

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



Document Prepared By EKI Energy Services Limited

Project Title	Bundled Wind Power Project in Madhya Pradesh, Gujarat and Kerala by D.J. Malpani
Version	3
Date of Issue	19-February-2018
Monitoring Period	28-March-2016 to 23-Dec-2017 (both days included)
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TABLE OF CONTENT

TABLE OF CONTENT	2
1 Project Details	3
1.1 Summary Description of the Project and its Implementation Status	3
1.2 Sectoral Scope and Project Type.....	4
1.3 Project Proponent	4
1.4 Other Entities Involved in the Project	4
1.5 Project Start Date	4
1.6 Project Crediting Period	6
1.7 Project Scale and Estimated GHG Emission Reductions or Removals	6
1.8 Description of the Project Activity.....	7
1.9 Project Location	8
1.10 Conditions Prior to Project Initiation	11
1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks.....	11
1.12 Ownership and Other Programs	12
1.12.1 Project Ownership	12
1.12.2 Emissions Trading Programs and Other Binding Limits	12
1.12.3 Other Forms of Environmental Credit	12
1.12.4 Participation under Other GHG Programs	12
1.12.5 Projects Rejected by Other GHG Programs	12
1.13 Additional Information Relevant to the Project.....	12
2 Application of Methodology	13
2.1 Title and Reference of Methodology	13
2.2 Applicability of Methodology.....	14
2.3 Project Boundary.....	16
2.4 Baseline Scenario	17
2.5 Additionality	18
2.6 Methodology Deviations	29
3 ESTIMATed GHG Emission Reductions and Removals.....	29
3.1 Baseline Emissions	29
3.2 Project Emissions.....	34
3.3 Leakage.....	34
3.4 Estimated Net GHG Emission Reductions and Removals	34
4 Monitoring	35
4.1 Data and Parameters Available at Validation	35
4.2 Data and Parameters Monitored	36
4.3 Monitoring Plan	37
5 Safeguards	40
5.1 No Net Harm	40
5.2 Environmental Impact	40
5.3 Local Stakeholder Consultation	40
5.4 Public Comments	41
6 ACHieVED GHG Emission Reductions and Removals.....	41
6.1 Data and Parameters Monitored	41
6.2 Baseline Emissions	41
6.3 Project Emissions.....	42
6.4 Leakage.....	42
6.5 Net GHG Emission Reductions and Removals.....	42
APPENDIX 1: Calibration and Meter Details	43
APPENDIX 2: Input Parameters and Assumptions for Additionality Assessment	45

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 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 66 MW; which involves operation of Wind Turbine Generators (WTGs) in multiple states of India. The details of the project is given below:

SI 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	26 MW	D. J. Malpani	Savarkundala Site, Amreli	Gujarat
5	Wind	22 MW	D. J. Malpani	Kinfra Site, Palakkad	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 estimated annual GHG emission reductions from the project activity will be 127,207 tonnes of CO₂ and total GHG emission reductions for the chosen 10 year crediting period will be 1,272,070 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.

Total emission reductions achieved in this monitoring period:

During the Current Monitoring Period from 28/03/2016 to 23/12/2017 (First and last date included) the project activity has supplied 79,128 MWh of electricity, and thus contributing to the GHG reductions 76,380 tCO₂e.

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	29-03-2016	Tulaheda	Ghatiya		
3		RGP2- 18		Tulaheda	Ghatiya		
4		RGP2- 03		Tajpur	Mahidpur		
5		RGP2- 07		Ranaheda	Ghatiya		
6	D. J. Malpani	IWISL/2000/16-17/3826	31-03-2017	Ranipat	Muli	Surendranagar	Gujarat
7		IWISL/2000/16-17/3829					
8		IWISL/2000/16-17/3830					
9	D. J. Malpani	IWISL/2000/16-17/4060	31-03-2017	Pithavadi	Savarkundla	Amreli	Gujarat
10		IWISL/2000/16-17/4061		Bhenkara			
11		IWISL/2000/16-17/4062		Bhenkara			
12		IWISL/2000/16-17/4063		Bhenkara			
13		IWISL/2000/16-17/4064		Bhenkara			
14		IWISL/2000/16-17/4065		Senjal			
15		IWISL/2000/16-17/4066		Piyava			
16		IWISL/2000/16-17/4067	31-03-2017	Piyava			
17		IWISL/2000/16-17/40678	31-03-2017	Piyava			
18		IWISL/2000/16-17/4350	31-03-2017	Piyava			
19		IWISL/2000/16-17/4489		Piyava			
20		IWISL/2000/16-17/4490		Piyava			
21		IWISL/2000/16-17/4491		Piyava			
22	D. J. Malpani	DJM 01	28-03-2017	Kanjikode	Palakkad	Palakkad	Kerala
23		DJM 02					
24		DJM 03					
25		DJM 05					
26		DJM 06					

² Date Of commissioning

27		DJM 07	Yet to Commission				
28		DJM 08					
29		DJM 09					
30		KIN - 23					
31		KIN - 24					
32		KIN - 25					
33	D. J. Malpani	ADD- 01	31-03-2016	Navagaon	Dhar	Dhar	Madhya Pradesh
34		ADD- 06		Navagaon			
35		TIR- 11		Athar			

1.6 Project Crediting Period

Crediting Period Start date: 28-March-2016

Crediting Period End date: 27-March-2026

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 66 MW of wind power project.

Project Scale	
Project	✓
Large project	

As the Estimated GHG emission reductions or removals per year is 127,207 (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	127,207
Year 2	127,207
Year 3	127,207
Year 4	127,207
Year 5	127,207
Year 6	127,207
Year 7	127,207
Year 8	127,207
Year 9	127,207
Year 10	127,207

Total estimated ERs	1,272,070
Total number of crediting years	10 years
Average annual ERs	127,207

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 66 MW; which involves operation of 1.5 MW and 2 MW capacity of WTGs for the wind projects located in Gujarat, Kerala and Madhya Pradesh state of India.

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 127,207 tCO₂e per year, thereon displacing 131,783 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 8 WTG's of ReGen Power Tech make and 27 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

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

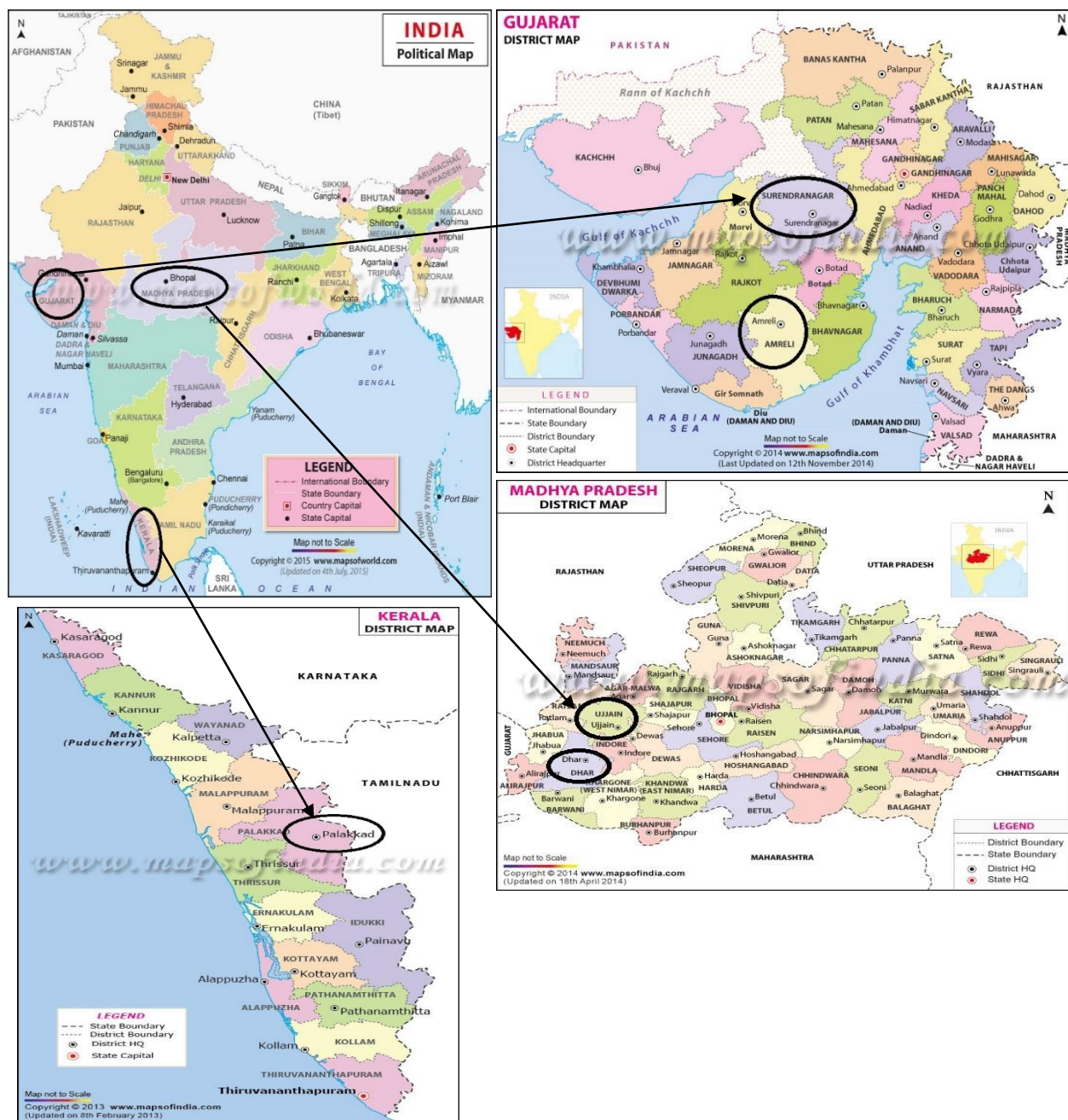
Control of Output	Pitch Regulation
Speed Control	Variable, micro controller based
Low Voltage Ride Through (LVRT)	3 seconds
Primary Brake system	Aerodynamic
Pitch System	Electromechanical
Remote Monitoring	VPN
Wind Turbine type class	GL III B
Design Lifetime	25 years

