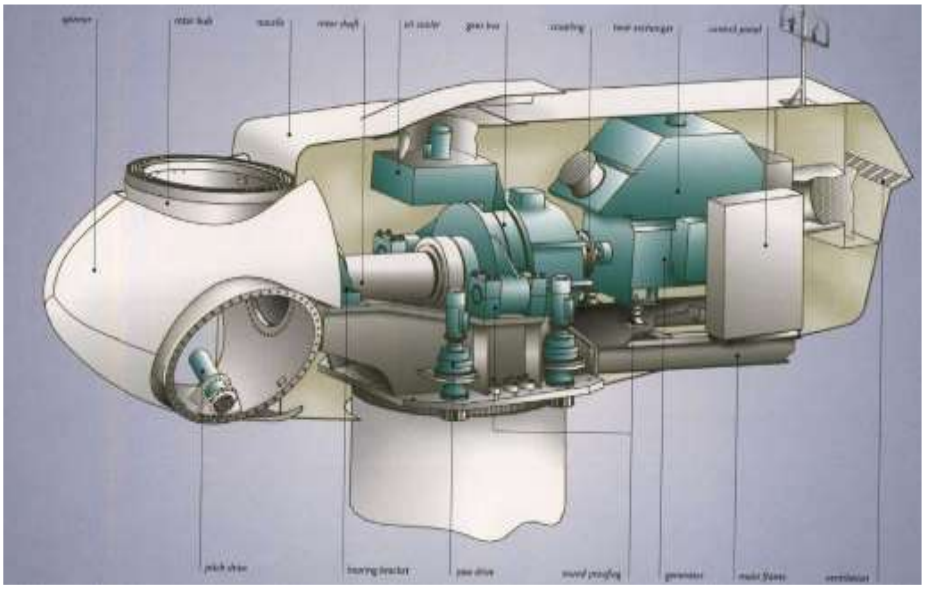


Figure 2: Cross sectional diagram of wind turbine



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.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	BLP Vayu (Project 1) Private Limited	No
Sweden	Asian Development Bank, as Trustee of the Future Carbon Fund; Swedish Energy Agency.	No

A.5. Public funding of project activity

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There is no public funding involved in the project activity. The project proponent hereby confirms that there is no diversion of Official Development Assistance into the project activity. The project proponents also hereby confirm that there is no Central Financial Assistance into the project activity. Project participants also confirm that there is no funding from Annex 1 party(ies).

A.6. History of project activity

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The project activity is a registered CDM project activity. **(UNFCCC Ref No:2347[4])**

A.7. Debundling

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The project activity is a large-scale project activity. Hence, this section is not relevant to the project activity.

[4] https://cdm.unfccc.int/Projects/DB/BVQI1229917560.71/view

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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Methodology: ACM0002: Grid-connected electricity generation from renewable sources --- Version 20.0, Sectoral Scope: 01, EB 105, Annex 3
https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG
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

B.2. Applicability of methodologies and standardized baselines

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The following steps will show the applicability of the project under this methodology; Methodology: ACM0002: Grid-connected electricity generation from renewable sources --- Version 20.0, Sectoral Scope: 01, EB 105, Annex 3

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;	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

	(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 of the project activity.	
3.	In case of hydro power plants, one of the following conditions shall apply:[5] (c) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (d) 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 (e) 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 (f) 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	The project activity is wind power project thus this condition is not applicable

[5] 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.

	power project.	
4.	In the case of integrated hydro power projects, project proponent shall: (g) 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 (h) 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.	The project activity is wind power project thus this condition is not applicable
5.	The methodology is not applicable to: (i) 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; (j) 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.[6]	The project applies the following tools and is in compliance to the same;

[6] 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.

		• "Tool to calculate the emission factor for an electricity system";

B.3. Project boundary, sources and greenhouse gases (GHGs)

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ACM0002 specifies that the project boundary will be:

According to the methodology, for emissions sources, only CO_2 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 project activity is feeding the generated electricity in the Indian grid. The proposed project would have marginal impact on all the generation facilities in the grid. Thus, all the power generation facilities connected to Indian grid form the project boundary for the purpose of baseline estimation.

