Project design document form

(Version 10.1)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Grid Connected Wind Power Project by M/s. Giriraj Enterprises at Tejuva, Rajasthan
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	05.1
Completion date of the PDD	25/04/2019
Project participants	M/s Giriraj Enterprises
Host Party	India
Applied methodologies and standardized baselines	AMS-I.D. Grid connected renewable electricity generation --- Version 18.0
Sectoral scopes linked to the applied methodologies	Sectoral Scope 1: Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	13,583 tCO2e per annum

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

Introduction:

The proposed project activity is grid-connected wind power generation in Village- Serawa, Taluka & District- Jaisalmer, State - Rajasthan in India. M/s. Giriraj Enterprises is the owner and developer of the project activity. The total capacity of the project activity is 8.4 MW (4 WTGs × 2.10 MW). The project activity having capacity 8.4 MW & is within the SSC limit of 15 MW comes under Type I project activity as Renewable energy project activities which have an output capacity up to 15 megawatts (or an appropriate equivalent), in accordance with the CDM rules and requirements are Type I, Small scale project activity. The project activity employs Wind Turbine Generators (WTGs) of Class S-88 manufactured by M/s. Suzlon Energy Limited.

The project activity will supply the generated electricity to Indian Grid of India. The purpose of the project activity is generation of clean electricity by utilizing kinetic energy of wind. The project activity is estimated to generate 14,336 MWh of electricity annually; thus reducing GHGs to the tune of 13,583 tCO2e /annum for the entire crediting period of 7 years.

Purpose of the project activity:

Since the proposed project activity is a Greenfield project, the methodology AMS I.D. already prescribes the baseline scenario as being “Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the Tool to calculate the emission factor for an electricity system”. The electricity exported by the proposed project activity would displace an equivalent amount of electricity generated by the power plants already operational and proposed to be added in the Indian Grid which relies predominantly on power plants running on fossil fuels (particularly coal).

Thus, it contributes towards reduction in the demand-supply gap during periods of electricity shortage and increase in the share of renewable energy in the grid mix.

The Indian grid is mainly dominated by fossil fuel based power projects. The development of the project activity would reduce generation of electricity in the Indian grid by fossil fuel based power projects. This will help to mitigate Green House Gases (GHGs) emission by fossil fuel based power projects and contribute to conservation of fossil fuel resources.

Baseline:

The electricity generation is the result of the utilization of kinetic energy in wind to drive the wind turbine blades to generate electricity without emitting any form of GHG in atmosphere. Thus the operation of the wind power project is considered as environmentally safe.

In absence of the project activity, the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The estimation of GHG emission reductions by the project activity is limited to the emission of carbon dioxide (CO2) only, its primary source being the power plants running on fossil fuels in the

Indian grid. The proposed project activity would lead to an estimated emission reduction of 13,583 tCO2e annually over the chosen crediting period.

Contribution to the sustainable development

The project activity will contribute to sustainable development in various ways. These will be as follows:

Social well-being:

Social well-being focuses on the reflections of the project activity on the neighbouring community. The project promoter envisages following social benefits:

- Improved standard of living
- Availability of infrastructure like electricity, roads, medical facilities etc.
- Reduce migration from rural to urban area for the sake of employment
- Awareness about the global issues, their solutions & role of India in the same
- Awareness among local people regarding wind power & its effect on rain and ground water level

It will thus be responsible in bringing social well-being in the region.

Environmental well-being:

The project activity is a clean source of power generation. The environmental aspects in consideration are as follows:

- In comparison to other sources of power generation prevailing in the country, wind power is the cleanest technology.
- As compared to other power plants, less amount of land is required for a single wind turbo-generator.
- Wind power is renewable. It can be used continuously, whenever available. There is no danger of depletion of the raw material used for power generation.
- Wind power is a naturally available source of energy. There is no processing required to make it available for power generation.

Thus, wind power technology goes hand-in-hand with the environmental well-being of the region.

Technological well-being:

The power generation technology used in this project activity is provided by M/s. Suzlon Energy Limited. The technological well-being envisaged by the project promoter is as follows:

- It will boost the use of such technology by other project developers.
- Successful implementation and operation of this project will give necessary impetus in implementation of similar technology in the region.
- The project activity will lead to transfer of environmentally safe and sound technologies that are comparable to best practices in order to assist in upgradation of the technological base in the local region.

Economic well-being:

Economic well being refers to additional investment consistent with the needs of the local community. The project in due course of time will draw additional investment to the region. In general, the project activity envisages following economic benefits:

- Employment opportunities
- Market facilities for local products
- Industrial development
- Improvement of a rural economy
- Flow of goods and services

Although the realization of the above benefits would take a longer time needlessly, the economic development of the region would be attributed to the project operation. The project will contribute to the sustainable development of the region during its entire operational life.

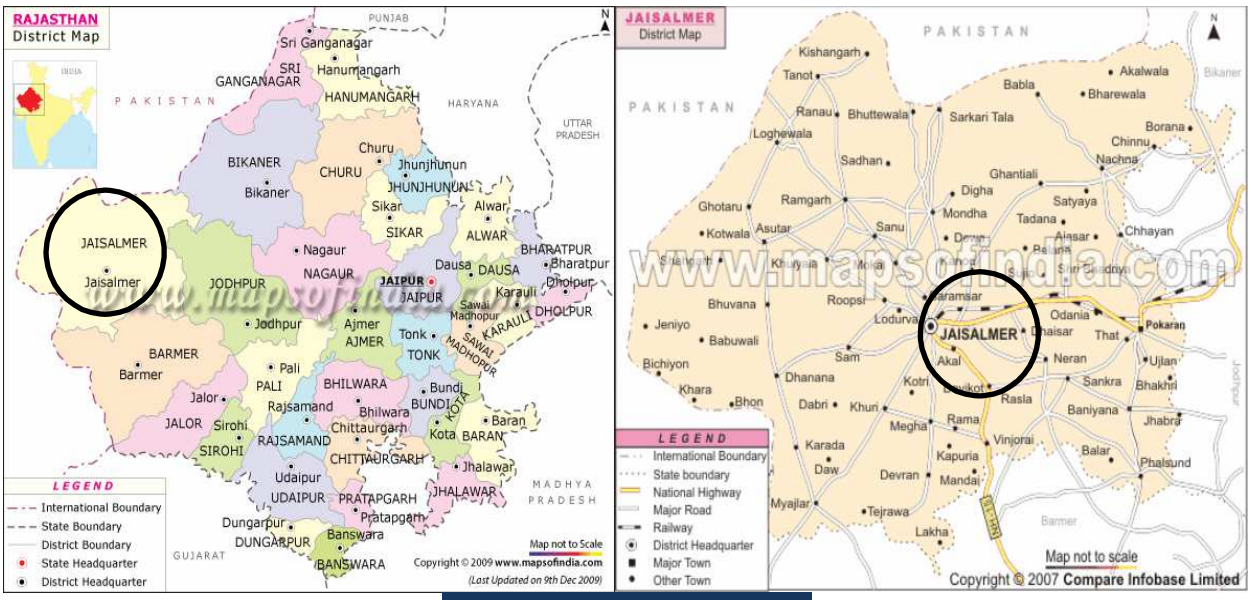
A.2. Location of project activity

>>
Taluka: Jaisalmer
District: Jaisalmer
State: Rajasthan
Country: India (Host Party)

