

BUNDLED WIND POWER PROJECT IN MADHYA PRADESH, GUJARAT AND KERALA BY D.J. MALPANI

Document Prepared By EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The purpose of the project activity is to generate power using renewable energy source (wind energy) and sell the power generated to the state grid. The project activity generates electricity using wind. The generated electricity is exported to the regional grid system which is under the purview of the INDIAN electricity grid of India.

The wind power generated from the Project will be displacing the electricity generated from thermal power stations feeding into Indian grid (Indian Electricity Grid) and will be replacing the usage of diesel generators for meeting the power demand during shortage periods. Since, the wind and solar power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only.

The proposed project activity involves the installation of Wind Power Projects. The total installed capacity of the project is 60 MW; which involves operation of Wind Turbine Generators (WTGs) in multiple states of India. The details of the project is given below:

Sr No.	Project Type	Project Capacity (in MW)	Owner of Project	Project Location	State
1	Wind	4.5 MW	D. J. Malpani	Dhar Site, Dhar	Madhya Pradesh
2	Wind	7.5 MW	D. J. Malpani	Ghatiya Site, Ujjain	Madhya Pradesh
3	Wind	6 MW	D. J. Malpani	Sadla Site, Surendranagar	Gujarat
4	Wind	20 MW	D. J. Malpani	Savarkundala Site, Amreli	Gujarat
5	Wind	22 MW	D. J. Malpani	Kinfra Site, Kerala	Kerala

The power produced displaces an equivalent amount of power from the grid, which is fed mainly by fossil fuel fired power plants. Hence, it results in reduction of GHG emissions. Average annual GHG emission reductions from the project activity will be 99,433 tonnes of CO₂ and total GHG emission reductions for the chosen 10 year crediting period will be 994,330 tonnes of CO₂.

The Project activity is a new facility (Greenfield) and the purpose of the project activity is to generate energy electricity by the utilization of renewable wind technology and further selling the generated energy to the Indian Grid. In this process there is no consumption of any fossil fuel and hence the project does not lead to any greenhouse gas emissions. Thus, electricity would be generated through sustainable means without causing any negative impact on the environment.

In the Pre- project scenario the entire 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.

1.2 Sectoral Scope and Project Type

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

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

Project Type : I - Renewable Energy Projects

Methodology : ACM0002: Grid-connected electricity generation from renewable sources - Version 17.0¹

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	D. J. Malpani
Contact person	Mr. Prafulla Khinvasara
Title	CEO- Renewable Power Projects
Address	Malpani House, New Nagar Road, Tal- Sangamner, Dist – Ahmednagar, Maharashtra, India
Telephone	+91 98223 22145
Email	prafulla@malpani.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Contact person	Mr. Manish Dabkara
Title	MD & CEO
Address	Office No. 201, EnKing Embassy, Plot No. 48, Scheme No. 78, Part II, Vijay Nagar INDORE – 452010, India.
Telephone	+91-731-4289086
Email	manish@enkingint.org

1.5 Project Start Date

Project Start Date: 28-March-2016.

¹ <http://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN>

The project start date is the date of earliest commissioning date of WTG. The individual project activities details are mentioned below:

S. No.	Project Owner	Machine ID	DOC ²	Village	Taluka	District	State
1	D. J. Malpani	RGP2- 09	28-03-2016	Tulaheda	Ghatiya	Ujjain	Madhya Pradesh
2		RGP2- 08		Tulaheda	Ghatiya		
3		RGP2- 18		Tulaheda	Ghatiya		
4		RGP2- 03		Tajpur	Mahidpur		
5		RGP2- 07		Ranaheda	Ghatiya		
6	D. J. Malpani	SDL-T-002	31-03-2017 (expected)	Ranipat	Muli	Surendranagar	Gujarat
7		SDL-T-005					
8		SDL-T-006					
9	D. J. Malpani	SVR-T-033	31-03-2017 (expected)	Pithavadi	Savarkundla	Amreli	Gujarat
10		SVR-T-034		Bhenkara			
11		SVR-T-035		Bhenkara			
12		SVR-T-036		Bhenkara			
13		SVR-T-037		Bhenkara			
14		SVR-T-123		Bhokarva			
15		SVR-T-137		Piyava			
16		SVR-T-138		Piyava			
17		SVR-T-139		Piyava			
18		SVR-T-136		Piyava			
19	D. J. Malpani	GFL-K- 01	31-03-2017 (expected)	Pudussery Central & Elapully	Palakkad	Palakkad	Kerala
20		GFL-K - 02					
21		GFL-K - 03					
22		GFL-K - 05					
23		GFL-K - 06					
24		GFL-K - 07					
25		GFL-K - 08					
26		GFL-K - 09					
27		KIN - 23					
28		KIN - 24					
29		KIN - 25					
30	D. J. Malpani	-	31-03-2016	-	Dhar	Dhar	Madhya Pradesh

1.6 Project Crediting Period

Crediting Period Start date: 28-March-2016

Crediting Period End date: 28-March-2026

² Date Of commissioning

The project activity adopts renewable crediting period of 10 years period which can be renewed for maximum 2 times.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

The project is a large scale project that involves setting up of 60 MW of wind power project.