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.

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	District	State	Latitude (N)	Longitude (E)
1	D. J. Malpani	RGP2- 09	Ujjain	Madhya Pradesh	23° 20' 16.5228"	81° 49' 10.4793"
2		RGP2- 08			23° 20' 30.7032"	81° 48' 57.2550"
3		RGP2- 18			23° 22' 04.6776"	81° 48' 13.4851"

4		RGP2- 03			23° 22' 16.2192"	81° 47' 48.1237"
5		RGP2- 07			23° 21' 23.8824"	81° 47' 38.5484"
6	D. J. Malpani	IWISL/2000/ 16-17/3826	Surendran agar	Gujarat	22° 41' 51.9612"	77° 11' 45.4457"
7		IWISL/2000/ 16-17/3829			22° 42' 9.1584"	77° 12' 20.8237"
8		IWISL/2000/ 16-17/3830			22° 41' 59.8704"	77° 12' 31.8505"
9	D. J. Malpani	IWISL/2000/ 16-17/4060	Amreli	Gujarat	21° 18' 27.5328"	77° 25' 05.4767"
10		IWISL/2000/ 16-17/4061			21° 18' 21.8484"	77° 25' 30.1157"
11		IWISL/2000/ 16-17/4062			21° 18' 29.9232"	77° 26' 02.8202"
12		IWISL/2000/ 16-17/4063			21° 18' 18.5436"	77° 26' 03.1529"
13		IWISL/2000/ 16-17/4064			21° 18' 10.5516"	77° 26' 09.6116"
14		IWISL/2000/ 16-17/4065			21° 18' 21.4776"	77° 30' 27.9626"
15		IWISL/2000/ 16-17/4066			21° 19' 48.1116"	77° 27' 17.9010"
16		IWISL/2000/ 16-17/4067			21° 19' 59.6028"	77° 27' 03.5558"
17		IWISL/2000/ 16-17/40678			21° 20' 11.4720"	77° 27' 14.2307"
18		IWISL/2000/ 16-17/4350			21° 17' 09.9168"	77° 31' 36.7340"
19		IWISL/2000/ 16-17/4489			21° 18' 21.6432"	77° 30' 27.8613"
20		IWISL/2000/ 16-17/4490			21° 19' 48.2124"	77° 27' 17.7986"
21		IWISL/2000/ 16-17/4491			21° 19' 59.6316"	77° 27' 03.6604"
22	D. J. Malpani	DJM 01	Palakkad	Kerala	10° 47' 08.8332"	76° 47' 22.4161"
23		DJM 02			10° 47' 00.7296"	76° 47' 16.9701"
24		DJM 03			10° 46' 52.2372"	76° 47' 10.6991"
25		DJM 05			10° 46' 42.0600"	76° 47' 03.9574"
26		DJM 06			10° 46' 34.0176"	76° 47' 58.6108"
27		DJM 07			10° 46' 31.8864"	76° 47' 07.1889"
28		DJM 08			10° 46' 24.7080"	76° 47' 10.5038"
29		DJM 09			10° 46' 18.3972"	76° 47' 21.4268"
30		KIN - 23			10° 46' 08.9652"	76° 47' 47.9981"

31		KIN - 24			10° 45' 59.2416"	76° 47' 41.4237"
32		KIN - 25			10° 46' 46.9920"	76° 47' 11.7214"
33		ADD- 01			24° 14' 31.2540"	81° 37' 41.7437"
34	D. J. Malpani	ADD- 06	Dhar	Madhya Pradesh	24° 14' 45.6144"	81° 37' 28.5165"
35		TIR- 11			24° 16' 19.3368"	81° 36' 44.3202"

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. Prior to the initiation of the project activity, the equivalent amount of electricity would have been drawn from grid connected or new power plants, in Indian Grid. The grid is predominantly coal based and therefore is a major source of carbon di oxide emissions in India. The main emission in the pre project scenario is the power plants connected to the Indian Grid, and main GHG involved is CO₂. The baseline identified in section 2.4 is same as the pre-project scenario.

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.

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

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

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

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

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The 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 VCS. It is going to be registered under VCS program to avail carbon credits. PP is not availing REC benefits, the PP will claim only VCU and there will not be any double accounting for the same monitoring period. The PP undertaking of no REC benefits and no double accounting is submitted to DOE.

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 06.0, EB 97, Annex 07 <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v6.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,	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

calculated using equation (3), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	
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	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.

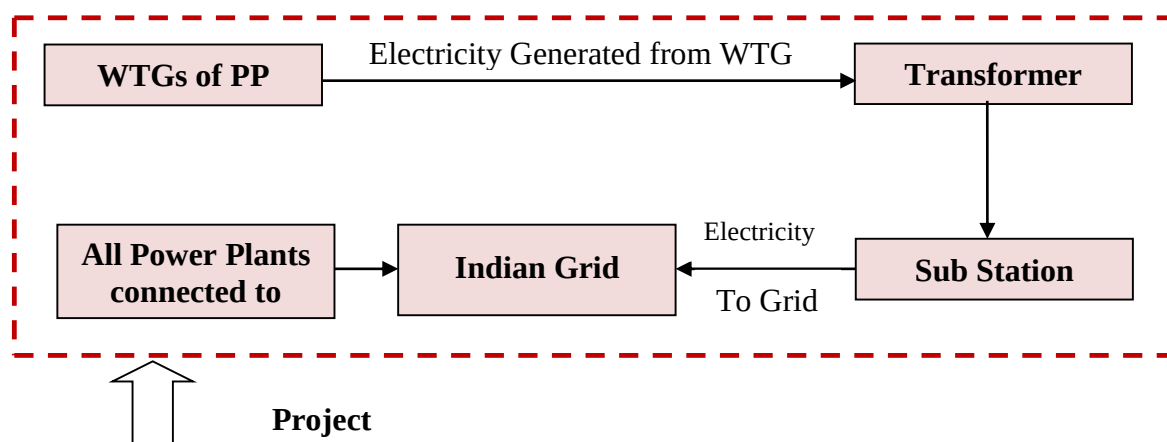
implementation of the project activity and undertaking business as usual maintenance”.	
8. In addition, the applicability conditions included in the tools referred to below apply.	The project applies the following tools and is in compliance to the same; • "Tool to calculate the emission factor for an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

Project Boundary Diagram:



The GHG emission sources considered for the project boundary and their explanations are as follows:

Source		Gas	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	No	No CO ₂ emissions are emitted from the project
Proj act	Greenfield Wind	CO ₂	No	No CO ₂ emissions are emitted from the project
		CH ₄	No	Project activity does not emit CH ₄

Source		Gas	Included?	Justification/Explanation
	Power Project Activity.	N ₂ O	No	Project activity does not emit N ₂ O
		Other	No	Project activity does not emit other forms of GHG emissions

2.4 Baseline Scenario

As per the approved consolidated Methodology ACM0002 (Version 17.0, EB 89, Annex 1) para 24: *"If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power 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 project activity involves setting up of wind projects to harness the power of sun to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants.