The project activity is located in District- Jaisalmer, State- Rajasthan in India. The details of each WTG project location are given below:

Sr. No.	Location No.	Khasra No.	Latitude	Longitude
1.	MK- 54	442/P	N 27°12'21.1"	E 70°37'32.9"
2.	MK- 55	441/P	N 27°12'14.4"	E 70°37'50.6"
3.	MK- 56	440/P	N 27°12'07.8"	E 70°38'08.3"
4.	SKD-187	446/P	N 27°12'34.3"	E 70°36'45.8"

Project location on Map



A.3. Technologies/measures

>>

Technology/Measure:

The wind power technology is considered as one of the most environmental friendly technologies available. The operation of the wind turbine does not emit any harmful GHGs or any other harmful gases like conventional power plants during their operation. The electricity generation is the result of the utilization of kinetic energy in wind to drive the wind turbine blades to generate electricity. Thus the operation of the wind power project is considered as environmentally safe.

Technical specifications for Class S-88[1]:

1.	**Operating Data**	
	Rated power	2.1 MW
	Cut-in wind speed	4 m/s
	Rated wind speed	14 m/s
	Cut-out wind speed	25 m/s
	Hub height	79 m (Foundation top equal to ground level)
	Rotational Speed	15 to 17.6 rpm
2.	**Rotor**	
	Pitch system	Pitch regulated, electrical
	Diameter	88 m
	Swept area	6082 m^2
	Blade material type	Epoxy bounded fibre glass
3.	**Generator**	
	Type	Asynchronous slip ring type induction generator
	Rated power	2100 kW
	Rated voltage	690 / 600 V
	Frequency	50 / 60 Hz
	Cooling system	Air cooled
	Insulation	Class H
4.	**Braking System**	
	Aerodynamic brake	3 independent systems with blade pitching mechanism
	Mechanical brake	Hydraulic fail-safe disc brake system
5.	**Gearbox**	
	Type	3 stages (One planetary & Two helical)
	Ratio	1:98.8 / 1:118.1
	Nominal load	2200 kW
6.	**Yaw System**	
	Type	Driven by 3 electrical driven planetary drives
	Bearings	Polyamide slide
7.	**Tower**	
	Type	Tubular Tower (4 sections)

[1] http://suzlon.com/pdf/S88%20product%20brochure.pdf

	Corrosion protection	Epoxy/PU coated

The project technology is indigenous & no technology transfer is involved.

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)	M/s. Giriraj Enterprises (Private Entity)	No

A.5. Public funding of project activity

>>
There is no public funding from Annex 1 countries and no diversion of Official Development Assistance (ODA) involved in the project activity.

A.6. History of project activity

>>
The project participant confirms:

a. The proposed CDM project activity is a registered CDM project activity with registration number 5845 and Registration Date 28-Feb-12; please refer the below weblink https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1330439068.52/view
b. The proposed CDM project activity is not a project activity that has been deregistered.

The project participant declares:

a. The proposed CDM project activity was NOT a CPA that has been excluded from a registered CDM PoA;
b. The proposed CDM project was NOT a registered CDM project activity or a CPA under a registered CDM PoA whose crediting period HAS NOT expired exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

>>
As per "Guidelines on Assessment of Debundling for SSC Project Activities" (Version- 03, EB-54, Annex- 13)[2] :

Debundling is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities. The full project activity or any component of the full project activity shall follow the regular CDM modalities and procedures.

This wind power project activity is a separate project activity having installed capacity of 8.4 MW (2.1 MW × 4 Nos.) and is not a debundled component of any large scale project activity.
Further, as per the guidelines,

[2] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small scale activity at the closest point

This small-scale project activity cannot be deemed to be a debundled component of a large project activity as there is no registered[3] small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participant;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small scale activity at the closest point.

It therefore satisfies all conditions listed in 'Guidelines on Assessment of Debundling for SSC Project Activities' (Version- 03, EB- 54, Annex- 13) regarding debundling. Thus, project proponent hereby confirms that the project activity is not a debundled component of another larger project activity.

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

>>

Title: Grid connected renewable electricity generation[4]

Methodology : AMS-I.D Grid Connected Renewable Electricity Generation (Version 18.0)
Type I : Renewable Energy Project (Small Scale)
Category : I. "D", Grid Connected Renewable Electricity Generation

Reference has been taken from indicative simplified baseline and monitoring methodologies for selected small scale (projects less than 15 MW) project activity categories.

- Tool to calculate the emission factor for an electricity system[5] - Version 07.0 (EB 100, Annex 4)
- Demonstration of additionality of small-scale project activities[6] - version 12 (EB99. Annex 3)

[3] PP has two CDM registered projects (UNFCCC Ref. Nos.1778 & 3742). Nevertheless, these projects do not fulfill above debundling criteria.

[4] https://cdm.unfccc.int/methodologies/SSCmethodologies/approved

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

[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v12.pdf/history_view

- Investment analysis[7] – Version 8.0 (EB 97 Annex 8)

B.2. Applicability of methodologies and standardized baselines

>>

The project activity having capacity 8.4 MW & is within the SSC limit of 15 MW comes under Type I project activity as Renewable energy project activities which have an output capacity up to 15 megawatts (or an appropriate equivalent), in accordance with the CDM rules and requirements are Type I, Small scale project activity. It will remain under the limits of small scale project activity types during every year of the crediting period.

