

WIND BASED POWER GENERATION BY PANAMA WIND ENERGY GODAWARI PRIVATE LIMITED, PUNE IN THE STATE OF MAHARASHTRA, INDIA

Document Prepared By EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The purpose of the project activity is to generate power using renewable energy source (wind) and sell the power generated to the state grid. The project activity generates electricity using wind potential and converts it into kinetic energy using Wind turbines, which drives the alternators to generate energy. The generated electricity is exported to the regional grid system which is under the purview of the NEWNE grid of India.

The proposed project activity involves the installation of Wind Power Projects. The total installed capacity of the project is 80 MW; which involves operation of 40 Wind Turbine Generators (WTGs) with capacity of 2 MW each located at Maharashtra state in India. The project is promoted by **Panama Wind Energy Godawari Private Limited**.

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. GHG emission reductions from the project activity will be 136,936 tonnes of CO₂ and total GHG emission reductions for the chosen 10 year crediting period will be 1,369,360 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 wind velocity power and further selling the generated energy to the NEWNE Grid. In this process there is no consumption of any fossil fuel and hence the project does not lead to any greenhouse gas emissions. Thus, electricity would be generated through sustainable means without causing any negative impact on the environment.

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

1.2 Sectoral Scope and Project Type

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

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

Project Type : I - Renewable Energy Projects

Methodology : ACM0002: Grid-connected electricity generation from renewable sources - Version 16.0¹

The project is not a grouped project activity.

¹<http://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHAR6MJ6VEU83>

1.3 Project Proponent

Organization name	Panama Wind Energy Godawari Private Limited
Contact person	Mr. Dinesh Jagdale
Title	Director & Chief Operating Officer
Address	Viman Nagar 1st Floor, LunkadTowers,Pune Maharashtra 411 014
Telephone	+91 20 26125060, Mobile No. +91 9822035814
Email	djagdale@panama-group.com

1.4 Other Entities Involved in the Project

Not applicable

1.5 Project Start Date

Project Start Date: 31-March-2014

The project start date is the date on which first WTG was commissioned under the Project activity.

S. No.	Machine ID	DOC ²	Village	Taluka	District	State
1	G 1	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
2	G 2	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
3	G 3	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
4	G 4	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
5	G 5	6-Sep-14	Khopti	Georai	Beed	Maharashtra
6	G 6	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
7	G 7	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
8	G 8	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
9	G 9	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
10	G 10	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
11	G 11	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
12	G 12	7-Oct-14	Manmodi	Georai	Beed	Maharashtra
13	G 13	7-Oct-14	Manmodi	Georai	Beed	Maharashtra
14	G 14	6-Sep-14	Manmodi	Georai	Beed	Maharashtra
15	G 15	6-Sep-14	Manmodi	Georai	Beed	Maharashtra
16	G 16	7-Oct-14	Manmodi	Georai	Beed	Maharashtra
17	G 17	6-Sep-14	Manmodi	Georai	Beed	Maharashtra
18	G 18	7-Oct-14	Manmodi	Georai	Beed	Maharashtra

²Date Of commissioning

19	G 19	7-Oct-14	Khoipti	Georai	Beed	Maharashtra
20	G 20	7-Oct-14	Manyarwadi	Georai	Beed	Maharashtra
21	G 21	5-Dec-14	Khoipti	Georai	Beed	Maharashtra
22	G 22	6-Sep-14	Rajpimpri	Georai	Beed	Maharashtra
23	G 23	6-Sep-14	Rajpimpri	Georai	Beed	Maharashtra
24	G 24	31-Mar-14	Rajpimpri	Georai	Beed	Maharashtra
25	G 25	31-Mar-14	Rajpimpri	Georai	Beed	Maharashtra
26	G 26	25-Jul-14	BangaliPimpla	Georai	Beed	Maharashtra
27	G 27	25-Jul-14	Sindkhed	Georai	Beed	Maharashtra
28	G28	25-Jul-14	Kombadwadi	Georai	Beed	Maharashtra
29	G 29	31-Mar-14	Kombadwadi	Georai	Beed	Maharashtra
30	G 30	31-Mar-14	Devimpri	Georai	Beed	Maharashtra
31	G 31	31-Mar-14	Kombadwadi	Georai	Beed	Maharashtra
32	G 32	25-Jul-14	Sushi	Georai	Beed	Maharashtra
33	G 33	31-Mar-14	Sushi	Georai	Beed	Maharashtra
34	G 34	31-Mar-14	Sushi	Georai	Beed	Maharashtra
35	G 35	31-Mar-14	Sushi	Georai	Beed	Maharashtra
36	G 36	31-Mar-14	Sushi	Georai	Beed	Maharashtra
37	G 37	31-Mar-14	Kumbhejgaon	Georai	Beed	Maharashtra
38	G 38	25-Jul-14	Sushi	Georai	Beed	Maharashtra
39	G 39	31-Mar-14	Kumbhejgaon	Georai	Beed	Maharashtra
40	G 40	31-Mar-14	Bangalipimpla	Georai	Beed	Maharashtra

1.6 Project Crediting Period

Crediting Period Start date: 31-March-2014

Crediting Period End date: 30-March-2024

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 80.0 MW of wind power project.