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

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 12 is the latest available data at the time of PD submission to DOE for validation, hence same is considered for emission factor calculations.

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

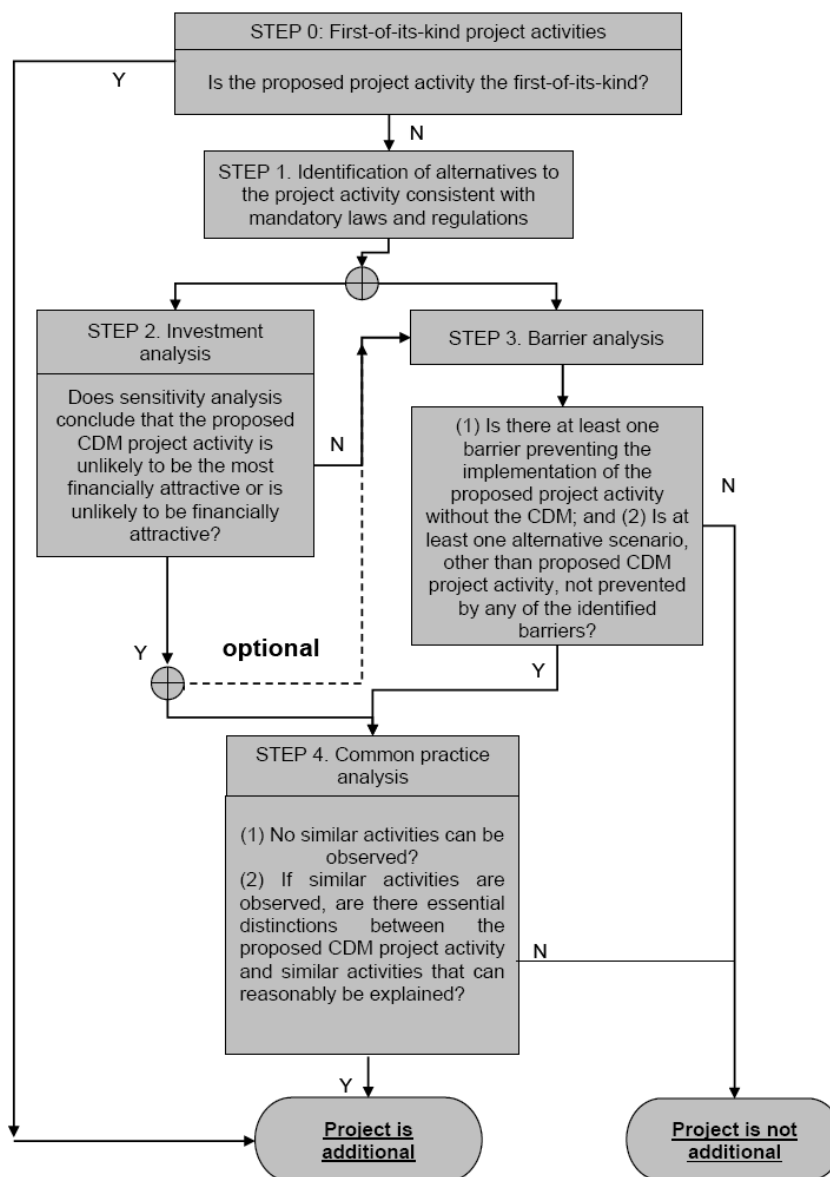
Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9653 tCO ₂ /MWh	Combined margin CO ₂ emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline CO ₂ Emission Database, Version 12.0 Dated May 2017 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9843 tCO ₂ /MWh	Operating margin CO ₂ emission factor for the project electricity system in year y	Calculated as the last 3 year (2012-13, 2013-14, 2014-15) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 12.0, Dated May 2017 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.9083 tCO ₂ /MWh	Build margin CO ₂ emission factor for the project electricity system in year y	Baseline CO ₂ Emission Database, Version 12.0, Dated May 2017 published by Central Electricity Authority (CEA), Government of India

2.5 Additionality

The table below is only applicable if the proposed project activity is a type of project activity which is deemed automatically additional, as defined by the applied approved methodology or standardized baseline.

Specify the methodology or standardized baseline that establish automatic additionality for the proposed project activity (including the version number and the specific paragraph, if applicable).	NA
Describe how the proposed project activity meets the criteria for automatic additionality in the relevant methodology or standardized baselines.	NA

The present VCS project generates power using wind energy which is a renewable, zero emission source of energy. Baseline considerations for the project are based on approved consolidated baseline methodology ACM0002 (Version 17.0). The methodology requires the project investor to determine the additionality based on “Methodological Tool- Tool for the demonstration and assessment of additionality”, Version 7.0.0. The step-wise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:



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

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

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

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

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.

The purpose of the project activity is to generate electrical power using wind energy and feed the electricity generated to the grid. Hence, the following alternatives are considered:

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.

Thus though two alternatives are mentioned above as per step of additionality tool, the first alternative is not possible as project activity is not viable without carbon credit benefits and second alternative is the baseline scenario for the project activity as per methodology as mentioned in section 2.4 of joint VCS PD & MR.

It is to be noted that being the green field project activity, “the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

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 (Option I) 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.

In the absence of the project activity grid electricity would have been the obvious choice for the Project which requires no investment. Hence investment comparison analysis (Option II) is also not appropriate for the project activity.

After eliminating Option I and Option II, 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:

(i) For the wind projects installed by D.J. Malpani in Madhya Pradesh and Gujarat Sites

As per Guidelines on the assessment of the investment analysis (Annex 12, EB 85), the value for cost of equity is selected from Annex 12 of EB 85. The default value of Return on Equity for Group-1 projects in India is **11.10%**.

(ii) For the wind project installed by D.J. Malpani in Kerala Site

As per Guidelines on the assessment of the investment analysis (Annex 5, EB 92), the value for cost of equity is selected from Annex 5 of EB 92. The default value of Return on Equity for Group-1 projects in India is **11.06%**.

As per the above mentioned documents, *"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:

(i) For the wind projects installed by D.J. Malpani in Madhya Pradesh and Gujarat Sites

As mentioned in EB 85 Annex 12 the cost of equity is determined by selecting the values provided in the Appendix, i.e. Default values for cost of equity (expected return on equity) is presented below:

Appendix A in EB 85 Annex 12 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.10%**

(ii) For the wind project installed by D.J. Malpani in Kerala Site

As mentioned in EB 92 Annex 5 the cost of equity is determined by selecting the values provided in the Appendix, i.e. Default values for cost of equity (expected return on equity) is presented below:

Appendix A in EB 92 Annex 5 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.06%**

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

$$\text{Nominal Benchmark}^4 = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

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

Where:

- Default value for Real Benchmark = 11.10% (as per Appendix of Annex 12, EB 85)
= 11.06% (as per Appendix of Annex 5, EB 92)
- Inflation Rate forecast for by Reserve Bank of India (RBI) (i.e. Central Bank of India) for India & in case where RBI Inflation forecast was not available Average Inflation rate forecast for India has been sourced from IMF web site.

Benchmark estimation:

(i) For the wind projects installed by D.J. Malpani in Madhya Pradesh and Gujarat Sites

Appendix in EB 85, Annex 12 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.10%**

(ii) For the wind project installed by D.J. Malpani in Kerala Site

Appendix in EB 92, Annex 5 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.06%**

Inflation Forecast for India as per RBI website is considered for benchmark calculation.