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:

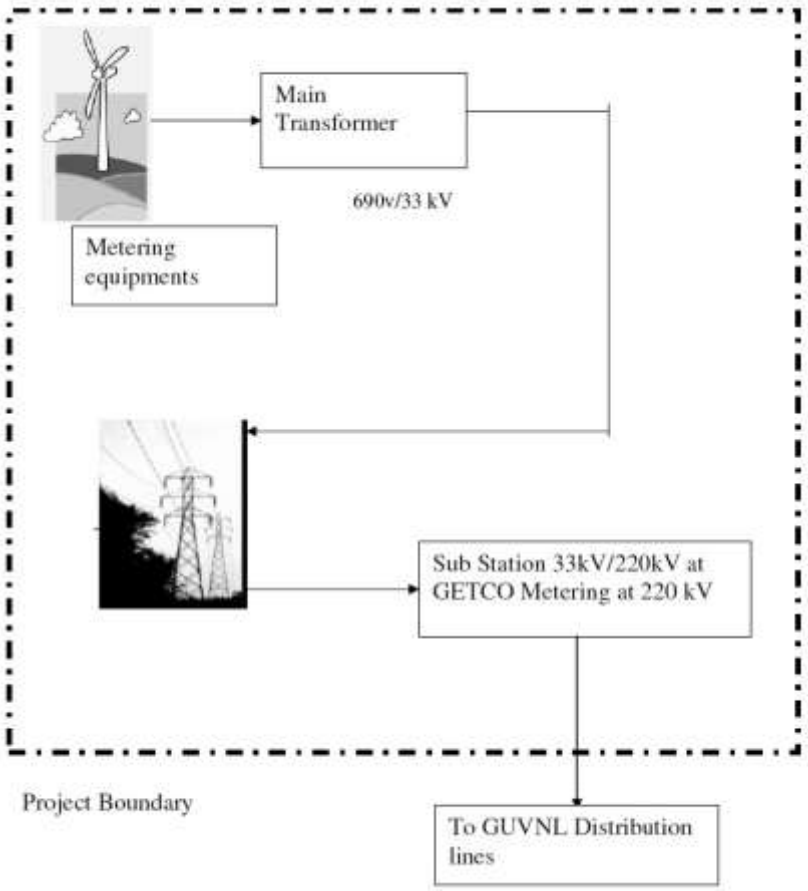

Table: Baseline and project emission sources

Source		GHG	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 CO_2 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.

B.4. Establishment and description of baseline scenario

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As baseline for the project activity at the time of validation was established according to ACM0002 version 7.

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 20, i.e. generation of electricity in the connected grid.

Baseline scenario for the second crediting period has been assessed 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 paragraph 300 of Project Standard & 49 (a) of the modalities and procedures of the Clean Development Mechanism.

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

There is no legal and regulatory requirement that mandates the production of energy by the chosen technology. Investment in wind energy projects in the State of Gujarat and the Indian electricity grid are not mandatory. There are no national or local laws or regulations that require this investment to be undertaken, i.e., setting up of wind power projects. The setting up of wind energy projects is a voluntary activity.

Hence, the baseline scenario for the project activity remains unchanged for the second crediting period.

Step 1.2: Assess the impact of circumstances

As per the methodology ACM0002, version 20.0.0, the alternative for the project activity is generation of equivalent amount of electricity by operation of grid-connected power plants and by addition of new generation sources. The alternative scenario for the project activity remains same and the grid still supplies primarily fossil-fuel based electricity as reflected in the combined margin emission factor. Hence, circumstances and the externalities for determining the baseline for the project activity are same.

Therefore, there is no change in baseline scenario.

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***

This sub-step has to be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment. Since this is not the case with the project activity under consideration, hence his condition is not applicable.

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 baseline emission factor has been updated as per the latest version of CEA database 14.0 available at the time of PDD submission for renewal of crediting period.

The approved consolidated baseline methodology, ACM0002. (Version 20.0), 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.

The details of CM Emission Factor calculation are reported under the section B.6.1 of the PDD. The values of the parameters are also reported under the section B.6.1.

B.5. Demonstration of additionality

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Project addionality was assessed in the Ist crediting period in the registered PDD. With reference to the CDM registered PDD version 4 dated 07/12/2012, PP had demonstrated additionality using the relevant guidelines which confirms that project activity is additional as per the applicable additionality guidelines.

As per CDM project standard version 02, para 280, "For renewal of crediting period of a registered CDM project activity, the project participants are not required to reassess the additionality of the project activity nor update the section of the PDD relating to additionality."

However, as per VVS version 02, para 404 - assess the validity of the original baseline or its update through an assessment of the following issues (a) "The impact of new relevant national and/or sectoral policies and circumstances on the baseline, taking into account relevant guidance from the Board with regard to renewal of the crediting period of a registered CDM project activity, at the time of requesting renewal of crediting period of the project activity"

"The project shall not be mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework. For UNFCCC non-Annex I countries, laws, statutes, regulatory frameworks or policies implemented since 11 November 2001 that give comparative advantage to less emissions intensive technologies or activities relative to more emissions- intensive technologies or activities need not be taken into account. For all countries, laws, statutes, regulatory frameworks or policies implemented since 11 December 1997 that give comparative advantage to more emissions-intensive technologies or activities relative to less emissions-intensive technologies or activities shall not be taken into account."