The qualifying criteria for the chosen project category AMS- I.D. (Version- 18) and its subsequent justification are given in the table below:

<table>
<tr><th>SL. NO.</th><th>Applicability</th><th>Compliance of condition</th></tr>
<tr><td>1</td><td>This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:
(a) Supplying electricity to a national or a regional grid.
(b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.</td><td>The project activity is a Renewable Energy Project i.e. Wind Power Project which falls under applicability criteria option 1(a) i.e., “Supplying electricity to a national or a regional grid”. Hence the project activity meets the given applicability criterion.</td></tr>
<tr><td>2</td><td>Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included below:
<table>
<tr><th></th><th>Project type</th><th>AMS-I.A</th><th>AMS-I.D</th><th>AMS-I.F</th></tr>
<tr><td>1</td><td>Project supplies electricity to a national/regional grid</td><td></td><td>√</td><td></td></tr>
<tr><td>2</td><td>Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)</td><td></td><td></td><td>√</td></tr>
<tr><td>3</td><td>Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)</td><td></td><td>√</td><td></td></tr>
<tr><td>4</td><td>Project supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel</td><td></td><td></td><td>√</td></tr>
</table></td><td>The project activity is 7.2 MW renewable wind project hence type I. The 1st option of Table of AMS I.D. Version 18, EB 81 is applicable.</td></tr>
</table>

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

	5 Project supplies electricity to household users (included in the project boundary) located in off grid areas √	
3	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 a new grid connected Wind power plant/ unit at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant) and hence this criterion is applicable.
4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; (b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2 ; (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2 .	The project activity involves generation of power by harnessing wind potential which is a form of renewable energy and exporting this power to the national grid. **Not Applicable**
5	If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity does not have any non-renewable component. The project activity entails power generation through wind power project of capacity 8.4 MW which is lower than 15 MW. Hence, the project activity complies with the mentioned criterion.
6	Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is not a co-generation activity. Hence, this condition is **not applicable** to the given type of project activity.
7	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	As the project activity is a Greenfield Project, so this condition is **not applicable**
8	In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	As the project activity is a Greenfield Project, so this condition is **not applicable** here.

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

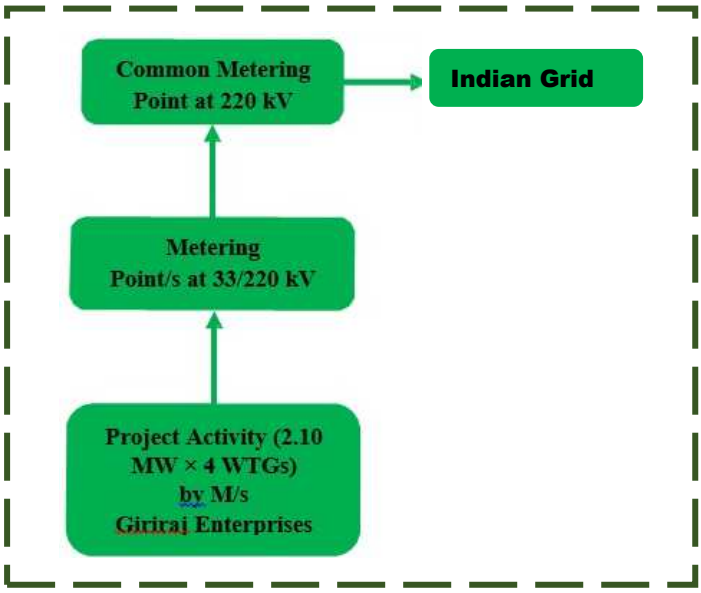
Thus, the project activity is complying with requisite criteria for AMS- I.D. (version 18.0).

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

>>

As per paragraph 18 of the chosen project category AMS- I.D. (Version- 18), 'The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.'

The project activity is located in the State of Rajasthan and is supplying generated electricity to the Indian Grid. The project boundary consists of project activity, evacuation facility, common metering point and connectivity to the Indian Grid. The schematic diagram of project boundary is as follows:



Source		GHGs	Included?	Justification/Explanation
Baseline Scenario	Grid-connected electricity generation	CO_2	Yes	Major emission sources.
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
Project Scenario	Greenfield Wind energy conversion system	CO_2	No	The project activity does not emit any emissions.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.

B.4. Establishment and description of baseline scenario

>>

As per AMS- I.D. (Version- 18), paragraph 19,

'If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.'

Since the project activity is a new grid-connected power plant, the above stated baseline is applicable for the project. Further, as per paragraph 22,

Baseline emissions include only CO2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Where:

BE_y = Baseline emissions in year *y* (t CO2)

$EG_{PJ,y}$ = 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)

$EF_{grid,y}$ = Combined margin CO2 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 CO2/MWh)

As per AMS- I.D. (Version- 18), para 23 'The emission factor shall be calculated in a transparent and conservative manner as follows:

a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'.

OR,

b) The weighted average emissions (in tCO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available.

The emission factor has been calculated using option 'a' above i.e. combined margin (as the data required to determined weighted average emissions (in t CO_2/MWh) of the current generation mix was not available at the time of submission of PDD for validation) by using "Tool to calculate the emission factor for an electricity system" (Version- 07, EB-100, Annex- 4).

Following information is used for the calculation of baseline emissions:

1. Net electricity supplied by the project activity to the grid in year y taken from monthly Break up of net export units reports.

2. CO_2 Baseline Database (Version- 13, Date- June 2018) published by Central Electricity Authority (CEA), Government of India under Baseline Carbon Dioxide Emissions From Power Sector.

Sr. No.	Parameters	Unit	Value	Reference
1.	$EF_{grid,OM,y}$	tCO_2/MWh	0.9726	Operating margin CO_2 emission factor for the project electricity system. The value is calculated for year 2014-15, 2015-16 & 2016-17.
2.	$EF_{grid,BM,y}$	tCO_2/MWh	0.8723	Build margin CO_2 emission factor for the project electricity system. The value is calculated for year 2016-17.
3.	$EF_{grid,CM,y}$	tCO/ MWh	0.9475	Combined margin CO emission factor for the project electricity system.

The combined margin emissions factor is calculated as follows:

$EF_{grid,OM,y}$	=	Operating Margin CO_2 Emission Factor (tCO_2/MWh)
$EF_{grid,BM,y}$	=	Build Margin CO_2 Emission Factor (tCO_2/MWh)
W_{OM}	=	Weighting of operating margin emission factor (%)
W_{BM}	=	Weighting of build margin emission factor (%)

The steps are detailed under section B.6.1.

B.5. Demonstration of additionality

>>

National policies and circumstances relevant to the baseline of the project activity:

The Electricity Act (EA), 2003 provides an enabling framework for accelerated and more efficient development of the power sector. The EA seeks to encourage competition with appropriate regulatory intervention. Competition is expected to yield efficiency gains and in turn result in availability of quality supply of electricity to consumers at competitive rates.