Project Scale	
Project	✓
Large project	

As the Estimated GHG emission reductions or removals per year is 99,433 (tCO₂e) which is less than 300,000 tonnes of CO₂e per year, thus the project falls in the category of Project

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	99,433
Year 2	99,433
Year 3	99,433
Year 4	99,433
Year 5	99,433
Year 6	99,433
Year 7	99,433
Year 8	99,433
Year 9	99,433
Year 10	99,433
Total estimated ERs	991,330
Total number of crediting years	10 years
Average annual ERs	99,433

1.8 Description of the Project Activity

The proposed project activity involves the installation of Wind Power Projects in different location of India. The total installed capacity of the project is 60 MW; which involves operation of 1.5 MW and 2 MW capacity of wind projects located in Gujarat, Kerala and Madhya Pradesh.

The Project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to the Indian electricity grid. The Project will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The Project Proponent plans to avail the VCS benefits for the Project.

In the Pre- project scenario the entire electricity, delivered to the grid by the project activity, would have otherwise been generated by the operation of grid-connected power plants which is mainly dominated by fossil fuels or by the addition of new generation sources.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 99,433 tCO₂e per year, thereon displacing 101,704 MWh/year amount of electricity from the grid.

Wind Power Project Technology Details –

The technology employed, converts wind energy to electrical energy. In wind power generation, energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind power generation technology is environment friendly technology since there are no GHG emissions associated with the electricity generation. There is no transfer of technology involved in the project activity.

The project activity comprises a total of 5 WTG's of ReGen Power Tech make and 24 WTG's of INOX make. The commissioning details of the project activity has been mentioned in section 1.5.

Technical details for VENSYS 87, 1500 KW Machine³

Particulars	Details
Make	ReGen Powertech
Rated power	1500 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	22 m/s
Survival wind speed	52.5 m/s
Generator	Variable Speed Multi Pole Synchronous
Rotor Diameter	87 m
Swept area	5942 m ²
Speed Range	9 to 17.3 rpm
Hub Height	85 m
Design	Tubular, Four Sections
Foundation Type	Floating
Control of Output	Pitch Regulation
Speed Control	Variable, micro controller based
Low Voltage Ride Through (LVRT)	3 seconds
Primary Brake system	Aerodynamic
Pitch System	Electromechanical
Remote Monitoring	VPN
Wind Turbine type class	GL III B
Design Lifetime	25 years

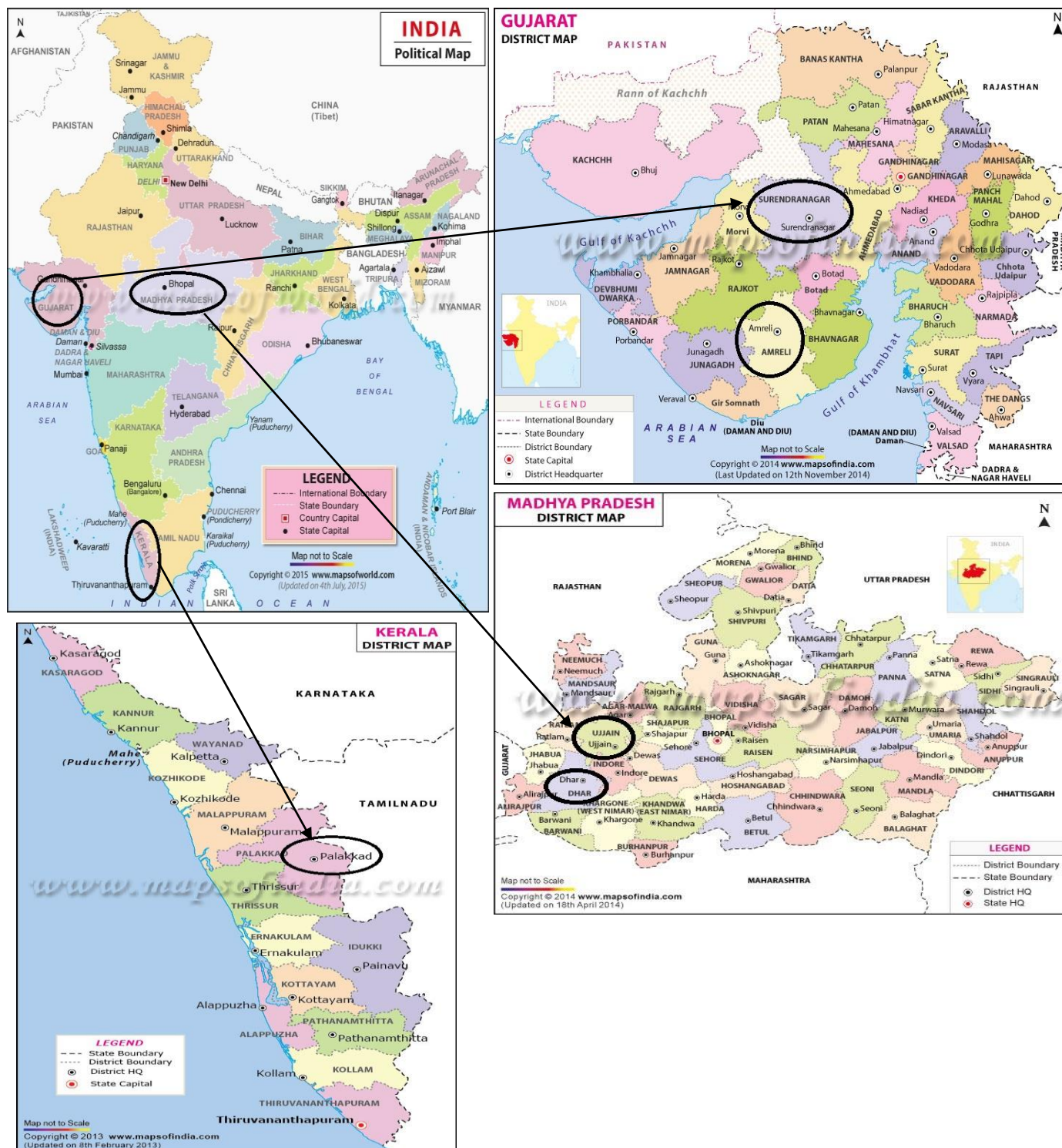
Technical details for WT 2000 DF/100- 2 MW WTG by Inox