Since RBI publishes the inflation forecast for 5 years and 10 years, PP has considered the maximum 10 year inflation considering the renewable crediting period of total 30 years.

The decision dates for implementing the wind projects by D.J. Malpani are provided below and the benchmark is determined based on this decision made date.

For 4.5 MW wind project at Dhar site, Madhya Pradesh

Benchmark Calculations	Value	Sources Link or Title	Document Date	Decision Making Date
Default Value for India as per UNFCCC guidelines	11.10%	EB 85 Annex 12, Version 06 of methodological tool "Investment Analysis" Table 1 Appendix	24-Jul-15	30-01-16
Inflation forecast (WPI Mean) as per RBI for 10 yrs	3.80%	Table A.9: Annual Average Percentage Change ⁵	01-Dec-15	
Benchmark (with 10 yrs Forecast)	15.32%			

For 7.5 MW wind project at Ghatiya site, Madhya Pradesh

Benchmark Calculations	Value	Sources Link or Title	Document Date	Decision Making Date
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⁵ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16710>

Default Value for India as per UNFCCC guidelines	11.10%	EB 85 Annex 12, Version 06 of methodological tool "Investment Analysis" Table 1 Appendix	24-Jul-15	30-01-16
Inflation forecast (WPI Mean) as per RBI for 10 yrs	3.80%	Table A.9: Annual Average Percentage Change ⁶	01-Dec-15	
Benchmark (with 10 yrs Forecast)	15.32%			

For 6 MW wind project at Sadla site, Gujarat

Benchmark Calculations	Value	Sources Link or Title	Document Date	Decision Making Date
Default Value for India as per UNFCCC guidelines	11.10%	EB 85 Annex 12, Version 06 of methodological tool "Investment Analysis" Table 1 Appendix	24-Jul-15	20-09-16
Inflation forecast (WPI Mean) as per RBI for 10 yrs	3.90%	Table A.9: Annual Average Percentage Change ⁷	09-Aug-16	
Benchmark (with 10 yrs Forecast)	15.43%			

For 26 MW wind project at Savarkundla site, Gujarat

Benchmark Calculations	Value	Sources Link or Title	Document Date	Decision Making Date
Default Value for India as per UNFCCC guidelines	11.10%	EB 85 Annex 12, Version 06 of methodological tool "Investment Analysis" Table 1 Appendix	24-Jul-15	20-09-16
Inflation forecast (WPI Mean) as per RBI for 10 yrs	3.90%	Table A.9: Annual Average Percentage Change ⁸	09-Aug-16	
Benchmark (with 10 yrs Forecast)	15.43%			

For 22 MW wind project at Kinfara site, Kerala

Benchmark Calculations	Value	Sources Link or Title	Document Date	Decision Making Date
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⁶ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16710>

⁷ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=17119>

⁸ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=17119>

Default Value for India as per UNFCCC guidelines	11.06%	EB 92 Annex 5, Version 06 of methodological tool "Investment Analysis" Table 1 Appendix	24-Jul-15	05-12-16
Inflation forecast (WPI Mean) as per RBI for 10 yrs	3.98%	Table A.9: Annual Average Percentage Change ⁹	09-Aug-16	
Benchmark (with 10 yrs Forecast)	15.48%			

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):

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

The IRR and Benchmark analysis are calculated in excel spreadsheet and same have been submitted to DOE during validation of project activity.

Based on result of IRR excel spreadsheets, equity IRR is less than Benchmark.

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

For input assumptions and IRR calculations, please refer Appendix-2 of this report.

Sub-step 2d: Sensitivity Analysis:

Addressing Guidance 28 & 29 of EB92, Annex 5, following factors has been subjected to sensitivity analysis:

1. PLF
2. O&M Cost
3. Project Cost
4. Tariff

The rationale of sensitivity is, "The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis."

The Appendix 2 of this report mentions the result of IRR, Benchmark and sensitivity analysis.

The results of sensitivity analysis show that even with a variation of +10% & -10% in project cost, O&M cost, PLF and Tariff Rate Equity IRR is significantly lower than the benchmark. And it is evident from the results given above; the project remains additional even under the most favourable conditions.

⁹ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=17390>

Probability to breach the benchmark:
Sensitivity Parameter 1 : PLF
PLF considered in financials for is as per Third Party PLF report in line with “ Guidelines for the reporting and validation of Plant load factors ” stated in EB 48 Annex11 option 3(b) . Hence, variation in PLF of more than 10% is unlikely to happen as the PLF has been reported as per the Third Party Report based on long term data.
Sensitivity Parameter 2 : O&M
The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is subject to escalation (as evidence by the O&M agreement) and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. Hence, the reduction in the O&M cost is highly unlikely.
Sensitivity Parameter 3 : Project Cost
Project Cost for financial analysis is considered from Offer Letter of the project activity, being available at the time of investment making decision to go ahead with the project activity. The actual project cost is lower than the Offer Letter cost. Since the Purchase Order cost is firm, there is no possibility of project cost going below this level. However, Sensitivity is carried out for threshold level below which benchmark is not breached.
Sensitivity Parameter 4 : Tariff Rate
The tariff is determined by PPA which is fixed for entire lifetime of the project activity. Hence, there is no probability to get variation for the same. However, Sensitivity is carried out for +/-10% even then the benchmark is not breached.

Outcome of Step 2:

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

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice Analysis

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

For the concerned project activity, the Common Practice Analysis has been carried out.

Stepwise approach for common practice analysis has been carried out as per Methodological tool “Common Practice”, version 03.1 EB 84, Annex 7:

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%	99	MW
Capacity of the proposed project activity	66	MW
-50%	33	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 Madhya Pradesh, Gujarat and Kerala states of India. Therefore, projects in the geographical area of Madhya Pradesh, Gujarat and Kerala have been chosen for analysis. The project activity involves generation of electricity from wind energy. The project activity is located in the different states in India and the policy applicable for the wind projects is regulated by respective state policy. The policies/tariff for each state is regulated by State Electricity Regulatory Commissions of respective states and they differ for respective states. The project implemented in different states are claimed as different since the policies and regulations differ in each state. Each state have different policies regarding renewable energy, hence Madhya Pradesh, Gujarat and Kerala state is considered as geographical region for common practise 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 33 MW to 99 MW.
- (f) The start date (Commercial operation as per VCS guideline) of the project activity is 28-Mar-2016. Therefore projects, which had started commercial operation before 28-Mar-2016 have been identified. As per CDM guideline, earlier purchase order will be start date of project activity, however conservatively commercial operation date (which is later date than earlier purchase order) is considered for common practise analysis.

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

Particulars	No. of Projects	Source
N _{Wind}	17	Directory - Indian Wind Power published by CECL, Bhopal -2016

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 are excluded from similar projects. Thus 12 projects are excluded from similar projects list.

Out of remaining 5 projects, the following 3 projects were excluded from the CPA analysis.

1. 38 MW wind project by Oil India Limited is excluded from the CPA analysis as the investment climate is different because Oil India Limited is a government company and proposed project activity is of private company.
2. Both 58.5 MW and 39 MW wind projects by Orange Mamtakheda Wind Pvt. Ltd. are excluded from the CPA analysis as the investment climate is different because these projects are registered with Gold Standard Mechanism.

Thus $N_{all} = 2$

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} .

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 $N_{all} = 2$; thus $N_{diff} = 0$

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

As $N_{all} = 2$ thus and $N_{all} - N_{diff} = 2$;

Outcome of Step 5:

As,

- i. $F = 1$;

- ii. $N_{all} - N_{diff} = 2$ which is less than 3

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:

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

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)

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

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

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 12¹⁰ (May 2017). 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

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.