As per the current regulatory norms, there is no legal and regulatory requirement that mandates the production of energy by the chosen technology. Investment in wind energy projects in the State of Gujarat and else were in the national electricity grid are not mandatory. There are no national or local laws or regulations that require this investment to be undertaken, i.e., setting up of wind power projects. The setting up of wind energy projects is a voluntary activity. Thus, project activity is additional

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

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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 20.0) 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;
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.

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

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 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:

- **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:

***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.*

***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/MWh

Therefore, Baseline Emissions:

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

BE_y **= 348,210 x 0.9368 = 326,203 tCO_2**

BE_y = 326,203 tCO_2

Emission reductions are calculated as follows:

$$ERy = BEy - PEy$$

Where:

ERy = Emission reductions in year *y* (t CO_{2e}/yr)

BEy = Baseline emissions in year *y* (t CO_{2e}/yr)

PEy = Project emissions in year *y* (t CO_{2e}/yr)

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

i.e. $ER_y = BE_y$

B.6.2. Data and parameters fixed ex ante

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(s) applied	0.9610 (Indian Grid)
Choice of data or measurement methods and procedures	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
Additional comment	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
Value(s) applied	0.8644 (Indian Grid)
Choice of data or measurement methods and procedures	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
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

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

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(s) applied	0.9368 (Indian Grid)
Choice of data or measurement methods and procedures	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
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

B.6.3. Ex ante calculation of emission reductions

>>

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) (*EFy*): - 0.9368 tCO_{2e}/MWh

Annual electricity supplied to the grid by the Project Activity *(EGy)*

= 150 MW (Capacity) x 26.5% (PLF) x 8,760 (hours)
= 348210 MWh

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

BE_y **= 348,210 x 0.9368 = 326,203 tCO_2**

ER_y = BE_y = 326,203 tCO_2 /Annum

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	326,203	0	0	326,203
Year 2	326,203	0	0	326,203
Year 3	326,203	0	0	326,203
Year 4	326,203	0	0	326,203
Year 5	326,203	0	0	326,203
Year 6	326,203	0	0	326,203
Year 7	326,203	0	0	326,203
Total	2,283,421	0	0	2,283,421
Total number of crediting years	7			

Annual average over the crediting period	326,203	0	0	326,203

B.7. Monitoring plan

B.7.1. Data and parameters to be 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.
Value(s) applied	348,210 MWh/Annum
Measurement methods and procedures	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 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 Suzlon. 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. Electricity Meters of 0.2s Class
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	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 emission.
Additional comment	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs 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.
Value(s) applied	348,210
Measurement methods and procedures	Electricity Meters of 0.2s Class 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.

Monitoring frequency	Continuous measurement and at least monthly recording.
QA/QC procedures	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
Additional comment	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs 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 Suzlon
Value(s) 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.
Measurement methods and procedures	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.
Monitoring frequency	Continuous measurement and at least monthly recording. The meter is a software-based meter integrated with the control panel of the WEG.
QA/QC procedures	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
Additional comment	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	EG_{VCB}
Data unit	MWh
Description	Electricity generation recorded at the Vacuum Circuit Breaker (VCB)
Source of data	Daily generation reports provided by Suzlon
Value(s) 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.
Measurement methods and procedures	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.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	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.

Additional comment	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2. Sampling plan

>>
Not Applicable.

B.7.3. Other elements of monitoring plan

>>
The monitoring plan is being devised as per approved consolidated monitoring methodology ACM0002 – Ver 20**.**

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 “Grid-connected electricity generation from renewable sources” (ACM0002);

- Data needed to recalculate the build margin emission factor, if needed, consistent with “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.

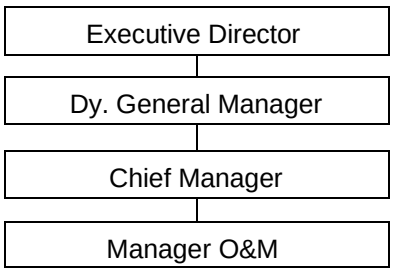
Hence, under the monitoring protocol for the project it is required to: Monitor and record the electricity generated and exported by the wind farm to the National grid.

To ensure trouble free operations and efficient generations through all the wind turbines, BLP has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines for a period of 20 years. The contractor Suzlon, under the O&M contract with BLP 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 BLP.

BLP 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.