SR. NO.	PARTICULARS	DETAILS
1.	Rated power	2 MW
2.	Cut-in wind speed	3 m/s
3.	Rated wind speed	11 m/s
4.	Cut-out wind speed	20 m/s
5.	Hub height	80m
6.	Diameter	100.3 m
7.	Swept area	7894 m ²
8.	Estimated design Life time	25 years.

³ <http://www.regenpowertech.com/104/technical-data>

1.9 Project Location

The project location has been highlighted in the geographical map shown below.



The Geo Coordinates of the project location has been mentioned in the table below

S. No.	Project Owner	Machine ID	Village	Taluka	District	State	Latitude	Longitude
1	D. J. Malpani	RGP2- 09	Tulaheda	Ghatiya	Ujjain	Madhya Pradesh	583783	2581166
2		RGP2- 08	Tulaheda	Ghatiya			583405	2581600
3		RGP2- 18	Tulaheda	Ghatiya			582146	2584483
4		RGP2- 03	Tajpur	Mahidpur			581424	2584834
5		RGP2- 07	Ranaheda	Ghatiya			581161	2583223
6	D. J. Malpani	SDL-T-002	Ranipat	Muli	Surendranagar	Gujarat	725582	2511732
7		SDL-T-005					726584	2512276
8		SDL-T-006					726903	2511995
9	D. J. Malpani	SVR-T-033	Pithavadi	Savarkundla	Amreli	Gujarat	750856	2358121
10		SVR-T-034	Bhenkara				751569	2357957
11		SVR-T-035	Bhenkara				752508	2358220
12		SVR-T-036	Bhenkara				752523	2357870
13		SVR-T-037	Bhenkara				752713	2357627
14		SVR-T-123	Bhokarva				760156	2358080
15		SVR-T-137	Piyava				754635	2360659
16		SVR-T-138	Piyava				754216	2361006
17		SVR-T-139	Piyava				754518	2361376
18		SVR-T-136	Piyava				762174	2355910
19	D. J. Malpani	GFL-K- 01	Puduserry Central & Elapully	Palakkad	Palakkad	Kerala	695668	1192866
20		GFL-K - 02					695504	1192616
21		GFL-K - 03					695315	1192354
22		GFL-K - 05					695112	1192040
23		GFL-K - 06					694951	1191792
24		GFL-K - 07					695212	1191728
25		GFL-K - 08					695314	1191508
26		GFL-K - 09					695647	1191316
27		KIN - 23					696456	1191031
28		KIN - 24					696258	1190731
29		KIN - 25					695347	1192193
30	D. J. Malpani	-	-	Dhar	Dhar	Madhya Pradesh	-	-

1.10 Conditions Prior to Project Initiation

The project is a Greenfield wind power project and does not involve generation of GHG emissions for the purpose of their subsequent reduction, removal or destruction.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning for each WTG from the state Nodal agencies and is in compliance to the local laws and regulations

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The Project is owned by Individual investors hence it possess right of use of ER credits. The Ownership is demonstrated through the following documents.

- 1) Commissioning certificates for WTGs in the name of PP issued by respective state electricity board.
- 2) Power Purchase Agreement with respective State Electricity Board for sale of electricity by the PP

1.12.2 Emissions Trading Programs and Other Binding Limits

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

1.12.3 Other Forms of Environmental Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals other than CDM or VCS. It is going to be registered under VCS program to avail pre CDM credits. If any PP is availing REC benefits, the PP will claim either VCU or REC and there will not be any double accounting for the same monitoring period.

1.12.4 Participation under Other GHG Programs

The Project is not registered in other GHG programs. For current monitoring period, there is no any claim of GHG emission reductions with other GHG program.

1.12.5 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

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

Leakage Management

Not applicable to the project activity.

Commercially Sensitive Information

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

Sustainable Development

Contribution to sustainable development:

Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being:** The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.
- **Economic well-being:** The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state.

The project activity will generate power using zero emissions wind based power generation which helps to reduce GHG emissions and specific pollutants like SO_x, NO_x, and SPM associated with the conventional thermal power generation facilities.

- **Technological well-being:** The successful operation of project activity would lead to promotion of wind based power generation and would encourage other entrepreneurs to participate in similar projects
- **Environmental well-being:** Wind being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions.