Project Scale	
Project	
Large project	✓

As the Estimated GHG emission reductions or removals per year is 136,936(tCO₂e) which 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	136,936
Year 2	136,936
Year 3	136,936
Year 4	136,936
Year 5	136,936
Year 6	136,936
Year 7	136,936
Year 8	136,936
Year 9	136,936
Year 10	136,936
Total estimated ERs	1,369,360
Total number of crediting years	10 years
Average annual ERs	136,936

1.8 Description of the Project Activity

The proposed project activity involves the installation of Wind Power Projects. The total installed capacity of the project is 80 MW; which involves operation of 40 Wind Turbine Generators (WTGs) with capacity of 2 MW each located at Maharashtra state in India. The project is promoted by **Panama Wind Energy Godawari Private Limited**.

The Project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to the NEWNE 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 and by the addition of new generation sources.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 136,936tCO₂e per year, thereon displacing 140,160MWh/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. The technology is an 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 40 WTG's of Gamesa India Limited. The commissioning of the project activity has been completed and details are mentioned in section 1.5.

Technical details for Gamesa G97-2.0 MW³, 2000 KW Machine

Particulars	Details
Model	Gamesa G97-2.0 MW
Rated power	2000kW
Diameter	97 m
Swept area	7,390 m ²
Rotational speed	9.6 - 17.8 rpm
Design Lifetime	25 years

Power generated by the wind turbines will be collected at 33 kV and fed to pooling substation near Rajpimpri village (5 kms away), where it is stepped up to 132kV. The pooling station itself is then connected to 132 kV grid at MSETCL existing Substation Georai.

Emission Reductions from anthropogenic sources:

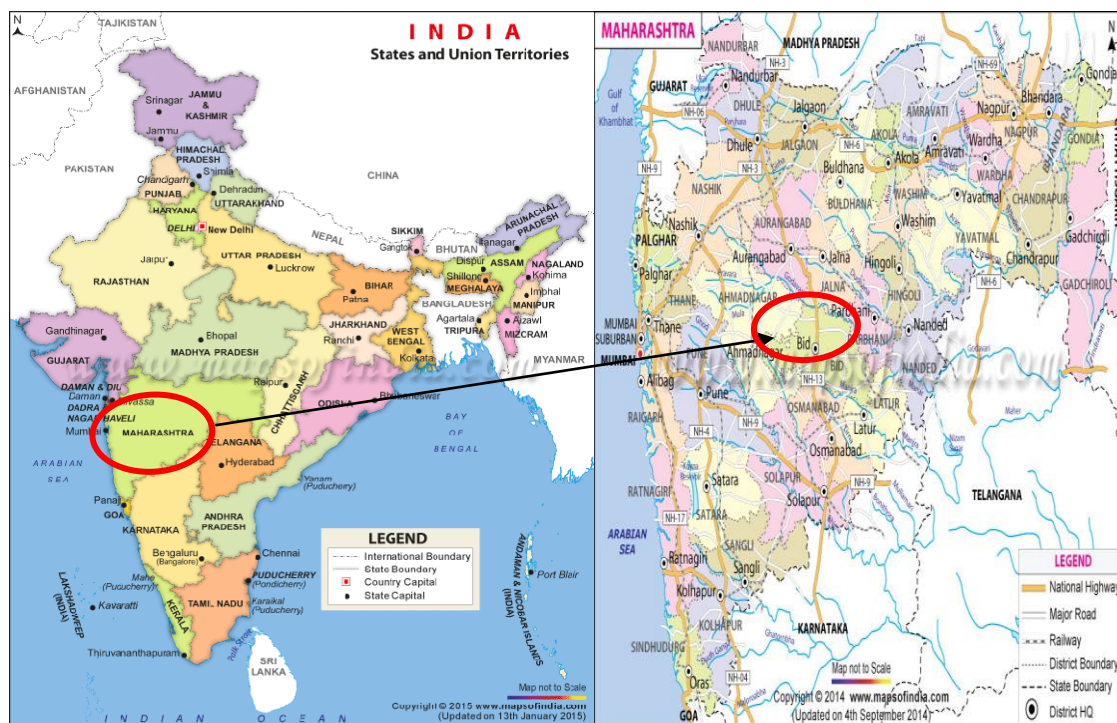
The wind power generated from the Project will be displacing the electricity generated from thermal power stations feeding into NEWNE grid and will be replacing the usage of diesel generators for meeting the power demand during shortage periods. Since, the wind power is Green House Gas (GHG) emissions 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.