¹⁰ http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

However since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO₂ Baseline Database. As of 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Puducherry
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Lakshadweep
Rajasthan		Goa	Tripura	Telangana
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)					
	2011-12	2012-13	2013-14	2014-15	2015-16
Indian	19.6%	16.9%	18.6%	16.8%	15.1%

Data Source: Central Electricity Authority (CEA) database Version 12, May'2017

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 tCO₂/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)			
	2013-14	2014-15	2015-16
Indian	725,037	810,011	871,740

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
	2013-14	2014-15	2015-16
Indian	1.0002	0.9903	0.9655

Weighted Generation Operating Margin	
Indian	0.9843

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)	
	2015-16
Indian	0.9083

(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 06.0.0, EB 97, Annex 7, 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 ($EF_{grid,BM,y}$):

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

Where,

W _{OM}	75% weight of operating margin emissions factor (%)
W _{BM}	25% weight of build margin emissions factor (%)
$EF_{grid,OM,y}$	operating 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)

$$\begin{aligned} EF_{Grid,CM,y} &= 0.75*0.9843 + 0.25*0.9083 \\ &= 0.9653 \text{ tCO}_2/\text{MWh} \end{aligned}$$

Therefore, Baseline Emissions:

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

$$BE_y = 131,783 \times 0.9653 = 127,207 \text{ tCO}_2$$

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 17.0, *“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 17.0, 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 17.0; 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:

$$ER_y = BE_y - PE_y$$

$$ER_y = 127,207 - 0$$

$$= 127,207 \text{ tCO}_2$$

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	127,207	0	0	127,207
Year 2	127,207	0	0	127,207
Year 3	127,207	0	0	127,207
Year 4	127,207	0	0	127,207
Year 5	127,207	0	0	127,207
Year 6	127,207	0	0	127,207
Year 7	127,207	0	0	127,207
Year 8	127,207	0	0	127,207
Year 9	127,207	0	0	127,207
Year 10	127,207	0	0	127,207
Total	1,272,070	0	0	1,272,070

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 12, May 2017 ¹¹
Value applied:	0.9843
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 06.0.0" as 3-year generation weighted average using data for the years 2013-2014, 2014-2015 & 2015-2016. The data are obtained from "CO ₂ Baseline Database for Indian Power Sector" version 12.0, 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

¹¹ http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

Source of data	Calculated from CEA database, Version 12, May 2017 ¹²
Value applied:	0.9083
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 06.0.0” 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 12.0, 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 12, May 2017 ¹³
Value applied:	0.9653 (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).

¹² http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

¹³ http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

	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:	131,783 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 year¹⁴ 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 - It is also noted that apportioning procedure (if applicable) is under control of state electricity board and PP do not have any control on it. The available parameter to PP is the net electricity supplied to grid and same parameter is mentioned as monitoring parameter
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.

¹⁴ As per CEA regulation

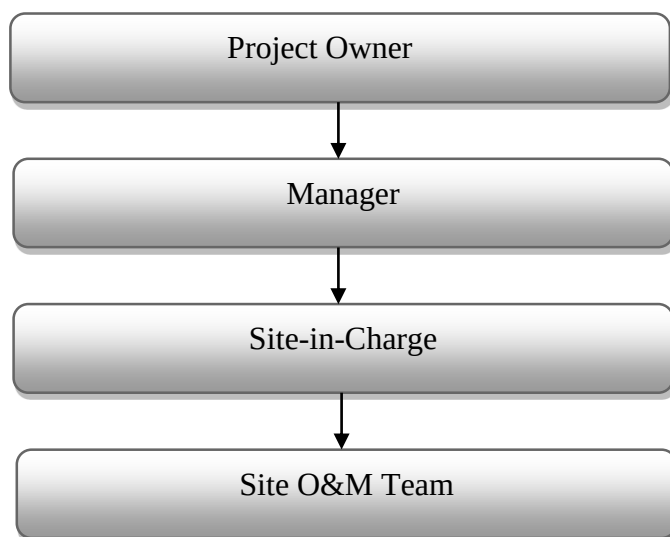
Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the net electricity exported to the grid.

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:



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.

If any common metering is involved for project activity, then apportioning procedure will be involved which is under control of state electricity board. 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.

The project activity is located in Madhya Pradesh, Gujarat and Kerala states of India. In Indian scenario the monitoring, metering arrangement, apportioning procedure, calibration frequency and feeder arrangement is under control of respective state electricity board and PP do not have any control on it. Thus there is possibility of changes in meters, feeders for the project activity. PP is getting the net electricity supplied to grid and based on this value invoice will be raised by PP. Hence feeder wise details of WTGs, metering arrangement, monitoring procedure etc are not mentioned in VCS PD.

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.

The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013. This report clearly mentioned that wind project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same¹⁵.

Thus there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the 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 2006¹⁶ and thus an EIA is not required. Ministry of Environment & forests vide their OM J-11013/41/2006 - IA II (I) dated 01st Dec 2009¹⁷ has re-affirmed this and exempted Wind power plants from EIA and Environmental Consent requirement.

As per the Schedule 1 of the EIA notification dated 1/12/2009¹⁸ and latest notification dated 24/12/2013¹⁹, 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.

However, the PP conducted the local stakeholder meetings and the details of the same has been mentioned below.

Sl. No	Project Investor	Project Site	State	Notice Date	Meeting Date
1	D. J. Malpani	Dhar	Madhya Pradesh	08/02/2016	15/02/2016
2		Ghatiya		08/02/2016	16/02/2016
3		Sadla	Gujarat	04/10/2016	12/10/2016
4		Savarkundla			

¹⁵ <http://mnre.gov.in/file-manager/UserFiles/report-on-developmental-impacts-of-RE.pdf>

¹⁶ <http://envfor.nic.in/legis/eia/so1533.pdf>

¹⁷ <http://www.moef.nic.in/downloads/rules-and-regulations/3067.pdf>

¹⁸ <http://moef.nic.in/downloads/rules-and-regulations/3067.pdf>

¹⁹ <http://envfor.nic.in/sites/default/files/ia-24122013.pdf>

5		Kinfara	Kerala	12/01/2017	20/01/2017
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There were no negative comments received for the project activity.

The Minutes of meeting with commenting sheet from LSH, invitation letter receipt copy has been submitted to the DOE.

Few queries raised during local stakeholder consultation are addressed satisfactorily.

There were no major comments or protest raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region. The PP also placed an grievance register onsite in where the stakeholder can put down his/her complain and the same if found genuine will be addressed immediately.

5.4 Public Comments

The project activity was published for public comment and no comments were received during the one month commenting period. Thus this section is not applicable. Please refer below web link for VCS project web page

http://www.vcsprojectdatabase.org/#!/pipeline_details/PL1679

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:	79,128
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)

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
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EGPJ, y	MWh	79,128
EF _{grid, CM, y}	tCO _{2e}	0.9653
BE _y	=	79,128*0.9653
	=	76.380

6.3 Project Emissions

PE_{FF, y} = 0 , As per para 37 of ACM0002 version 17.0, “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 17.0, 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 _{2e} /yr)
BE _y	=	Baseline emissions in year y (t CO ₂ /yr)
PE _y	=	Project emissions in year y (t CO _{2e} /yr)

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

$$ER_y = BE_y - PE_y$$

$$ER_y = 76,380 - 0$$

$$= 76,380 \text{ tCO}_2$$

Year	Baseline emissions or removals (tCO _{2e})	Project emissions or removals (tCO _{2e})	Leakage emissions (tCO _{2e})	Net GHG emission reductions or removals (tCO _{2e})
2016	14,343	0	0	14,343
2017	62,037	0	0	62,037
Total	76,380	0	0	76,380

APPENDIX 1: Calibration and Meter Details

The Main and Check Meter details for Dhar Site, Madhya Pradesh are as follows:

The WTGs are commissioned on 31/03/2016 and calibration is done prior to commissioning date for this site.

Meter Details for WTG ID: TIR- 11			
Main Meter		Check Meter	
Make	Secure	Make	Secure
Meter Sl. No	XD500605	Meter Sl. No	XD500606
Accuracy Class	0.2 s	Accuracy Class	0.2 s
Calibration Date ²⁰	19-03-16	Calibration Date	21-03-16

Meter Details for WTG ID: ADD- 01 & ADD- 06			
Main Meter		Check Meter	
Make	Secure	Make	Secure
Meter Sl. No	XD500602	Meter Sl. No	XD500603
Accuracy Class	0.2 s	Accuracy Class	0.2 s
Calibration Date ²¹	21-03-16	Calibration Date	19-03-16

The Main and Check Meter details for Ghatiya Site, Madhya Pradesh are as follows:

The WTGs are commissioned on 28/03/2016 and 29/03/2016 and calibration is done prior to commissioning date for this site.