Further Information

Till now no legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Methodology: ACM0002: Grid-connected electricity generation from renewable sources --- Version 17.0, Sectoral Scope: 01,

<https://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN>

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 05.0, EB 87, Annex 09 <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v5.0.pdf>

2.2 Applicability of Methodology

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

Applicability Criterion	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 a new grid connected wind power plant 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.
2. 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 proposed project activity is an installation of a new grid connected wind power plant. Hence this condition is met.
3. 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.	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
4. In case of hydro power plants, one of the following conditions shall apply: a. The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b. The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m²; or c. The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m²; or d. The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply:	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

(i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²; (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/m² shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	
5. In the case of integrated hydro power projects, project proponent shall: • 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 • 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 proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
6. The methodology is not applicable to: • 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; • Biomass fired power plants/units.	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
7. 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	The project activity involves a new grid connected wind power plant and not a retrofits, replacement or capacity additions and therefore this criterion is not applicable to the project activity.

activity and undertaking business as usual maintenance”.	
8. In addition, the applicability conditions included in the tools referred to below apply.	The project applies the following tools and is in compliance to the same; • "Tool to calculate the emission factor for an electricity system"; • "Tool for the demonstration and assessment of additionality";

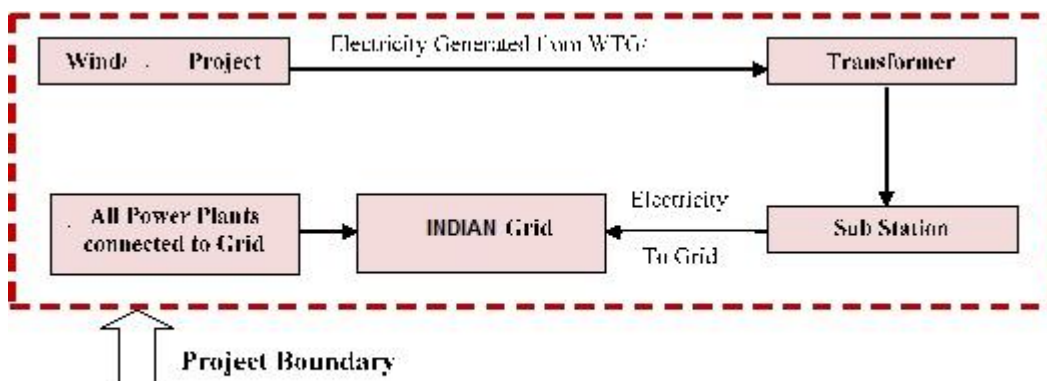
2.3 Project Boundary

As per the para 20 of the applicable methodology ACM0002 (Version 17.0.0) “*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*”.

Therefore, the project boundary includes all the WTGs along with the WTGs of the other project proponents connected to the sub-station, which is further connected to the network of the Indian grid, i.e. the project boundary also includes the Indian grid. Thus, the project boundary further includes all the power plants physically connected to the Indian grid

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 ₂ O	No	Excluded for simplification. This is conservative
Project Scenario	Greenfield Wind energy generation system	CO ₂	No	The project activity does not emit any emissions.
		CH ₄	No	No methane generation is expected to be emitted.
		N ₂ O	No	No nitrous oxide generation is expected to be emitted.

Project Boundary Diagram:



2.4 Baseline Scenario

As per para 23 of ACM0002 version 17.0; If the project activity is the installation of a Greenfield power plant

“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”.

2.5 Additionality

In line with VCS Standard version 3.5, the additionality of the Project activity is ascertained in line with the applicable guidance from the UNFCCC. The demonstration of additionality for the proposed Project activity is being carried out in accordance with the additionality tool provided by the UNFCCC i.e. “Tool for demonstration and assessment of Additionality” Version 07.0.0,. The tool provides a step-wise approach to demonstrate additionality which is displayed below:

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

No, this project activity is not first-of-its-kind project. The additionality of the project activity has demonstrated by using the investment barrier and the same has been discussed in the following steps.

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

Sub-step 1a: Define alternatives to the project activity:

Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed VCS project activity.

Alternative 1: The proposed project activity not undertaken as a VCS project activity.

The PP could proceed with the implementation of the project without Carbon credit benefits. The electricity produced from the renewable energy project would have been sold to the grid. This is in

compliance with all applicable legal and regulatory requirements and can be a part of the baseline. However, the Project activity is not feasible without revenues from sale of Carbon Credits. This argument has been discussed in step 2 of the Additionality section.

Alternative 2: No proposed project activity and equivalent amount of energy would have been produced by the grid electricity system through its currently running power plants and by new capacity addition to the grid i.e. Continuation of the present situation.

The PP would have continued without investment in Project activity with usual business activities. The grid would continue with the fossil fuel based power projects and this would result in GHG emissions. Hence, the new capacity add-on from a fossil fuel based power plant is appropriate, realistic & credible baseline alternative for the project activity.

Outcome of Sub-step 1a: All the realistic alternatives for the project activity have been enlisted above.

Sub-step 1b: Consistency with mandatory laws and regulations:

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

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

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

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

- Power generation using wind energy is not a legal requirement or a mandatory option.
- There are state and sectoral policies, framed primarily to encourage wind power projects.

These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.

- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
- There is no legal requirement on the choice of a particular technology for power generation.

Outcome of Sub-step 1b: Hence, both the alternatives enlisted above are found to comply with the mandatory laws and regulations taking into account the enforcement of the legislations in the region or country and EB decisions on national and/or sectoral policies and regulations. However, Alternative 2 has been selected as the appropriate baseline alternative for this project activity.