The Section 3 (1) of the Electricity Act 2003 requires the Central Government to formulate, inter alia, the National Electricity Policy in consultation with Central Electricity Authority (CEA) and State Governments. The provision is quoted below[8]:

"The Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy".

Further, as per section 5.2.12 of the National Electricity Plan14[9]:

Even with full development of the feasible hydro potential in the country, coal would necessarily continue to remain the primary fuel for meeting future electricity demand.

The National Electricity Plan also emphasizes the use of other fossil fuel like gas, LNG, Lignite, other imported fossil fuels in meeting the future electricity need.

It further emphasizes on the Renovation and Modernization (R&M) of the low performing thermal power stations in the country. This will enable to achieve improved PLF of the thermal power plant.

Further 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.

[8] http://www.powermin.nic.in/acts_notification/electricity_act2003/pdf/The%20Electricity%20Act_2003.pdf, Pg 8

[9] http://www.powermin.nic.in/indian_electricity_scenario/national_electricity_policy.htm

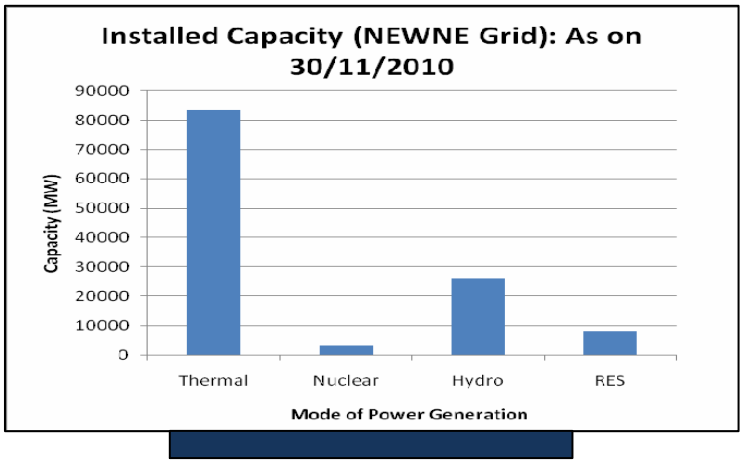
• The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
• There is no legal requirement on the choice of a particular technology for power generation.
• Generation Based Incentives (GBI), announced by the Ministry of New and Renewable Energy (MNRE), for Grid Interactive Wind Power Projects commissioned after 17/12/2009, of Rs. 0.50 per unit of electricity fed into the grid with a cap of Rs. 62 Lakh/MW.

The implementation of the National Electricity Plan is clearly evident from the installed capacity in the project boundary i.e. the NEWNE Grid:

As per CEA Report, the installed capacity (in MW) of NEWNE Grid region as on 30/11/2010[10] is as follows:

Sr. No.	Power Sources	Installed Capacity, MW	Percentage, %
1	Thermal	83490.4	68.8
2	Nuclear	3460.0	2.9
3	Hydro	26068.4	21.5
4	RES	8263.3	6.8
5	Total	121282.1	100.0

The graphical representation of the above statistics is given below:



It can be observed from the above statistics that NEWNE Grid Region is dominated mostly by fossil fuel based thermal power plants. The share of thermal based power generation is 83490.4 MW (68.8%) as against the contribution of Renewable Energy Sources i.e. 8263.3 MW (6.8%). The percentage of hydro power is also substantial in the project boundary i.e. 21.5%.

[10] http://cea.nic.in/ (Reference: Monthly Review of Power Sector Reports/November 2010/Sr. No. 06/Chapter: All India generating installed capacity- region wise/Page 8)

Thus, the national policy clearly prefers the installation of the fossil fuel based power plants, which forms the basis of the project activity.

Project Additionality:

The additionality of this wind power project is proven by using the Investment barrier (option a) in accordance with Attachment A of Appendix B (Version 08, EB- 63, Annex- 24) & Guidelines on the Assessment of Investment Analysis (Version- 5, EB- 62, Annex- 5)

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

The investment analysis for this project activity is done as per the "Guidelines on the Assessment of Investment Analysis" (Version- 5, EB- 62, Annex- 5).

Project proponent is required to determine that the project activity is not:

- The most economically or financially attractive; or
- Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

As per paragraph 19 of "Guidelines on the Assessment of Investment Analysis" (Version- 5, EB- 62, Annex- 5) – 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, project promoter has considered Benchmark analysis to prove the additionality of the project.

PP has considered post tax project IRR as suitable financial indicator for the project.

Suitability of benchmark:

The 'Guidelines on the Assessment of Investment Analysis' (Paragraph- 12, Version- 5, EB- 62, Annex- 5) states that, Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR, hence PP has selected Prime Lending Rate (PLR) applicable at the time of project conceptualization stage. PP has considered PLR of Bank of Baroda [11] as bench mark of the project. The PLR of the bank at the time of project conceptualization was 13.25%, which has been considered as benchmark of the project.

Calculation and comparison of financial indicators

PP has calculated project IRR of the project for entire life cycle. Key financial assumptions are as under:

Sr. No	Particulars	Unit	Details	Basis
1.	Nature of Concern	-	Partnership	-
2.	Capacity	kW	2100	Project financials considered during investment decision

[11] Bank of Baroda is a regular lender to the PP.

3.	No of WTGs	-	4	Project financials considered during investment decision
4.	Total Capacity	kW	8400	Project financials considered during investment decision
5.	Generation per WTG	Million	3.95	Project financials considered during investment decision
6.	Loss: Machine Unavailability	%	5.00	Project financials considered during investment decision
7.	Loss: Transmission Loss	%	3.00	Project financials considered during investment decision
8.	Generation after Losses per WTG	Million	3.63	Proposal from Supplier
9.	Add: Losses given by State Board	%	4	State Policy
10.	Total Billable Generation / WTG	Million	3.78	Calculated
11.	Annual Generation from project	Million	15.12	Calculated
12.	PLF[12]	%	20.54	Calculated
13.	Deration in 6th, 10th, 14th and 18th year	%	1.25	Rajasthan Electricity Regulatory Commission order September 2006
14.	Tariff Rate	INR/kWh	3.87	http://www.rerctest.rajasthan.gov.in/Orders/Order101.pdf
15.	Rate per tCO_2	Euro	13	https://www.theice.com/marketdata/reports/ReportCenter.shtml?reportId=10&contractKey=81
16.	Exchange Rate	INR	70	http://www.x-rates.com/cgi-bin/hlookup.cgi
17.	Grid Emission factor[13]	tCO_2/M	0.9580	CEA CO_2 data, version 06
18.	CO_2 Emission Per Year [14]	MT	14482	Calculated
19.	O & M	INR in Million	7.60	Project financials considered during investment decision
20.	Service Tax	INR in Million	0.78	The Finance Bill 2011
21.	O & M including Service Tax	INR in Million	8.38	
22.	Escalation in O & M Exp.	%	5.00	Project financials considered during investment decision
23.	O & M Free For	Years	1.0	Project financials considered during investment decision

[12] The PLF value arrived by the 3rd party report is 19.48% & the PLF offered by Suzlon is 19.75%. PP has considered PLF of 20.54% for financial analysis by adding 4% line losses as per State policy (line losses in the premises of the license at 132kV) to the PLF offered by Suzlon as a conservative measure. Moreover, the 3rd party PLF value of 19.48% (i.e. 14336 MWh) is used for ER calculation as a conservative measure.