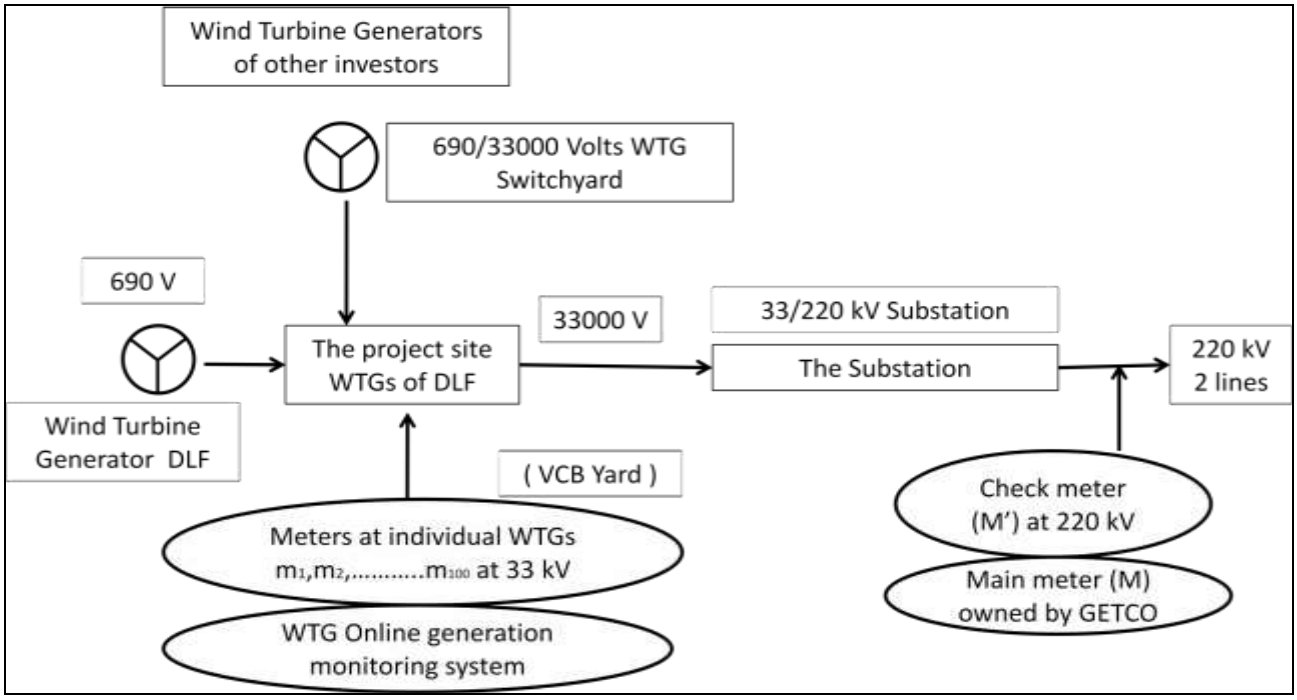
Manager O&M. For O&M monitoring and coordinate with the O&M contractor Suzlon for smooth functioning of the wind farm. To assess regular maintenance of monitoring equipment.
The O&M personnel of Suzlon are qualified engineers and are trained at the WTG manufacturing facility of Suzlon Energy Limited at Daman for operating and ensuring best performance of the WTGs.

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.

Figure: The wire diagram for the meters at substation:



Metering and related issues

1. As the WEGs 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 DLF, 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 (DLF 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 Suzlon. 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 Suzlon 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 / Suzlon, GEDA and GETCO.
   ii. Any meter seal(s) shall be broken only by the GEDA /GETCO/ representative in the presence of DLFs 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: DLF 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. BLP 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 upto the end of the crediting period, whichever late.

Billing and meter failure related issues:

a) The billing will be on monthly basis. BLP 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.

CER Issuance

a) The emission reduction calculations will be done on the basis of net electricity supplied to the grid after subtracting the losses incurred due to transmission from the WEG to the GETCO feeder.

b) In the event that the date of registration is in the middle of the month, while the share certificate for the electricity generation is issued on monthly basis. The CERs will be estimated based on the generation of VCB meter readings at the WTGs for the period from the start date of the project registration and the end of the month.

c) In the event that the GETCO meter error is found at the time of the meter calibration after the issuance of CERs during the crediting period, the correction of the meter error for the CER calculation will be incorporated in the next issuance of the CERs.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
07/09/2007, date of first real action i.e. Purchase order.

C.2. Expected operational lifetime of project activity

>>
20 yrs

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
Renewable crediting period. This is the second renewal crediting period for the project. The first crediting period for the project was from 18/06/2009 to 17/06/2016.