Step 2: Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sale of emission reductions credits. To conduct the investment analysis, use the following sub-steps:

Sub-step 2a: Determine appropriate analysis method

The Project activity envisages to export the power to Indian grid and the revenues from the sale would be generated in accordance with the terms and tariffs established in the Power Purchase Agreement (PPA). Thus, simple cost analysis cannot be used as the analysis method as the sale of the units of generated electricity shall result in a revenue stream during the operations of the Project activity.

After eliminating Option I, the use of Benchmark analysis (Option III) is the method of analysis that has been selected as the most suitable method. This method determines the attractiveness of the project activity for the investors, as well as provides a measure of the viability of the investment to generate revenues during its operation, as compared with other avenues and investment options. Hence, the Benchmark analysis method is to be employed for analysis of the said project.

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

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

Choice of Financial Indicator:

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

Choice of Benchmark:

As per para 15 of Guidelines on the assessment of the investment analysis (Annex 05, EB 62), the value for cost of equity is selected from Appendix A of Annex 05 of EB 62. The default value of Return on Equity for Group-1 projects in India is 11.75%.

As per paragraph 7 of Appendix A of the above mentioned document, *“In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the **inflation forecast of the central bank of the host country for the duration of the crediting period**. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used”.*

Default Value Benchmark Calculations:

As mentioned in Appendix A in EB62 Annex 5 and latest Clarification from UNFCCC in EB 73 (Applicability of the “Guidelines on the assessment of investment analysis” version 01.0), default value benchmark is presented below:

Appendix A in EB62 Annex 5 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = 11.75%

The Required return on equity (benchmark) was computed in the following manner:

Nominal Benchmark⁴ = $\{(1+\text{Real Benchmark}) \times (1+\text{Inflation rate})\} - 1$

Where:

- Default value for Real Benchmark = 11.75% (as per Appendix of Annex 5, EB 62)
- Inflation Rate forecast by Reserve Bank of India (RBI) (i.e. Central Bank of India) for India

For input assumptions and IRR calculations, the IRR spreadsheet will be shared to the DOE.

Sub-step 2c: Sensitivity Analysis:

As per Guidance 20 and 21 of Annex 5 of EB 62 Annex 5, 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 and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Guidance also states, “All parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude”. The Annex also states, as a general point of departure, variations in the sensitivity analysis should at least cover a range of +10% and –10%, unless this is not deemed appropriate in the context of the specific project circumstances.

Since the project cost is already firmed up, the cost is not variable. The tariff is determined by PPA which is fixed for years mentioned as per the tariff order and hence it need not be subjected to variation. All other expenses are much less than 20% of the total cost. Hence, only PLF needs to be subjected to reasonable variation. Nevertheless, following factors have been subjected to sensitivity analysis:

- (a) PLF
- (b) O&M Cost
- (c) Project Cost
- (d) Tariff Rate

It can be observed from above table that in various scenarios wherein there are changes in tariff, O&M cost, net saleable units and project's capital cost, the Equity IRR does not cross the benchmark. Thus, it can be concluded that revenue from sale of VCUs is important to alleviate this gap and hence the project has been considered to be additional.

	Probability to breach the benchmark
PLF	Not possible as the PLF has been reported as per the Third Party Report based on long term data and hence a PLF fluctuation of more than 10% is unlikely to happen. Moreover, the project activity has considered higher PLF than what the applicable state electricity board tariff order has been considered.
O&M	With the country experiencing 6.50% inflation on an average, the question of O&M coming down is ruled out. Moreover, the purchase orders provide for a 5% escalation in the cost every year.
Project Cost	The total project cost is -10.15% higher than considered at the time of decision making cost. Since the project cost is firm, there is no possibility of project cost going below this level. However, we have conducted sensitivity analysis for project cost being 10% less than that considered during decision making. Still, the IRR does not breach the Benchmark.

⁴ As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

Tariff Rate	The tariff is determined by PPA which is fixed for years mentioned as per the State Electricity Board's tariff order. Hence, there is no probability to get variation for the same.
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Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice Analysis

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

Common practice analysis has been carried out as per "Guidelines on Common Practice, version 02.0 EB69, Annex 8". In the context of the project activity, the following parameters are defined as per **Part I. Definitions** of the Guidelines on Common Practice:

1. Applicable Geographical Area (Para 1): The host country, i.e. India has been considered as the applicable geographical area for this project.
2. Measure (Para 2): The project activity reduces greenhouse gas emissions by generating electricity using renewable energy source-wind. Therefore, the project activity falls under the following measure:
(b) *Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies*
3. Output (Para 3): The project activity produces electricity. Therefore, electricity is considered as output of the project activity.
4. Different Technologies (Para 4): The project activity uses wind energy for producing electricity and hence as per Para 4(a), the technologies which use energy source/ fuel other than wind will be considered as the different technologies for the project activity

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

Range	Capacity	Unit
+50%	90	MW
Capacity of the proposed project activity	60	MW
-50%	30	MW

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

- (a) *The projects are located in the applicable geographical area;*
- (b) *The projects apply the same measure as the proposed project activity;*
- (c) *The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;*
- (d) *The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;*
- (e) *The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;*

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

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

- (a) Project is located at multiple states in India. Therefore, country has been chosen for analysis.
- (b) The project activity is a green-field wind power project and uses measure (b) *“Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies”*.
Therefore, all projects applying same measure (b) as the proposed project activity are candidates for similar projects.
- (c) The energy source used by the project activity is wind. Hence, only wind energy projects have been considered for analysis.
- (d) The project activity produces electricity; therefore, all power plants that produce electricity are candidates for similar projects.
- (e) The capacity range of the projects is within the applicable capacity range from 30 MW to 90 MW.
- (f) The start date of the project activity is 28/03/2016. As Kyoto Protocol was ratified by India on 26/08/2002⁵, therefore projects, which had started commercial operation before 28/03/2016 have been identified.