[13] Value considered by PP as during CDM decision for the project activity

[14] Value considered by PP as during CDM decision for the project activity

24.	Insurance	INR in Million	0.70	Project financials considered during investment decision
25.	Cost of WTG	INR in Million	464.70	Project financials considered during investment decision
26.	Term Loan (75%)	INR in Million	348.53	Project financials considered during investment decision
27.	Promoters Contribution (25%)	INR in Million	116.18	Project financials considered during investment decision
28.	Term Loan Repayment Period (Including moratorium period)	Months	78.00	Project financials considered during investment decision
29.	Moratorium Period	Months	6.00	Project financials considered during investment decision
30.	Rate of Interest	%	13.25	As per applicable BPLR
31.	Depreciation as per Companies Act	%	5	Straight line method
32.	Depreciation in 1st Year	%	80.00	As per Income Tax Act
33.	Depreciation in 2nd Year		16.00	As per Income Tax Act
34.	Depreciation in 3rd year		3.20	As per Income Tax Act
35.	Depreciation in 4th year		0.80	As per Income Tax Act
36.	Income Tax	%	30.90	Section 143, Income Tax Act 1961

The Project IRR value for the project activity has been calculated for the life time of the project. The
Project IRR *without* CDM benefits comes to 9.25%, which is lower than the benchmark rate of 13.25%[15].

Thus, we can conclude that successful CDM registration of this project activity is important to make it financially attractive.

Sensitivity analysis

The "Guidelines on the Assessment of Investment Analysis" (Paragraph 20, Version- 5, EB- 62, Annex- 5), states that only variables, including the initial investment cost, that constitute more than 20 % of either total project costs or total project revenues should be subjected to reasonable variation.

The different parameters that affect the viability of a wind power project as per above clause are mentioned below –

Parameters	Comments
Annual Generation	This is the most important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.
Project Cost	This is other important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this

[15] http://www.moneycontrol.com/stocks/stock_market/corp_notices.php?autono=391989

	parameter. Sensitivity analysis has therefore been carried out for it.
O & M Cost	This does not add to 20% of either total project cost or total project revenues, even then sensitivity analysis is conducted out to show the effect on viability of the project.
Tariff	This is the most important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.

Outcome of Sensitivity analysis:

Sensitivity Analysis based on Annual Generation, Project Cost and O & M Cost			
Variation by….	-10%	0	10%
Annual Generation	7.30%	9.25%	11.10%
Project Cost.	10.94%	9.25%	7.79%
O & M Cost	9.60%	9.25%	8.89%
Tariff	7.30%	9.25%	11.10%

From the above table it seems that if the generation increased by 10%, project cost decreased by 10%, O & M decreased by 10% and tariff increased by 10%, the financial indicator will not cross the benchmark selected by the PP. The project activity is clearly unattractive in absence of CDM income. Hence the project activity is additional.

The successful registration of the project as CDM project is imperative in order to make it financially more attractive.

Prior CDM Consideration:

As per paragraph 02 of the Guidelines On The Demonstration And Assessment Of Prior Consideration Of The CDM (Version: 04, EB: 62, Annex: 13), the PP has intimated to both UNFCCC & DNA on 08/04/2011 regarding intentions to seek CDM benefits for the project activity. The start date of the project activity is considered as 10/03/2011 (Earliest Purchase Order date of Wind Turbine Generators).The intimation is within six months of the project start date.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

>>

Baseline Emissions (BEy):

Baseline methodology for project category I.D has been detailed in paragraphs 19-22 of the approved small scale methodology AMS- I.D. (Version- 16, EB- 54). As per paragraph 19,

'If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.'

Since the project activity is a new power plant, the above stated baseline is applicable for the project. Further, as per paragraph 22,

'The baseline emissions are the product of electrical energy baseline $EG_{PJ, y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.'

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

As per paragraph 26 of AMS I.D versión 26, if the project activity is the installation of a greenfield power plant, then:
$EG_{PJ,y} = EG_{PJ,facility,y}$

Where:

BE_y = Baseline emissions in year y; (t CO2)

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

$EF_{grid,y}$ = CO2 Emission Factor of the grid in year y; (t CO2 / MWh)

As per paragraph 23 of AMS- I.D. (Version- 18), 'The emission factor can be calculated in a transparent and conservative manner as follows:

a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'.

OR

b) The weighted average emissions (in t CO2/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' (Version 07.0, EB 100 Annex 4) since data is available from an official source.

CO_2 Baseline Database for the Indian Power Sector, Version 13, June 2018[16], published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

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

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

[16] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver13.pdf

(e) **Step 5:** Calculate the build margin (BM) emission factor;
(f) **Step 6:** Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems
As described in tool *"For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems".* It also states that *"If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used."*

Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern. However, all the 5 zones have 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 may choose between the following two options to calculate the operating margin and build margin emission factor:

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

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

Step 3: Select a method to determine the operating margin (OM)
The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:
(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

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

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

	2012-13	2013-14	2014-15	2015-16	2016-17
India	16.9%	18.6%	16.8%	15.1%	14.6%

Data Source: Central Electricity Authority (CEA) database Version 13, June '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 five most recent years) for the Indian grid is less than 50 % of the total generation.

Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average 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:

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

OR

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

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the 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 ($EF_{grid,OMSimple,y}$) according to the selected method

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

Net Generation in Operating Margin (GWh) (incl. imports)		
2014-15	**2015-16**	**2016-17**
808,417	871,753	916,278

Simple Operating Margin Emission Factors (t CO2/MWh) (incl. Imports)		
2014-15	**2015-16**	**2016-17**
0.9903	0.9655	0.9636

Weighted Generation Operating Margin (t CO2/MWh)	**0.9726**

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)
As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 72:

In terms of vintage of data, project participants can choose between one of the following two options:
(a) ***Option 1*** *- for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of 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 by PP to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
	2016-17
Indian Grid	**0.8723**

Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid,CM,y}$)
As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 81:

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:
(a) Weighted average CM; or
(b) Simplified CM.