C.3.2. Start date of crediting period

>>

Start date of Second Crediting period is: 18/06/2016

C.3.3. Duration of crediting period

>>
7 Years, 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

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. Although an EIA is not required, the possible environmental impacts listed below were analysed:

Impact on Land use

The land on which the project activity takes place is barren and unfertile. Prior to the project activity the land had no beneficial use. DLF has bought the land for a worthwhile application and obtained necessary approvals for installation of windmills. No dislocation of people is involved in the course of the project activity.

Impact on Soil Use

The minor quantity of solid / liquid discharge, likely to be generated during the construction phase has no noticeable impact on soil use and the project proponent has made arrangements to dispose them in an environmentally acceptable manner.

Impact on Air Environment

Wind Power plants are known to contribute to zero atmospheric pollution as no fuel combustion is involved during any stage of the operation. The source of emission that is anticipated is likely due to the exhaust released due to the running of the HEMV (Heavy Earth Moving Vehicle), during the movement of the construction material, which shall be properly maintained to minimize the smoke. The dust so generated during haulage shall be minimized by sprinkling of water.

Impact on Noise Environment

Personal protective equipment's are provided to workers involved in the construction activity to mitigate the effects of noise pollution, but they have no impact on ambient noise level. The emissions involved in the construction of the wind power plant and the gridlines are negligible as a percentage of the total power generated. Taking into consideration the project life cycle, the magnitude of the impacts during construction phase is negligible and exists for a temporary period of time till the end of construction phase. Therefore, it would not affect the environment considerably.

Operation and Maintenance Phase:

Systematic and Scientific maintenance of all equipment's would be carried out to ensure the best safety standards.

Impact on Land use

The project site is a barren land and unproductive area with no application and habitat. There are no migratory birds / endangered species in the region of project activity. Therefore, no harm on the ecological environment is envisaged.

Impact on Noise Environment

Noise is generated due to the movement of rotor blades. It has no direct effect on the population, as the area is less populated and noise generated will be attenuated by ambient conditions. Though noise is generated

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

during the operation of Wind Turbine Generators, Considering the overall impact of the project in reducing GHG's, creation of employment etc., makes this effect negligible.

Socio-Economic Impacts

There is no inconvenience to the local community due to the transmission lines. The locals have benefited economically through land sales. The project activity helps the upliftment of skilled and unskilled manpower in the region. The project will be providing employment opportunities not only during the construction phase, but also during its operational lifetime. The project activity improves employment rate and livelihood of local populace in the vicinity of the project. Moreover, the project generates eco-friendly, GHG free power which contributes to sustainable development of the region.

Transboundary environmental or social impacts

Generating electricity from the resources, that were not used before, creates an additional income to the local community, influencing the poverty alleviation, particularly in the rural areas and accelerating the regional economic development.

Project development will promote the use of renewable energies in the region. It will also require widespread education and skills improvement, as the local people will be incorporated in the development and maintenance of the project.

Impact of oily and solid waste

The wind-farm consume very little (negligible) oil/grease during the operation and maintenance. The pollution due to oily and solid waste will not be severe, and can and will be mitigated to a proper level through taking effective management measures. The O&M contractor Suzlon has established and maintained procedures for disposal of oily and solid waste in a responsible manner. On behalf of DLF the O&M Contractor Suzlon will maintain an accurate and up-to-date record oily and solid waste disposed to the authorized agencies.

Conclusion

The net impact under environmental pollution category would be positive as all necessary abatement measures would be adopted and periodically monitored. The project activity does not have any major adverse impacts on environment during its construction or operational phase. The human interest parameters would show positive impacts due to increased job opportunities at the facility as well as other ancillary units coming up

D.2. Environmental impact assessment

>>

The Environmental impact are not considered significant in the project activity.

SECTION E. Local stakeholder consultation

E.1. Modalities for 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. Gujarat Urja Vikas Nigam Limited
4. Supplier of WTG

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
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

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

Supplier of WTGs

Suzlon Energy Ltd. is the supplier of WTGs and is also responsible for the operation and maintenance of the DLF's project activity.

DLF has organized a stakeholder consultation meeting with the local villagers on 10th and 11th January 2008 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 January 2008 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 January 2008 for the stakeholder meeting. The oral (Dhindhora) announcements were also made on the day of the stakeholder meeting (i.e. 10th , 11th January 2008) to call the stakeholders on the venue. Registered letters to each village head (sarpanch) nearby the project activity was also sent on 7th January to send their written comments on the project activity.