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

Particulars	No. of Projects	Source
N_{Wind}	8	Directory - Indian Wind Power published by CECL, Bhopal -2013

Sources:

Directory - Indian Wind Power published by CECL, Bhopal and refer CPA sheet

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

All the projects identified in step-2 are either registered or project activities submitted for registration, or project activities undergoing validation.

Thus N_{all} = 4

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

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

⁵ http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

The policies/tariff for each state is regulated by the State Electricity Regulatory Commission of the respective states. The geographical scope of project activity is India. Therefore, it can be assumed that the policies and tariff are different in different states and hence projects installed in other states have been considered in N_{diff} . The identified projects in N_{all} (step 3) located in different states of India are regulated by the respective State Electricity Regulatory Commissions (SERCs). Therefore, these projects come under different investment climate and have been considered under N_{diff} .

As $N_{all} = 4$; thus $N_{diff} = 4$

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

Calculate $F=1-N_{diff}/N_{all} = 0$

As $N_{all} = 4$ thus and $N_{all}-N_{diff} = 0$;

Outcome of Step 5:

As,

- i. $F = 0.0$;
- ii. $N_{all}-N_{diff} = 0$ which is less than 4

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

2.6 Methodology Deviations

There is no methodology deviation

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As per para 46 of ACM0002 version 17.0, Baseline emissions include only CO₂ 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:

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

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 VCS 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)

Baseline Emissions

As per the equation 6 of the methodology ACM 0002 (Version 17.0),

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \quad (1)$$

Where:

BE_y :	Baseline emissions in year y (tCO ₂ e/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 VCS project activity in year y (MWh/yr)
$EF_{grid,CM,y}$:	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO ₂ e/MWh)

Calculation of $EG_{PJ,y}$

The methodology ACM 0002 (Version 17.0) has procedures for calculation of $EG_{PJ,y}$ for the following cases:

- (a) Greenfield plants,
- (b) Retrofits and replacements, and
- (c) Capacity additions.

As the proposed project activity is Greenfield plant, option (a) as provided in the methodology ACM 0002 (Version 17.0) shall be applicable and is described below:

“If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, 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)

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

The methodology ACM0002 (Version 17.0) 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 version 4 of Tool to calculate emission factor for an electricity system, following steps are included in the calculation of the emission factor for the baseline scenario:

- 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.

The Central Electricity Authority (CEA) has published CO₂ baseline database in its version 11⁶ (December, 2014). The values for OM, BM, CM are given excluding and including imports. For the present project activity, including imports are considered.

STEP 1: Identify the relevant electricity power systems

Grid/project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The Southern grid and the NEWNE Grid form the two independent regional grids of India. As the project activity comprises the project activity located in multiple states of India, the Indian grid is applicable to the proposed CDM project.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional grid in which it is located. Hence for the purpose of estimation of the baseline emission factor, the Indian grid has been chosen as the relevant electricity system.

Table: Indian Grid Classification

NEWNE				Southern
Northern	Eastern	Western	North-Eastern	
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Kerala
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Tamil Nadu
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Andhra Pradesh
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	

⁶ www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

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

Project participants have the option of choosing between the following two options to calculate the operating margin and build margin emission factor:

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

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

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

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

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

- (a) Simple OM, or
- (b) Simple adjusted OM, or
- (c) Dispatch data analysis OM, or
- (d) Average OM.

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

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)					
	2009-10	2010-11	2011-12	2012-13	2013-14
Indian	15.9%	17.6%	19.0%	17.2%	18.0%

Data Source: Central Electricity Authority (CEA) database Version 10, Dec'2014

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 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 operating margin" has been calculated as per the weighted average emissions (in tCO_2/MWh) of all generating sources serving the system, excluding hydro, geo-thermal, wind, low-cost biomass, nuclear and solar generation;

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 VCS-PD 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)			
	2011-12	2012-13	2013-14
Indian	508,004,381	546,941,372	569,215,756

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
	2011-12	2012-13	2013-14
Indian	0.9699	0.9919	0.9953

Weighted Generation Operating Margin	
Indian	0.9862

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

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)	
	2013-14
Indian	0.9495

(With sample group constituting most recent capacity additions to the grid comprising 20% of the system generation)

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 particular, for intermittent and non-dispatchable generation types such as wind and solar photovoltaic, the Tool to calculate the emission factor for an electricity system, Version 05.0.0, EB 87, Annex 9, allows to weigh the operating margin and Build margin at 75% and 25%, respectively.

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 operating 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)

$$EF_{Grid, CM, y} = 0.75 * 0.9862 + 0.25 * 0.9495$$

$$= 0.9777 \text{ tCO}_2/\text{MWh}$$

Therefore, Baseline Emissions:

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

$$BE_y = 101,704 \times 0.9777 = 99,433 \text{ tCO}_2$$

3.2 Project Emissions

The project emission calculation as per para 35 of ACM0002 version 17,

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

PE_y	=	Project emissions in year y (t CO ₂ e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (t CO ₂ /yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (t CO ₂ e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year y (t CO ₂ e/yr)

$PE_{FF,y} = 0$, As per para 37 of ACM0002 version 17, “For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected”

$PE_{GP,y} = 0$, Not applicable for the wind power projects

$PE_{HP,y} = 0$, Not applicable for the wind power projects

Therefore, **$PE_y = 0$**

3.3 Leakage

As per para 60 of ACM0002 version 17, No leakage emissions need to be considered for the project activity.