PP has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.
The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$	=	Build margin CO2 emission factor in year *y* (t CO2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO2 emission factor in year *y* (t CO2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (per cent)
w_{BM}	=	Weighting of build margin emissions factor (per cent)

The following default values should be used for w_{OM} and w_{BM}:
(a) 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

Therefore, $EF_{grid,CM,y}$ = 0.9726*0.75 + 0.8723*0.25
= 0.9475 t CO2/MWh

Baseline emission factor (EF_y):

The baseline emission factor is calculated using the combined margin approach as described in Step 6 above:
Therefore, $EF_y = EF_{grid,CM,y} =$ 0.9475 t CO2/MWh.

Baseline Emissions (BEy):

The product of Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y in MWh with CO2 Emission Factor of the grid in year y in tCO2/MWh will give the estimated value of Baseline Emissions tCO2 (BEy).

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

Project Emissions (PEy):

As per paragraph 39 of approved methodology AMS- I.D. (Version- 18, EB- 81), For most renewable energy project activities, PEy = 0.

As the project activity is a wind power generation, the project emissions are considered zero.

Leakage Emissions (LEy):

As per paragraph 42 of the approved methodology AMS- I.D. (Version- 18, EB- 81), If the energy generating equipment is transferred from another activity, leakage is to be considered. The leakage emissions may be considered as zero tCO2 as no such equipment shall be transferred from another project activity.

Emission Reductions (ERy):

The emission reductions (ERy) are calculated as per paragraph 43 of AMS- I.D. (Version- 18).
ERy = BEy – PEy - LEy

Where

ER_y	=	Emission reductions in year y (tCO_2/y)
BE_y	=	Baseline Emission in year y (tCO_2/y)
PE_y	=	Project Emission in year y (tCO_2/y)
LE_y	=	Leakage Emission in year y (tCO_2/y)

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data or parameter.)

Data/Parameter	$EF_{grid,y}$
Data unit	tCO_2 / MWh
Description	Combined margin CO_2 emission factor for the project electricity system.
Source of data	Calculated from CEA database, Version 13, June 2018[17]
Value(s) applied	0.9475
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0". The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 13.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	The calculation is done as ex ante.

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 13, June 2018[18]
Value(s) applied	0.9726
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0" as 3-year generation weighted average using data for the years 2014-2015, 2015-2016 & 2016-17. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 13.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	The calculation is done as ex ante.

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin CO2 emission factor in year y
Source of data	Calculated from CEA database, Version 13, June 2018[19]
Value(s) applied	0.8723
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07 .0". The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 13.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	The calculation is done as ex ante.

[17] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver13.pdf
[18] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver13.pdf
[19] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver13.pdf

B.6.3. Ex ante calculation of emission reductions

>>

The Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh) is calculated using the following parameters:

Sr. No.	Project Parameters	Details
1.	Location	Serawa, Rajasthan
2.	Grid	Indian Grid
3.	Capacity per WTG	2.1 MW
4.	Total no. of WTGs	4
5.	Total Capacity	8.4 MW
6.	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y	14,336 MWh

Baseline Emissions (BE_y), tCO_2:

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

$= 14,336 \times 0.9475$

$= 13,583\ tCO2$

The project emissions (PE_y) & leakage emissions (LE_y) are zero as explained in Section B.6.1. Thus,

$ER_y = BE_y$

$= 13,583\ tCO_2$

Thus, the project activity is estimated to achieve emission reductions of 13,583 tCO_2e per annum over the entire crediting period of 7 years.

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	13,583	0	0	13,583
Year 2	13,583	0	0	13,583
Year 3	13,583	0	0	13,583
Year 4	13,583	0	0	13,583
Year 5	13,583	0	0	13,583
Year 6	13,583	0	0	13,583
Year 7	13,583	0	0	13,583
Total	**95,081**	0	0	**95,081**
Total number of crediting years	7 Years (Renewable)			

Annual average over the crediting period	**13,583**	0	0	**13,583**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data or parameter.)

Data/Parameter	$EG_{PJ, facility,y}$
Data unit	MWh/y
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)
Source of data	Monthly Break up of net export units report
Value(s) applied	14,336 (Average Estimated Value)
Measurement methods and procedures	Metering at 33 kV/220 kV level: The electricity generated by the project activity WTG/s is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTG/s along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These tri vector energy meters are having accuracy class of 0.2s. The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import. The electricity (export and import) for the connected WTG/s is apportioned on monthly basis by the State Utility at 33 kV/220 kV level on the basis of generation ratio at the applicable metering point (ratio of controller reading of connected WTG to the controller reading for all WTGs connected to the applicable metering point) and the electricity (export, import etc) recorded by the energy meters at 33 kV/220 kV GSS on monthly basis. It will give export kWh & import kWh for connected WTG. The net export obtained at 33 kV/220 kV level for any given month for the connected WTG is then obtained by: Net Export = Export kWh – Import kWh All these metering points are further connected to the common delivery point at the 220 kV level. Metering at 220 kV level: The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) receiving from all connected metering points. The common metering point consist of both main & check meters. These energy meters are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility. Billing of the energy will be done based on the energy break up available at the metering at 220 kV level. **Transmission loss:**

	The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of exports for all metering points at 33/220 kV level and the total reading of exports for same metering points recorded at the 220 kV level. Similarly, transmission loss occurred during import of the electricity is also calculated. The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point (ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point). The values of transmission loss during export & import for the given WTG are subtracting from $EG_{Export, metering point}$ & $EG_{Import, metering point}$ respectively to get the values of export and import respectively for the given month. **Calculation of Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y:** The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export. The values of the net electricity delivered to the Grid are aggregated annually to get $EG_{PJ, facility,y}$ The value of net electricity delivered to the Grid ($EG_{PJ, facility,y}$) by the project activity per annum is converted to MWh before the calculation of emission reductions (ex ante determined in tCO_2/MWh unit).
Monitoring frequency	Monthly
QA/QC procedures	The meters are approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The calibration of the meters will be carried out by State Utility. The calibration of the meters will be carried out at least once in three years (as per paragraph 17 (c) of General Guidelines to SSC CDM methodologies, Version 17). In the absence of the meter calibration—Guidelines For Assessing Compliance With The Calibration Frequency Requirements will be applied appropriately to confirm the conservativeness of metering and emission reductions. In case of malfunction of both meters (main & check) at the same time, PP will not consider any generation during that malfunction time. This will ensure conservativeness of emission reductions. The measurement results shall be cross checked with records for sold electricity (e.g. invoices).
Purpose of data	To calculate the baseline emission
Additional comment	Data will be archived in electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

B.7.2. Sampling plan

>>
Sampling is not required for the given project activity.