Meter Details for WTG ID: RGP2- 08 & RGP2- 09 at Feeder-1			
Main Meter		Check Meter	
Make	Secure	Make	Secure
Meter Sl. No	XD500608	Meter Sl. No	XD500609
Accuracy Class	0.2 s	Accuracy Class	0.2 s
Calibration Date ²²	24-03-16	Calibration Date	24-03-16
Meter Details for WTG ID: RGP2- 18, RGP2- 03 & RGP2- 07 at Feeder-2			
Main Meter		Check Meter	
Make	Secure	Make	Secure
Meter Sl. No	Y0056943	Meter Sl. No	Y0056944
Accuracy Class	0.2 s	Accuracy Class	0.2 s
Calibration Date ²³	24-03-16	Calibration Date	24-03-16

²⁰ The frequency of calibrating the energy meter is once in 5 year. As the calibration of the Main Meter was on 19/03/2016 and the Check Meter was calibrated on 21/03/2016, the calibration certificate for the Main Meter is valid till 18/03/2021 and for the Check Meter, the calibration certificate is valid till 20/03/2021.

²¹ The frequency of calibrating the energy meter is once in 5 year. As the calibration of the Main Meter was done on 19/03/2016 and the Check Meter was calibrated on 21/03/2016, the calibration certificate for the Main Meter is valid till 18/03/2021 and for the Check Meter, the calibration certificate is valid till 20/03/2021.

²² The frequency of calibrating the energy meter is once in 5 year. As the calibration has been done on 24/03/2016, the calibration certificate is valid till 23/03/2021.

²³ The frequency of calibrating the energy meter is once in 5 year. As the calibration has been done on 24/03/2016, the calibration certificate is valid till 23/03/2021.

The Main and Check Meter details for Gujarat sites are as follows:

The WTGs are commissioned on 30/03/2017 and 31/03/2017 and calibration is done prior to commissioning date for this site

Meter-1		Meter-2	
Make	Secure	Make	Secure
Meter Sl. No	GJ 3710 A	Meter Sl. No	GJ 3711 A
Accuracy Class	0.2 s	Accuracy Class	0.2 s
Calibration Date ²⁴	30-01-17	Calibration Date	30-01-17

The Main and Check Meter details for Kinfara site, Kerala are as follows:

The WTGs are commissioned on 28/03/2017 and calibration is done prior to commissioning date for this site

Meter Details for Feeder- 1			
Main Meter		Check Meter	
Make	L & T	Make	L & T
Meter Sl. No	16088079	Meter Sl. No	16088085
Accuracy Class	0.2 s	Accuracy Class	0.2 s
Calibration Date ²⁵	25-03-17	Calibration Date	25-03-17
Meter Details for Feeder- 2			
Main Meter		Check Meter	
Make	L & T	Make	L & T
Meter Sl. No	16088074	Meter Sl. No	16088092
Accuracy Class	0.2 s	Accuracy Class	0.2 s
Calibration Date ²⁶	27-03-17	Calibration Date	27-03-17

²⁴ The frequency of calibrating the energy meter is once in 5 year. As the calibration has been done on 30/01/2017, the calibration certificate is valid till 29/01/2022.

²⁵ The frequency of calibrating the energy meter is once in 5 year. As the calibration has been done on 25/03/2017, the calibration certificate is valid till 24/03/2022.

²⁶ The frequency of calibrating the energy meter is once in 5 year. As the calibration has been done on 27/03/2017, the calibration certificate is valid till 26/03/2022.

APPENDIX 2: Input Parameters and Assumptions for Additionality Assessment

1. Assumptions and Values considered for Financial and Sensitivity Analysis for 4.5 MW Wind project at Dhar Site, Madhya Pradesh

Details of the project		Source
State where the project is situated	Madhya Pradesh	
No. of machines	3	
Capacity /machine (MW)	1.5	
Total Capacity (MW)	4.5	Calculated Value
Date of Commissioning	31-Mar-16	Assumption
Life of the plant (Yrs.)	25	As per MPERC order dt. 26.03.2013, Pg 7 ²⁷
Generation of electricity		
PLF (%)	19.70%	As per MPERC order dt. 26.03.2013, Pg 6 ²⁸
Annual generation (kWh)	7765740	Calculated Value
Tariff Rate	5.92	As per MPERC order dt. 26.03.2013, Pg 10 ²⁹
Deration after 10 years of opertaion	5%	Wind Energy Information by TERI
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	5.5416	As Per Offer Letter
Escalation in the operational expenses (%)	6%	As Per Offer Letter
O & M free for (Yr.)	1	As Per Offer Letter
Insurance (INR Mn.)	0.4725	As per TAC order 2001, Sheet No. 31 ³⁰
Financial parameters		
TOTAL COST (INR Mn.)	315.00	As Per Offer Letter
Loan Amount (INR Mn.)	0	
Equity Investment (INR Mn.)	315.00	
Book Depreciation (SLM Method)		
Land Cost	12	
Gross Depreciable Value (INR Mn.)	285.00	Calculated Value
Salvage Value (%)	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination

²⁷ <http://www.mperc.nic.in/26032013-Wind-tariff-order.pdf>

²⁸ <http://www.mperc.nic.in/26032013-Wind-tariff-order.pdf>

²⁹ <http://www.mperc.nic.in/26032013-Wind-tariff-order.pdf>

³⁰ <https://iib.gov.in/IIB/tac/tariffs/AIFT2001.pdf> (Though the CERC order 2012, http://www.cercind.gov.in/2012/orders/RE_35_2012.pdf is the latest available source for insurance which mentioned 1% of capital cost for insurance, however PP has considered the 0.15% of capital cost as a conservative purpose from IREDA source.)

		from Renewable Energy Sources) Regulations, 2012 ³¹
Salvage value (INR Mn.)	28.50	Calculated Value
Net Depreciable Value (INR Mn.)	256.50	Calculated Value
Residual Value (INR Mn.)	40.50	Calculated Value
IT Depreciation		
IT Depreciation (WDV Method) (%)	12.73%	As per companies act 2013 ³²
Income Tax		
Financial Year	FY 2015-16	
Income tax rate (%)	30.00%	As Per Income Tax Rule, Pg 29 Para E(I) ³³
Corporate Tax (%)	33.00%	As Per IT rule ³⁴
Service Tax (%)	15.00%	As Per Income Tax Rule ³⁵
Surcharge (%)	12.00%	As Per Income Tax Rule, Pg 30 ³⁶
Education cess (%)	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12 ³⁷
Final Tax rates		
Income tax rate (%)	34.61%	Calculated Value
Corporate Tax (%)	38.07%	Calculated Value
Service Tax (%)	15.45%	Calculated Value

Sensitivity Analysis:

Sensitivity Analysis	Equity IRR			
Variation %	-10%	Normal	10%	Breaching Value
PLF	5.40%	6.75%	8.02%	75.41%
O&M	7.01%	6.75%	6.48%	-485.10%
Project Cost	7.86%	6.75%	5.81%	-47.72%
Tariff Rate	5.40%	6.75%	8.02%	75.41%

Final Result:

Equity IRR without CDM	Benchmark (Equity IRR)
6.75%	15.32%

³¹ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

³² <http://taxadda.com/companies-act-2013/depreciation-rates-as-per-companies-act-2013/>

³³ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

³⁴ <https://www.bankbazaar.com/tax/corporate-tax.html>

³⁵ <http://taxguru.in/service-tax/service-tax-rate-chart-effect-01062016.html>

³⁶ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

³⁷ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

2. Assumptions and Values considered for Financial and Sensitivity Analysis for 7.5 MW Wind project at Ghatiya Site, Madhya Pradesh