The meetings were organized by the project proponent with the help of the developer Suzlon Energy Ltd. All participants were informed in their local language about the salient features and environmental benefits of the project activity. Over 100 villagers took part in the meetings at different location are people living or working in a close vicinity to the project area. 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.

At the beginning of each meeting representatives of DLF and Suzlon presented the project idea, discussed issues regarding the general energy production with the focus on wind power. Afterwards the presentation by officials was conducted, who explained in detail the aim of the meeting and the process of stakeholder

evaluation, focusing on environmental and social aspects of the region in order to give all the participants the chance to follow and understand the project assets and advantages. After all the presentations, DLF and Suzlon officials answered the stakeholder's questions. In parallel all the comments were collected and documented. Afterwards no written comments were received.

E.2. Summary of comments received

>>

The overall response to the Project, from local stakeholders, was encouraging and positive. In all, no adverse reaction/comments/clarifications have been received during the hearing. The participants of the meetings have not raised any significant concerns related to potential impacts of the Project. The stakeholders admitted the sustainability of the project and sought more projects of a similar nature which would contribute towards regional and national growth. Moreover, the project has been highly acclaimed for a higher capital cost intensive renewable power generation for the objective of environmental sustainability.

All the details were submitted to DOE during the registration of the project activity.

E.3. Consideration of comments received

>>

The project activity has complied with all the applicable conditions detailed in the consents and agreements. As per UNFCCC requirement the PDD will be published at the validator's/UNFCCC web site for public comments.

SECTION F. Approval and authorization

>>

All the approval & authorization has been well received by the project activity as this is a registered CDM project activity.

Please find the link below to access the same:
https://cdm.unfccc.int/Projects/DB/BVQI1229917560.71/view

Appendix 1. Contact information of project participants

Organization name	BLP Vayu (Project 1) Private Limited
Country	India
Address	12th Floor, Crescent 1, Prestige Shantiniketan, ITPL Main Road, Hoodi, Whitefield, Bengaluru - 560 048, Karnataka
Telephone	
Fax	
E-mail	saurabh.agrawal@enel.com
Website	
Contact person	Mr. Saurabh Agrawal

Appendix 2. Affirmation regarding public funding

There is no public funding involved in the project activity.

Appendix 3. Applicability of methodologies and standardized baselines

Applicability and eligibility of selected methodology (ACM0002 version 20) has already been mentioned in section B.2 of the PDD.

Appendix 4. Further background information on ex ante calculation of emission reductions

We have adopted the approach specified in the latest version of “Tool to calculate the emission factor for an electricity system”.

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE		
VERSION	14	http://www.cea.nic.in/tpeandce.html
DATE	Dec'18	
Tool Applied	"Tool to Calculate the Emission Factor for an Electricity System", Version 7.0	

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

Simple Operating Margin (tCO2/MWh) (incl. Imports) (1) (2)			
	2015-16	**2016-17**	**2017-18**
Indian Grid	0.9655	0.9636	0.9543

Build Margin (tCO2/MWh) (not adjusted for imports)			
	2015-16	**2016-17**	**2017-18**
Indian Grid	0.9083	0.8723	0.8644

Weighted Generation Operating Margin	
Indian Grid	0.9610

Combined Margin Emission Factor	
Indian Grid	0.9368

Appendix 5. Further background information on monitoring plan

Please refer to section B.7 for detailed information on monitoring plan.

Project WTGs Geo Coordinates:

Latitude and Longitude details of the wind farm
Site: Jakhau, District Kutch, Gujarat