B.7.3. Other elements of monitoring plan

>>
Monitoring of the project activity:

The monitoring of the project activity is given as below:

- The electricity generated by the project activity WTGs is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTGs along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These tri vector energy meters are having accuracy class of 0.2s.
- The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import.
- All these metering points are further connected to the common delivery point at the 220 kV level.
- The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) received from all connected metering points. The common metering point consist of both main & check meters. These energy meters are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility.
- Billing of the energy will be done based on the energy break up available at the metering at 220 kV level.
- The common delivery point receive the electricity is two separate lines (Line 1 & Line 2). Both lines are equipped with set of main & check meters. The total export & import is arrived by summation of the respective values from both the meters (Line 1 & 2). The billing is done on the basis of main meter reading.
- The monitoring & measurement of electricity will be done on continuous basis; while recording will be done on monthly basis as Joint Meter Reading by the representatives of State Utility & PP.
- The value of monthly export by the project activity along with import and net export will be recorded in the monthly Break up of net export units report.
- The values of monthly export & import by the project activity recorded in the monthly Break up of net export units report is calculated based on the apportioning method by the state utility.
- The meters shall be approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The calibration of the meters will be carried out by State Utility.
- The calibration of the meters will be carried out at least once in three years (as per paragraph 17 (c) of General Guidelines to SSC CDM methodologies, Version 17). In the absence of the meter calibration— Guidelines For Assessing Compliance With The Calibration Frequency Requirements will be applied appropriately to confirm the conservativeness of metering and emission reductions.
- In case of malfunction of both meters (main & check) at the same time, PP will not consider any generation during that malfunction time. This will ensure conservativeness of emission reductions.
- The measurement results shall be cross checked with records for sold electricity (e.g. invoices).
- The net electricity supplied to the grid will be converted to MWh for calculation of emission reductions.

- Data will be archived in electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

Sample Apportioning Procedure:

The apportioning of the electricity is the responsibility of the State Utility. The sample apportioning procedure adopted for any given WTG for any given month is given below:

Generation Ratio at metering point (33 kV/220 kV level GSS):

The generation ratio is the ratio of electricity generated by installed WTG of PP to the total generation by all the connected WTGs to the applicable metering point.

$$G_{R,\ metering\ point} = EG_{Controller,\ WTG} / EG_{Controller,\ metering\ point} \quad (a)$$

Where:

$G_{R,\ metering\ point}$: Generation Ratio at metering point

$EG_{Controller,\ WTG}$: Electricity generated by installed WTG of PP connected to the applicable metering point

$EG_{Controller,\ metering\ point}$: Total generation by all the connected WTGs to the applicable metering point

Calculation of net electricity exported at applicable metering point:

The Main and Check meters at the applicable metering point measures number of parameters including export and import for all the connected WTGs.

The import, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Import,\ metering\ point} = G_{R,\ metering\ point} \times EG_{Total\ Import,\ metering\ point} \quad (b)$$

Where:

$EG_{Import,\ metering\ point}$: Import, kWh by the WTG at the metering point
$G_{R,\ metering\ point}$: Generation Ratio at metering point
$EG_{Total\ Import,\ metering\ point}$: Total Import, kWh by all the WTGs at the metering point

The export, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Export,\ metering\ point} = G_{R,\ metering\ point} \times EG_{Total\ Export,\ metering\ point} \quad (c)$$

Where:

$EG_{Export,\ metering\ point}$: Export, kWh by the WTG at the metering point
$G_{R,\ metering\ point}$: Generation Ratio at metering point
$EG_{Total\ Export,\ metering\ point}$: Total Export, kWh by all the WTGs at the metering point

The net electricity exported by the WTG at the 33 kV/220 kV level metering point is calculated by subtracting equation (b) from (c).

Thus, the net electricity exported at 33 kV/220 kV level metering point

$$= EG_{Export,\ metering\ point} - EG_{Import,\ metering\ point} \quad (d)$$

Transmission Loss Calculation:

The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of export for all metering points at 33/220 kV level and the total reading of export for same metering points recorded at the 220 kV level. Similarly transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point.

Generation Ratio at common delivery point:

It is the ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point.

$$G_{R,\ Common\ Delivery\ Point} = EG_{Controller,\ WTG} / EG_{Controller,\ Common\ Delivery\ Point} \quad (e)$$

Where:

$G_{R,\ Common\ Delivery\ Point}$: Generation Ratio at common delivery point

$EG_{Controller,\ WTG}$: Electricity generated by installed WTG

$EG_{Controller,\ Common\ Delivery\ Point}$: Total generation by all the connected WTGs/ or connected metering points under common delivery point

Calculation of net electricity delivered to the Grid:

The values of transmission loss during export & import for the given WTG are subtracting from $EG_{Export,\ metering\ point}$ & $EG_{Import,\ metering\ point}$ respectively to get the values of export and import respectively for the given month.

The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export. Thus,

$$= \quad Export - Import \quad (f)$$

These apportioned values viz import, export and net export kWh can be referred from the Monthly Break up of net export units report.

Operation & Maintenance of the Project:

Suzlon Infrastructure Services Ltd. is providing O & M services to the project promoter. Suzlon Infrastructure Services Ltd. is ISO 9001: 2008 certified[20] company with regards to O & M of Wind Turbine Generators. Following services are provided by Suzlon Infrastructure Services Ltd.:

Routine Maintenance Services:

Routine maintenance labour work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and upkeep of the equipment including –

- Tower torquing
- Blade cleaning
- Nacelle torquing and cleaning
- Transformer oil filtration
- Control panel & LT panel maintenance
- Site and transformer yard maintenance

Security Services:

This service includes watch and ward and security of the wind turbines and the equipment.

Management Services:

- Data logging for power generation, grid availability, machine availability.
- Preparation and submission of monthly performance report in agreed format.
- Taking monthly meter reading jointly with utility of power generated at promoter's wind turbines and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

- Visual inspection of the WTGs and all parts thereof.
- Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services

Operational & Management Structure:

Sr. No.	Monitoring Team	Responsibility
1	Project Head	• Overall project management • Project execution • Review of project operations • Review of generation & achieved emission reductions by project

[20] http://www.suzlon.com/images/certificates/1040CC4-2006-AQ-IND-RvA_Rev_03_ISO%209001%202008.jpg

2	Project Coordinator	• Data Archival (electronic) • Site visit for actual project monitoring Storage of data • Coordination with O & M Contractor for day to-day operations • Coordination with Suzlon for regular calibration of meters • Reporting to Project Head • Online project monitoring • Feedback and corrective action wherever necessary
3	O & M Contractor (Suzlon)	• Compliance as per O & M Agreement with the PP

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
10/03/2011 (Purchase Order date of Wind Turbine Generators). It is the second crediting period of the project activity.