Details of the project		Source
State where the project is situated	Madhya Pradesh	
No. of machines	5	
Capacity /machine (MW)	1.5	
Total Capacity (MW)	7.5	Calculated Value
Date of Commissioning	31-Mar-16	Assumption
Life of the plant (Yrs.)	25	As per MPERC order dt. 26.03.2013, Pg 7 ³⁸
Generation of electricity		
PLF (%)	19.70%	As per MPERC order dt. 26.03.2013, Pg 6 ³⁹
Annual generation (kWh)	12942900	Calculated Value
Tariff Rate	5.92	As per MPERC order dt. 26.03.2013, Pg 10 ⁴⁰
Deration after 10 years of operation	5%	Wind Energy Information by TERI
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	9.236	As Per Offer Letter
Escalation in the operational expenses (%)	6%	As Per Offer Letter
O & M free for (Yr.)	1	As Per Offer Letter
Insurance (INR Mn.)	0.7875	As per TAC order 2001, Sheet No. 31 ⁴¹
Financial parameters		
TOTAL COST (INR Mn.)	525.00	As Per Offer Letter
Loan Amount (INR Mn.)	0	
Equity Investment (INR Mn.)	525.00	
Book Depreciation (SLM Method)		
Land	20	
Gross Depreciable Value (INR Mn.)	525.00	Calculated Value
Salvage Value (%)	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination

³⁸ <http://www.mperc.nic.in/26032013-Wind-tariff-order.pdf>

³⁹ <http://www.mperc.nic.in/26032013-Wind-tariff-order.pdf>

⁴⁰ <http://www.mperc.nic.in/26032013-Wind-tariff-order.pdf>

⁴¹ <https://iib.gov.in/IIB/tac/tariffs/AIFT2001.pdf> (Though the CERC order 2012, http://www.cercind.gov.in/2012/orders/RE_35_2012.pdf is the latest available source for insurance which mentioned 1% of capital cost for insurance, however PP has considered the 0.15% of capital cost as a conservative purpose from IREDA source.)

		from Renewable Energy Sources) Regulations, 2012 ⁴²
Salvage value (INR Mn.)	52.50	Calculated Value
Net Depreciable Value (INR Mn.)	472.50	Calculated Value
Residual Value (INR Mn.)	72.50	Calculated Value
IT Depreciation		
IT Depreciation (WDV Method) (%)	12.73%	As per companies act 2013 ⁴³
Income Tax		
Financial Year		
	FY 2015-16	
Income tax rate (%)	30.00%	As Per Income Tax Rule, Pg 29 Para E(I) ⁴⁴
Corporate Tax (%)	33.00%	As Per IT rule ⁴⁵
Service Tax (%)	15.00%	As Per Income Tax Rule ⁴⁶
Surcharge (%)	12.00%	As Per Income Tax Rule, Pg 30 ⁴⁷
Education cess (%)	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12 ⁴⁸
Final Tax rates		
Income tax rate (%)	34.61%	Calculated Value
Corporate Tax (%)	38.07%	Calculated Value
Service Tax (%)	15.45%	Calculated Value

Sensitivity Analysis:

Sensitivity Analysis	Equity IRR			
Variation %	-10%	Normal	10%	Breaching Value
PLF	5.68%	7.00%	8.25%	73.50%
O&M	7.25%	7.00%	6.74%	-472.14%
Project Cost	8.13%	7.00%	6.05%	-46.52%
Tariff Rate	5.68%	7.00%	8.25%	73.50%

Final Result:

Equity IRR without CDM	Benchmark (Equity IRR)
7.00%	15.32%

⁴² http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

⁴³ <http://taxadda.com/companies-act-2013/depreciation-rates-as-per-companies-act-2013/>

⁴⁴ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁴⁵ <https://www.bankbazaar.com/tax/corporate-tax.html>

⁴⁶ <http://taxguru.in/service-tax/service-tax-rate-chart-effect-01062016.html>

⁴⁷ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

⁴⁸ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

3. Assumptions and Values considered for Financial and Sensitivity Analysis for 6 MW Wind project at Sadla Site, Gujarat

Details of the project		Source
State where the project is situated	Gujarat	
No. of machines	3	
Capacity /machine (MW)	2	
Total Capacity (MW)	6	Calculated Value
Date of Commissioning	31-Mar-17	Assumption
Life of the plant (Yrs.)	25	As per GERC order 2016, Pg 25 ⁴⁹
Generation of electricity		
PLF (%)	24.50%	As per GERC order 2016, Pg 25 ⁵⁰
Annual generation (kWh)	12877200	Calculated Value
Tariff Rate	4.19	As per GERC order 2016, Pg 26 ⁵¹
Deration after 10 years of operation	5%	Wind Energy Information by TERI
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	7.6197	As Per Offer Letter
Escalation in the operational expenses (%)	5%	As Per Offer Letter
O & M free for (Yr.)	2	As Per Offer Letter
Insurance (INR Mn.)	0.61875	As per TAC order 2001, Sheet No. 31 ⁵²
Financial parameters		
TOTAL COST (INR Mn.)	412.50	As Per Offer Letter
Loan Amount (INR Mn.)	0	
Equity Investment (INR Mn.)	412.50	
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	412.50	Calculated Value
Salvage Value (%)	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012 ⁵³
Salvage value (INR Mn.)	41.25	Calculated Value
Net Depreciable Value (INR Mn.)	371.25	Calculated Value
Residual Value (INR Mn.)	41.25	Calculated Value

⁴⁹ <http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁵⁰ <http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁵¹ <http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁵² <https://iib.gov.in/IIB/tac/tariffs/AIFT2001.pdf> (Though the CERC order 2012, http://www.cercind.gov.in/2012/orders/RE_35_2012.pdf is the latest available source for insurance which mentioned 1% of capital cost for insurance, however PP has considered the 0.15% of capital cost as a conservative purpose from IREDA source.)

⁵³ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

IT Depreciation		
IT Depreciation (WDV Method) (%)	12.73%	As per companies act 2013 ⁵⁴
Income Tax		
Financial Year	FY 2016-17	
Income tax rate (%)	30.00%	As Per Income Tax Rule, Pg 29 Para E(I) ⁵⁵
Corporate Tax (%)	33.00%	As Per IT rule ⁵⁶
Service Tax (%)	15.00%	As Per Income Tax Rule ⁵⁷
Surcharge (%)	12.00%	As Per Income Tax Rule, Pg 30 ⁵⁸
Education cess (%)	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12 ⁵⁹
Final Tax rates		
Income tax rate (%)	34.61%	Calculated Value
Corporate Tax (%)	38.07%	Calculated Value
Service Tax (%)	15.45%	Calculated Value

Sensitivity Analysis:

Sensitivity Analysis	Equity IRR			
Variation %	-10%	Normal	10%	Breaching Value
PLF	4.65%	5.90%	7.08%	92.18%
O&M	6.14%	5.90%	5.65%	-636.36%
Project Cost	6.95%	5.90%	5.02%	-51.97%
Tariff Rate	4.65%	5.90%	7.08%	92.18%

Final Result:

Equity IRR without CDM	Benchmark (Equity IRR)
5.90%	15.43%

⁵⁴ <http://taxadda.com/companies-act-2013/depreciation-rates-as-per-companies-act-2013/>

⁵⁵ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁵⁶ <https://www.bankbazaar.com/tax/corporate-tax.html>

⁵⁷ <http://taxguru.in/service-tax/service-tax-rate-chart-effect-01062016.html>

⁵⁸ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

⁵⁹ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

4. Assumptions and Values considered for Financial and Sensitivity Analysis for 6 MW Wind project at Sadla Site, Gujarat

Details of the project		Source
State where the project is situated	Gujarat	
No. of machines	13	
Capacity /machine (MW)	2	
Total Capacity (MW)	26	Calculated Value
Date of Commissioning	31-Mar-17	Assumption
Life of the plant (Yrs.)	25	As per GERC order 2016, Pg 25 ⁶⁰
Generation of electricity		
PLF (%)	24.50%	As per GERC order 2016, Pg 25 ⁶¹
Annual generation (kWh)	55801200	Calculated Value
Tariff Rate	4.19	As per GERC order 2016, Pg 26 ⁶²
Deration after 10 years of operation	5%	Wind Energy Information by TERI
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	33.0187	As Per Offer Letter
Escalation in the operational expenses (%)	5%	As Per Offer Letter
O & M free for (Yr.)	2	As Per Offer Letter
Insurance (INR Mn.)	2.68125	As per TAC order 2001, Sheet No. 31 ⁶³
Financial parameters		
TOTAL COST (INR Mn.)	1787.50	As Per Offer Letter
Loan Amount (INR Mn.)	0	
Equity Investment (INR Mn.)	1787.50	
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	1787.50	Calculated Value
Salvage Value (%)	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012 ⁶⁴
Salvage value (INR Mn.)	178.75	Calculated Value
Net Depreciable Value (INR Mn.)	1608.75	Calculated Value
Residual Value (INR Mn.)	178.75	Calculated Value

⁶⁰ <http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁶¹ <http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁶² <http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁶³ <https://iib.gov.in/IIB/tac/tariffs/AIFT2001.pdf> (Though the CERC order 2012, http://www.cercind.gov.in/2012/orders/RE_35_2012.pdf is the latest available source for insurance which mentioned 1% of capital cost for insurance, however PP has considered the 0.15% of capital cost as a conservative purpose from IREDA source.)