Sl. No	Loc. No.	Zone	Turbine Co-ordinate		Latitude			Longitude		
			X	Y	Degree	Minute	Second	Degree	Minute	Second
1	M-726	42 Q	466499	2566625	**23**	12	30.2	**68**	40	21.4
2	M-727	42 Q	466681	2566249	**23**	12	17.9	**68**	40	27.8
3	M-744	42 Q	466846	2567109	**23**	12	45.9	**68**	40	33.5
4	M-745	42 Q	467581	2567340	**23**	12	53.5	**68**	40	59.4
5	M-746	42 Q	467708	2566954	**23**	12	40.9	**68**	41	3.9
6	M-747	42 Q	468112	2566530	**23**	12	27.2	**68**	41	18.1
7	M-748	42 Q	468125	2566237	**23**	12	17.7	**68**	41	18.6
8	M-749	42 Q	468165	2565817	**23**	12	4	**68**	41	20
9	M-750	42 Q	468440	2565185	**23**	11	43.5	**68**	41	29.7
10	M-761	42 Q	468499	2566947	**23**	12	40.8	**68**	41	31.7
11	M-762	42 Q	468862	2565724	**23**	12	1	**68**	41	44.6
12	M-764	42 Q	469192	2564945	**23**	11	35.7	**68**	41	56.2
13	M-765	42 Q	469913	2564475	**23**	11	20.5	**68**	42	21.6
14	M-770	42 Q	469239	2566747	**23**	12	34.3	**68**	41	57.7
15	M-771	42 Q	468994	2566307	**23**	12	20	**68**	41	49.2
16	M-772	42 Q	469499	2566017	**23**	12	10.6	**68**	42	6.9
17	M-773	42 Q	469544	2565603	**23**	11	57.1	**68**	42	8.6
18	M-774	42 Q	469762	2565236	**23**	11	45.2	**68**	42	16.3
19	M-775	42 Q	469968	2564882	**23**	11	33.7	**68**	42	23.5
20	M-783	42 Q	469694	2567314	**23**	12	52.8	**68**	42	13.7
21	M-785	42 Q	470043	2566546	**23**	12	27.8	**68**	42	26
22	M-786	42 Q	470224	2565748	**23**	12	1.9	**68**	42	32.5
23	M-787	42 Q	470867	2564930	**23**	11	35.3	**68**	42	55.1
24	M-789	42 Q	470420	2566278	**23**	12	19.1	**68**	42	39.3
25	M-790	42 Q	470857	2565748	**23**	12	1.9	**68**	42	54.7
26	M-791	42 Q	470929	2565331	**23**	11	48.4	**68**	42	57.3
27	M-792	42 Q	471667	2564261	**23**	11	13.6	**68**	43	23.3
28	M-793	42 Q	471680	2565620	**23**	11	57.8	**68**	43	23.7
29	M-794	42 Q	470955	2569490	**23**	14	3.6	**68**	42	57.9
30	M-810	42 Q	472137	2570272	**23**	14	29.1	**68**	43	39.5

Sl. No	Loc. No.	Zone	Turbine Co-ordinate		Latitude			Longitude		
			X	Y	Degree	Minute	Second	Degree	Minute	Second
1	M-417	42 Q	476904	2555707	**23**	6	35.8	**68**	46	28
2	M-418	42 Q	477078	2555335	**23**	6	23.7	**68**	46	34.2
3	M-419	42 Q	477329	2555010	**23**	6	13.1	**68**	46	43
4	M-420	42 Q	477267	2554611	**23**	6	0.1	**68**	46	40.8
5	M-421	42 Q	477656	2554345	**23**	5	51.5	**68**	46	54.5
6	M-422	42 Q	477682	2553828	**23**	5	34.7	**68**	46	55.5
7	M-431	42 Q	477650	2555940	**23**	6	43.4	**68**	46	54.2
8	M-439	42 Q	479020	2552587	**23**	4	54.4	**68**	47	42.6
9	M-440	42 Q	479185	2552277	**23**	4	44.3	**68**	47	48.4

10	M-443	42 Q	475680	2560249	**23**	9	3.4	**68**	45	44.7
11	M-444	42 Q	476114	2559916	**23**	8	52.6	**68**	46	0
12	M-455	42 Q	478217	2555695	**23**	6	35.4	**68**	47	14.2
13	M-456	42 Q	478513	2555311	**23**	6	23	**68**	47	24.6
14	M-464	42 Q	476146	2561063	**23**	9	29.9	**68**	46	1.1
15	M-465	42 Q	476208	2560604	**23**	9	15	**68**	46	3.3
16	M-478	42 Q	480153	2553918	**23**	5	37.7	**68**	48	22.3
17	M-479	42 Q	479808	2553437	**23**	5	22.1	**68**	48	10.2
18	M-506	42 Q	479765	2554928	**23**	6	10.6	**68**	48	8.6
19	M-508	42 Q	480035	2554331	**23**	5	51.2	**68**	48	18.2
20	M-514	42 Q	477524	2561078	**23**	9	30.4	**68**	46	49.5
21	M-526	42 Q	482146	2552731	**23**	4	59.2	**68**	49	32.4
22	M-533	42 Q	480840	2555592	**23**	6	32.2	**68**	48	46.4
23	M-544	42 Q	481612	2554985	**23**	6	12.5	**68**	49	13.6
24	M-586	42 Q	483907	2556578	**23**	7	4.4	**68**	50	34.2
25	M-587	42 Q	484179	2556236	**23**	6	53.3	**68**	50	43.8
26	M-589	42 Q	485745	2554999	**23**	6	13.1	**68**	51	38.9
27	M-632	42 Q	471476	2561472	**23**	9	42.9	**68**	43	16.8
28	M-634	42 Q	472120	2562911	**23**	10	29.8	**68**	43	39.4
29	M-640	42 Q	474637	2562070	**23**	10	2.6	**68**	45	7.9
30	M-641	42 Q	474529	2561612	**23**	9	47.7	**68**	45	4.2
31	M-643	42 Q	474614	2562490	**23**	10	16.2	**68**	45	7.1
32	M-645	42 Q	475195	2559849	**23**	8	50.4	**68**	45	27.7
33	M-667	42 Q	477285	2556235	**23**	6	52.9	**68**	46	41.4