C.2. Expected operational lifetime of project activity

>>
20 years- 0 months

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
The project activity has chosen Renewable crediting period. It is the second crediting period of the project activity.

C.3.2. Start date of crediting period

>>
01/03/2019

C.3.3. Duration of crediting period

>>
7 years and 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The guidelines on Environmental Impact Assessment have been published by Ministry of Environment and Forests (MoEF), Government of India (GOI) under Environmental Impact Assessment notification 14/09/2006[21].
Further amendments to the notification have been done on 01/12/2009[22]. As per the notification:

[21] EIA Notification 2006, http://envfor.nic.in/legis/eia/so1533.pdf

[22] EIA Amended Notification dated 01/12/2009, http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

"The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall hereinafter referred to be as the Central Government in the Ministry of Environment and Forests for matters falling under Category 'A' in the Schedule and at State level the State Environment Impact Assessment Authority (SEIAA) for matters falling under Category 'B' in the said Schedule, before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity:

(i) All new projects or activities listed in the Schedule to this notification;
(ii) Expansion and modernization of existing projects or activities listed in the Schedule to this notification with addition of capacity beyond the limits specified for the concerned sector, that is, projects or activities which cross the threshold limits given in the Schedule, after expansion or modernization;
(iii) Any change in product - mix in an existing manufacturing unit included in Schedule beyond the specified range."

As the wind power generation projects are not listed in any of the categories of the schedule, it does not require Environmental Impact Assessment.

D.2. Environmental impact assessment

>>
Wind energy projects are considered environmentally safe and as per Host party- India no EIA is required.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>
The stake holder meetings for the project were conducted at Suzlon's Regional office at Jaisalmer (Rajasthan) respectively on 24/03/2011 & 26/04/2011. The stake holders were invited by Public Notice dated 12/03/2011 & 12/04/2011 respectively. Personal invitations were also given to the stake holders. The meeting were coordinated by Suzlon Energy Limited. Mr. Mohammad Abid, Mr. Himanshu Kulkarni, Mr. Kishanlal Jakhar, Mr. Chetan Mehra & Mr. Surender Chaudhari represented Suzlon in these meetings. The PP was represented by Mr. Nitin Jadhav. The stake holders were identified based on the sustainability impact (direct & indirect) of this project activity on the life of the local people.

The project proponent & Suzlon welcomed the stakeholders for the meeting. The meeting was conducted in Hindi. The representatives of Suzlon & PP explained the purpose of the meeting to the present stakeholders and introduced all the stakeholders to all the representatives. He briefed the stakeholders about the concept of Clean Development Mechanism, wind technology, climate change, effect of green house gases on human life, environmental benefits of the wind power projects etc.

Mr. Mohammad Abid explained about the power-deficit scenario in India and the need of energy. He explained importance of wind mills projects with respect to environmental well-being and its effect on local economy. He informed stakeholders about project

promoter's keen interest in development of this proposed project and its effect on sustainable development of the local area.

Some villagers gave comments (which are discussed below) on the wind farm and its effect on their life. The stakeholder meeting ended with vote of thanks by Suzlon and PP.

E.2. Summary of comments received

>>
During the meeting the project proponent & Suzlon invited the stakeholders to offer their comments on the project.

The stake holders present in the meeting gave a positive response; illustrating the different improvements made in the village due to the project activity like medical facilities, availability of ambulance, oxygen cylinders, civil work contracts to the local people etc. They further added that, different employment opportunities, like security guards, drivers, have been created for local people.

Jitendra Singh, a local driver, said he is happy with the wind farm development in the local area as he has got job as a driver and that helped him to live a stable life. He then queried if more projects like these can be brought in the area. It was explained to the villagers that Suzlon has already commissioned many such projects in Jaisalmer and will continue to do so. Mr. Singh also wanted to know if the electricity from these projects can be supplied to the villager & neighbourhood areas. To this, Suzlon clarified that once the electricity is fed to the state grid, it is the decision of the state government as to where they supply the electricity.

Further, Mr. Kishanlal Jakhar asked following questions to the present stake holders, to which Mr. Jitendra Singh gave response behalf of all the stakeholders:

- Query: Are these wind power projects have any other benefits?

  Reply: Improved transportation, medical facility, good connectivity, employment etc.

- Query: Did project provide any employment opportunity or economic development in local area?
  Reply: Yes, it did. It has created jobs like security guard, driver etc for locals including project related job at local level.

- Query: Should such projects be promoted in local area?
  Reply: Yes, as these wind mill projects have brought some good medical facilities like ambulance for locals which were not available so easily to locals initially. Also project personnel have developed good relations with local villagers.

- Query: Do villagers face any problem to their day-to-day activities due to wind mill projects?
  Reply: Villagers do not face any problem due to wind mill projects

E.3. Consideration of comments received

>>
No negative comments were received on the project activity, so no additional measures are required by the PP

SECTION F. Approval and authorization

>>

The letter of approval from the party involved in the project activity has been submitted.

Appendix 1. Contact information of project participants

Organization name	M/s. Giriraj Enterprises
Country	India
Address	Malpani House, Sangamner
Telephone	+91-2425-225 261
Fax	+91-2425-225 033
E-mail	prafulla@malpani.com
Website	www.malpani.com
Contact person	Mr. Prafulla Khinvasara

Appendix 2. Affirmation regarding public funding

No public funding is involved in the project

Appendix 3. Applicability of methodologies and standardized baselines

The details regarding applicability of selected methodology are provided in Section B.2

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

The background information on the ex-ante calculation of emission reductions is detailed in section B.6.3.

Source:
CO2 Baseline Database for the Indian Power Sector version 13.0 June 2018 published by Central Electricity Authority.

Link: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver13.pdf

Appendix 5. Further background information on monitoring plan

The detailed monitoring plan is as provided in Section B.7.

Appendix 6. Summary report of comments received from local stakeholders

The detailed monitoring plan is as provided in Section E.3.

Appendix 7. Summary of post-registration changes

Not Applicable

- - - - -

Document information

Version	*Date*	*Description*
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
Document Type: Form
Business Function: Registration
Keywords: project activities, project design document