⁶⁴ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

IT Depreciation		
IT Depreciation (WDV Method) (%)	12.73%	As per companies act 2013 ⁶⁵
Income Tax		
Financial Year	FY 2016-17	
Income tax rate (%)	30.00%	As Per Income Tax Rule, Pg 29 Para E(I) ⁶⁶
Corporate Tax (%)	33.00%	As Per IT rule ⁶⁷
Service Tax (%)	15.00%	As Per Income Tax Rule ⁶⁸
Surcharge (%)	12.00%	As Per Income Tax Rule, Pg 30 ⁶⁹
Education cess (%)	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12 ⁷⁰
Final Tax rates		
Income tax rate (%)	34.61%	Calculated Value
Corporate Tax (%)	38.07%	Calculated Value
Service Tax (%)	15.45%	Calculated Value

Sensitivity Analysis:

Sensitivity Analysis	Equity IRR			
Variation %	-10%	Normal	10%	Breaching Value
PLF	4.76%	5.98%	7.15%	91.99%
O&M	6.22%	5.98%	5.74%	-635.00%
Project Cost	7.03%	5.98%	5.11%	-51.86%
Tariff Rate	4.76%	5.98%	7.15%	91.99%

Final Result:

Equity IRR without CDM	Benchmark (Equity IRR)
5.98%	15.43%

⁶⁵ <http://taxadda.com/companies-act-2013/depreciation-rates-as-per-companies-act-2013/>

⁶⁶ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁶⁷ <https://www.bankbazaar.com/tax/corporate-tax.html>

⁶⁸ <http://taxguru.in/service-tax/service-tax-rate-chart-effect-01062016.html>

⁶⁹ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

⁷⁰ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

5. Assumptions and Values considered for Financial and Sensitivity Analysis for 26 MW Wind project at Kinfara Site, Kerala

Details of the project		Source
State where the project is situated	Kerala	
No. of machines	11	
Capacity /machine (MW)	2	
Total Capacity (MW)	22	Calculated Value
Date of Commissioning	31-Mar-17	Assumption
Life of the plant (Yrs.)	25	As per Kerala SERC order Dt. 11.11.2015, Pg 21 ⁷¹
Generation of electricity		
PLF (%)	22.00%	As per Kerala SERC order Dt. 11.11.2015, Pg 21 ⁷²
Annual generation (kWh)	42398400	Calculated Value
Tariff Rate	5.76	As per Kerala SERC order Dt. 11.11.2015, Pg 21 ⁷³
Deration after 10 years of operation	5%	Wind Energy Information by TERI
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	27.9389	As Per Offer Letter
Escalation in the operational expenses (%)	5%	As Per Offer Letter
O & M free for (Yr.)	2	As Per Offer Letter
Insurance (INR Mn.)	2.18625	As per TAC order 2001, Sheet No. 31 ⁷⁴
Financial parameters		
TOTAL COST (INR Mn.)	1457.50	As Per Offer Letter
Loan Amount (INR Mn.)	1020.25	70% loan and 30% equity
Equity Investment (INR Mn.)	437.25	Calculated Value
Term loan		
Loan Amount (INR Mn.)	1,020.25	As per Kerala SERC order Dt. 11.11.2015, Pg 21 ⁷⁵
Interest rate (%)	12.70%	As per Kerala SERC order Dt. 11.11.2015, Pg 21 ⁷⁶
Loan Tenure (Qtr.)	40	
Moratorium Period (Qtr.)	0	
Repayment Period (Qtr.)	40	Calculated Value

⁷¹ [http://www.erckerala.org/regulations/KSERC%20\(Renewable%20Energy\)%202015%20-11.11.15.pdf](http://www.erckerala.org/regulations/KSERC%20(Renewable%20Energy)%202015%20-11.11.15.pdf)

⁷² [http://www.erckerala.org/regulations/KSERC%20\(Renewable%20Energy\)%202015%20-11.11.15.pdf](http://www.erckerala.org/regulations/KSERC%20(Renewable%20Energy)%202015%20-11.11.15.pdf)

⁷³ [http://www.erckerala.org/regulations/KSERC%20\(Renewable%20Energy\)%202015%20-11.11.15.pdf](http://www.erckerala.org/regulations/KSERC%20(Renewable%20Energy)%202015%20-11.11.15.pdf)

⁷⁴ <https://iib.gov.in/IIB/tac/tariffs/AIFT2001.pdf> (Though the CERC order 2012, http://www.cercind.gov.in/2012/orders/RE_35_2012.pdf is the latest available source for insurance which mentioned 1% of capital cost for insurance, however PP has considered the 0.15% of capital cost as a conservative purpose from IREDA source.)

⁷⁵ [http://www.erckerala.org/regulations/KSERC%20\(Renewable%20Energy\)%202015%20-11.11.15.pdf](http://www.erckerala.org/regulations/KSERC%20(Renewable%20Energy)%202015%20-11.11.15.pdf)

⁷⁶ [http://www.erckerala.org/regulations/KSERC%20\(Renewable%20Energy\)%202015%20-11.11.15.pdf](http://www.erckerala.org/regulations/KSERC%20(Renewable%20Energy)%202015%20-11.11.15.pdf)

Repayment instalments value (INR Mn.)	25.50625	Calculated Value
1st instalment from (Qtr. end)	30-Jun-17	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	1457.50	Calculated Value
Salvage Value (%)	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012 ⁷⁷
Salvage value (INR Mn.)	145.75	Calculated Value
Net Depreciable Value (INR Mn.)	1311.75	Calculated Value
Residual Value (INR Mn.)	145.75	Calculated Value
IT Depreciation		
IT Depreciation (WDV Method) (%)	12.73%	As per companies act 2013 ⁷⁸
Income Tax		
Financial Year	FY 2016-17	
Income tax rate (%)	30.00%	As Per Income Tax Rule, Pg 29 Para E(I) ⁷⁹
Corporate Tax (%)	33.00%	As Per IT rule ⁸⁰
Service Tax (%)	15.00%	As Per Income Tax Rule ⁸¹
Surcharge (%)	12.00%	As Per Income Tax Rule, Pg 30 ⁸²
Education cess (%)	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12 ⁸³
Final Tax rates		
Income tax rate (%)	34.61%	Calculated Value
Corporate Tax (%)	38.07%	Calculated Value
Service Tax (%)	15.45%	Calculated Value

Sensitivity Analysis:

Sensitivity Analysis	Equity IRR			
Variation %	-10%	Normal	10%	Breaching Value
PLF	8.67%	10.66%	12.72%	22.10%
O&M	10.97%	10.66%	10.34%	-168.50%
Project Cost	12.63%	10.66%	9.14%	-20.07%
Tariff Rate	8.67%	10.66%	12.72%	22.10%

⁷⁷ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

⁷⁸ <http://taxadda.com/companies-act-2013/depreciation-rates-as-per-companies-act-2013/>

⁷⁹ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁸⁰ <https://www.bankbazaar.com/tax/corporate-tax.html>

⁸¹ <http://taxguru.in/service-tax/service-tax-rate-chart-effect-01062016.html>

⁸² <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

⁸³ <http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html>

Final Result:

Equity IRR without CDM	Benchmark (Equity IRR)
10.66%	15.48%