Site: Suthari, District- Kutch, Gujarat

Sl. No	**Loc. No.**	**Zone**	**Turbine Co-ordinate**		**Latitude**			**Longitude**		
			X	Y	Degree	Minute	Second	Degree	Minute	Second
1	M-97	42 Q	487503	2549591	**23**	03	17	**68**	52	41
2	M-145	42 Q	489261	2554731	**23**	06	05	**68**	53	43
3	M-148	42 Q	489273	2554332	**23**	05	52	**68**	53	43
4	M-150	42 Q	489987	2552678	**23**	04	58	**68**	54	08
5	M-161	42 Q	489140	2551184	**23**	04	09	**68**	53	38
6	M-164	42 Q	490517	2554940	**23**	06	11	**68**	54	27
7	M-170	42 Q	490498	2553813	**23**	05	35	**68**	54	26
8	M-172	42 Q	492206	2554411	**23**	05	54	**68**	55	26
9	M-201	42 Q	492210	2550490	**23**	03	47	**68**	55	26
10	M-202	42 Q	492800	2547164	**23**	01	59	**68**	55	47
11	M-213	42 Q	492059	2552245	**23**	04	44	**68**	55	21
12	M-230	42 Q	495578	2548079	**23**	02	28	**68**	57	25
13	M-260	42 Q	497420	2540448	**22**	58	20	**68**	58	29
14	M-262	42 Q	497920	2540371	**22**	58	18	**68**	58	47
15	M-263	42 Q	499070	2541337	**22**	58	49	**68**	59	27
16	M-264	42 Q	499497	2542007	**22**	59	11	**68**	59	42
17	M-265	42 Q	500094	2542471	**22**	59	26	**69**	00	03
18	M-266	42 Q	497903	2540945	**22**	58	36	**68**	58	46
19	M-268	42 Q	499118	2540745	**22**	58	30	**68**	59	29
20	M-269	42 Q	500164	2539032	**22**	57	34	**69**	00	06
21	M-270	42 Q	500927	2538522	**22**	57	18	**69**	00	33
22	M-272	42 Q	500544	2541801	**22**	59	04	**69**	00	19
23	M-275	42 Q	501383	2538875	**22**	57	29	**69**	00	49
24	M-276	42 Q	501518	2538488	**22**	57	16	**69**	00	53
25	M-277	42 Q	501707	2538086	**22**	57	03	**69**	00	60
26	M-280	42 Q	501826	2539374	**22**	57	45	**69**	01	04
27	M-282	42 Q	502460	2537935	**22**	56	58	**69**	01	26
28	M-286	42 Q	502934	2538312	**22**	57	11	**69**	01	43

29	M-288	42 Q	503188	2539098	**22**	57	36	**69**	01	52
30	M-289	42 Q	503445	2538636	**22**	57	21	**69**	02	01
31	M-290	42 Q	501450	2542291	**22**	59	20	**69**	00	51
32	M-291	42 Q	501968	2541808	**22**	59	04	**69**	01	09
33	M-292	42 Q	502122	2541425	**22**	58	52	**69**	01	15
34	M-293	42 Q	502122	2541002	**22**	58	38	**69**	01	15
35	M-296	42 Q	502924	2540621	**22**	58	26	**69**	01	43
36	M-297	42 Q	502998	2542175	**22**	59	16	**69**	01	45
37	M-299	42 Q	503539	2541068	**22**	58	40	**69**	02	04

Appendix 6. Summary report of comments received from local stakeholders

Please refer to section E of the PDD.

Appendix 7. Summary of post-registration changes

This is the second renewal of crediting period.

However, during the first crediting period, Project Proponent had requested for Post Registration Changes (PRC) during the fourth CDM monitoring period and subsequently submitted the revised PDD to the CDM Executive Board for approval via PRC reference number PRC-2347-001. The changes in the monitoring plan, as detailed in the revised PDD, were approved on 18/04/2013.

http://cdm.unfccc.int/PRCContainer/DB/prcp272994770/view

The PRC Reference number for the submission is PRC-2347-001. The PRC was approved on 18/04/2013.

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.

Version	*Date*	*Description*
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Decision Class: Regulatory
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