3.4 Estimated Net GHG Emission Reductions and Removals

As per para 61 of ACM0002 version 16; Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y	=	Emission reductions in year y (t CO ₂ e/yr)
BE_y	=	Baseline emissions in year y (t CO ₂ /yr)
PE_y	=	Project emissions in year y (t CO ₂ e/yr)

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

$$ER_y = BE_y - PE_y$$

$$ER_y = 99,433 - 0$$

$$= 99,433 \text{ tCO}_2$$

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1	99,433	0	0	99,433
Year 2	99,433	0	0	99,433
Year 3	99,433	0	0	99,433
Year 4	99,433	0	0	99,433
Year 5	99,433	0	0	99,433
Year 6	99,433	0	0	99,433
Year 7	99,433	0	0	99,433
Year 8	99,433	0	0	99,433
Year 9	99,433	0	0	99,433
Year 10	99,433	0	0	99,433

Total	994,330	0	0	994,330
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4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁷
Value applied:	0.9941
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per “Tool to calculate the emission factor for an electricity system, version 05.0.0” as 3-year generation weighted average using data for the years 2012-2013, 2013-2014 & 2014-2015. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 11.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁸
Value applied:	0.9285
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per “Tool to calculate the emission factor for an electricity system, version 05.0.0” 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. The data is obtained from “CO ₂ Baseline Database for Indian Power Sector” version 11.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁹

⁷ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

⁸ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

⁹ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

Value applied:	0.9777 (Indian Grid)
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh) $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 75% W_{BM} = Weighting of build margin emissions factor (%) = 25%
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project (Wind) plant/unit to the grid in year y
Source of data	Joint meter readings
Description of measurement methods and procedures to be applied	The value of net electricity generation supplied to the grid as per Joint Meter Reading Report forms the basis for calculation of the emission reductions; which can be cross checked from the invoice raised to DISCOM. Net electricity supplied to grid will be calculated as the difference of the measured values of "export" and "import" of electricity through the dedicated SEB energy meter installed at the delivery point (i.e. the connected substation). Net electricity generated and supplied by the project (Wind) plant/unit to the grid = Electricity Export to the grid - Electricity Import from the grid Monthly meter readings are taken from the main and check meter installed at the substation and certified by the representatives of SEB Officials and the representatives of the project proponent. for apportioning procedure refer section 4.3
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and at least monthly recording
Value applied:	101,704 MWh
Monitoring equipment	Monitoring: Tri vector meter will be used Data type: Measured Type of meter: Static type meter (Main & Check). Both are Bidirectional meters. Class of meter: 0.2s

QA/QC procedures to be applied	- The energy meter reading are taken on monthly basis - Energy meters will be calibrated once in a five year¹⁰ and faulty meters will be duly replaced immediately. - All the energy meters are under the control of state utility and calibration of energy meters is also under the jurisdiction of state utility. - The Net electricity exported to the grid will be cross checked against the invoice raised by the PP towards the DISCOM
Purpose of data	Calculation of Baseline emissions
Calculation method	-
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

4.3 Monitoring Plan

Aim of monitoring:

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

Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the net electricity exported to the grid.

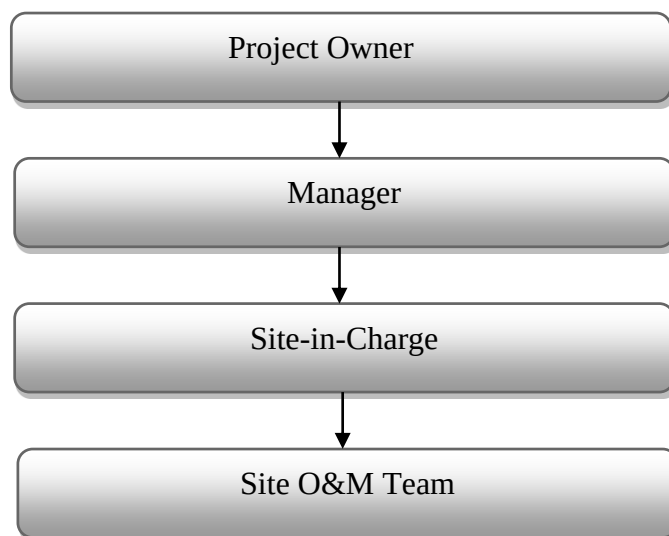
Monitoring roles and responsibilities

The operational and management structure implemented for data monitoring is as follows:

The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected wind power project being implemented in respective states in India. The monitoring plan, which will be implemented by the project proponent describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the project proponent. PP proposed the following structure for data monitoring, collection, data archiving and calibration of equipments for this project activity. The team comprises of the following members:

¹⁰ As per CEA regulation



PP has assigned the responsibility of operation and maintenance of WTGs to respective EPC contractor of wind turbines for each sites.

Responsibilities of Head: Overall functioning and maintenance of the project activity.

Responsibilities of Plant In-charge: Responsibility for Maintains the data records, ensures completeness of data, and reliability of data (calibration of equipments).

Responsibilities of Shift In-charge: Responsibility for day to day data collection and maintains day to day log book for monitored data.

QA/QC procedures:

The energy meters at the feeders are maintained and owned by discom. Neither the project proponent nor the site personnel have any control over it. The records will be cross-checked with the records of sold electricity to discom/ third party. The meters are calibrated by discom at-least once in five years.

Data Archiving:

Monthly data shall be archived electronically and in paper form and stored for the entire crediting period and two years thereafter.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the WTGs, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that O&M team is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. Each and every site personnel is provided with proper training to meet the requirements of the Operations and maintenance. This ultimately leads to creativity in problem solving.

1.	Apportioning Ratio	=	$\frac{\text{Generation at WTG Controller}}{\text{Total Generation of All WTG Controller for the feeder}}$
2.	Electricity Import from WTG by the grid (EG_{import})	=	Import from Main/Check Meter * Apportioning Ratio
3.	Electricity Export to the WTGs by the grid (EG_{export})	=	Export from Main/Check Meter * Apportioning Ratio
4.	Net electricity generated by WTG	=	Electricity Import from WTG by the grid – Electricity Export to the WTGs by the grid

Above steps for calculation of EG_{import} and EG_{export} are carried out by Discom Officials & energy break-up sheet is issued by the respective electricity board Officials. Based on the break-up sheets Project investor raises invoice to DISCOM/ third party which forms the basis of cross-check for the net electricity generated. The Project investor has no role in the entire procedure of apportioning

Emergency Preparedness and Uncertainty Procedure:

In case Main meter or check meter is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it will be repaired, recalibrated or replaced as soon as possible. In the event that the Main meter is not in service as a result of maintenance, repairs or calibration, the check meter will be used. In case both the main and check meter are found to be outside the acceptable limits of accuracy or faulty or not functioning properly, both the meters shall be calibrated immediately and the error percentage found in the main meter during its calibration shall be applied to its metered energy data for the entire period since its last calibration to obtain the corrected value of net electricity exported to the grid.

In case the dates of a particular monitoring period do not match with the dates of the billing cycle, the net electricity exported to the grid would be calculated from:

- Apportioning the net electricity exported to grid, as recorded in the consolidated Share Certificate / JMR Report / Credit Notes certified by the respective state discom, based on the number of days in the monitoring period and the number of days for which Share Certificate / JMR Report / Credit Notes was prepared.

The calculated value after apportioning would be used for calculation of emission reductions during that period.

5 SAFEGUARDS

5.1 No Net Harm

The project does not involve any potential negative environmental and socio economic impacts and hence this criteria is not applicable to this project activity.

5.2 Environmental Impact

The project activity has no significant impact on the environment. Wind power projects are not included in the Schedule I of the EIA notification S.O.1533 (E) dated 14th September 2006¹¹ and thus an EIA is not required. Ministry of Environment & forests vide their OM J-11013/41/2006 - IA II (I)

¹¹ <http://envfor.nic.in/legis/eia/so1533.pdf>

dated 13th May 2011¹² has re-affirmed this and exempted Solar PV power plants from EIA and Environmental Consent requirement.

As per the Schedule 1 of the EIA notification dated 1/12/2009¹³ and latest notification dated 24/12/2013¹⁴, given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the proposed Project activity does not fall under the list of activities requiring EIA as the environmental impacts for such project are not considered as significant by the host Party or PP.

5.3 Local Stakeholder Consultation

As the Sections 3.17.2-3.17.4 of VCS standard 3.6, the contract for validation is prior to the 19th April 2017, hence the local stake holder consultation is not mandatory.

5.4 Public Comments

Not applicable as for this project DOE contract is already signed on or before 19/04/2017 and project is under validation and verification.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project (Wind) plant/unit to the grid in year y
Value applied:	123,367.31
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years

6.2 Baseline Emissions

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

Where:

BE_y: Baseline emissions in year y (tCO₂e/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 VCS project activity in year y (MWh/yr)

¹² <http://moef.nic.in/downloads/public-information/OM-SolarPV.pdf>

¹³ <http://moef.nic.in/downloads/rules-and-regulations/3067.pdf>

¹⁴ <http://envfor.nic.in/sites/default/files/ia-24122013.pdf>

EF_{grid, CM, 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” (tCO₂e/MWh)

Parameter	Unit	Value
EG _{PJ, y} :	MWh	123,367
EF _{grid, CM, y} :	tCO ₂ e	0.9777
BE _y :	=	123,367.31*0.9777
	=	120,616

6.3 Project Emissions

PE_{FF, y} = 0 , As per para 37 of ACM0002 version 17, “For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected”

PR_{FF, y} = 0

6.4 Leakage

As per para 60 of ACM0002 version 17, No leakage emissions need to considered for the project activity.

6.5 Net GHG Emission Reductions and Removals

$$ER_y = BE_y - PE_y$$

Where:

ER _y	=	Emission reductions in year y (t CO ₂ e/yr)
BE _y	=	Baseline emissions in year y (t CO ₂ /yr)
PE _y	=	Project emissions in year y (t CO ₂ e/yr)

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

$$ER_y = BE_y - PE_y$$

$$ER_y = 120,616 - 0$$

$$= 120,616 \text{ tCO}_2$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2015	1,203	0	0	1,203
2016	35,275	0	0	35,275

2017	84,139	0	0	84,139
Total	120,616	0	0	120,616