1.9 Project Location

Sr. No.	Location No.	Village	Taluka	District	Latitude (D° M' Sec")	Longitude (D° M' Sec")
1	G01	Mulukwadi	Georai	Beed	N19 11 35.6	E75 43 38.4
2	G02	Mulukwadi	Georai	Beed	N19 11 12.3	E75 42 57.5
3	G03	Mulukwadi	Georai	Beed	N19 11 50.0	E75 43 19.7
4	G04	Mulukwadi	Georai	Beed	N19 11 30.1	E75 43 13.9
5	G05	Khoipti	Georai	Beed	N19 13 35.5	E75 41 23.4
6	G06	Mulukwadi	Georai	Beed	N19 11 59.1	E75 43 35.4
7	G07	Mulukwadi	Georai	Beed	N19 11 20.6	E75 43 40.8
8	G08	Mulukwadi	Georai	Beed	N19 11 59.5	E75 43 07.2
8	G09	Mulukwadi	Georai	Beed	N19 12 04.9	E75 42 37.4
9	G10	Mulukwadi	Georai	Beed	N19 12 24.6	E75 43 13.1
10	G11	Mulukwadi	Georai	Beed	N19 11 35.6	E75 43 38.4
11	G12	Manmodi	Georai	Beed	N19 12 38.0	E75 43 18.6
12	G13	Manmodi	Georai	Beed	N19 12 23.5	E75 42 36.7
13	G01	Manmodi	Georai	Beed	N19 12 36.0	E75 42 18.5
14	G14	Manmodi	Georai	Beed	N19 12 50.5	E75 42 24.3
15	G15	Manmodi	Georai	Beed	N19 12 59.8	E75 42 10.8
16	G16	Manmodi	Georai	Beed	N19 13 17.1	E75 42 10.1
17	G17	Manmodi	Georai	Beed	N19 13 22.3	E75 41 58.6

³<http://www.gamesacorp.com/en/products-and-services/wind-turbines/gamesa-g97-20-mw-iiia-en.html>

Sr. No.	Location No.	Village	Taluka	District	Latitude (D° M' Sec")	Longitude (D° M' Sec")
18	G18	Khopti	Georai	Beed	N19 13 29.6	E75 42 29.3
19	G19	Manyarwadi	Georai	Beed	N19 13 41.9	E75 42 19.2
20	G20	Khopti	Georai	Beed	N19 13 45.5	E75 42 59.5
21	G21	Rajpimpri	Georai	Beed	N19 14 06.3	E75 41 40.6
22	G22	Rajpimpri	Georai	Beed	N19 13 54.1	E75 41 27.6
23	G23	Rajpimpri	Georai	Beed	N19 13 46.6	E75 41 03.1
24	G24	Rajpimpri	Georai	Beed	N19 13 34.5	E75 40 24.8
25	G25	BangaliPimpla	Georai	Beed	N19 13 23.9	E75 40 11.5
26	G26	Sindkhed	Georai	Beed	N19 12 40.0	E75 37 28.9
27	G27	Kombadwadi	Georai	Beed	N19 13 09.5	E75 40 21.9
28	G28	Kombadwadi	Georai	Beed	N19 13 25.4	E75 39 28.6
29	G29	Devimpri	Georai	Beed	N19 13 43.7	E75 39 29.9
30	G30	Kombadwadi	Georai	Beed	N19 13 51.7	E75 39 06.1
31	G31	Sushi	Georai	Beed	N19 13 57.4	E75 39 33.0
32	G32	Sushi	Georai	Beed	N19 12 16.2	E75 37 44.2
33	G33	Sushi	Georai	Beed	N19 12 59.5	E75 38 47.3
34	G34	Sushi	Georai	Beed	N19 13 14.9	E75 38 57.3
35	G35	Sushi	Georai	Beed	N19 13 12.2	E75 38 26.2
36	G36	Kumbhejalgaon	Georai	Beed	N19 13 27.1	E75 38 20.9
37	G37	Sushi	Georai	Beed	N19 13 34.4	E75 38 00.3
38	G38	Kumbhejalgaon	Georai	Beed	N19 12 49.7	E75 38 08.6
39	G39	Bangalipimpla	Georai	Beed	N19 13 04.7	E75 37 53.8
40	G40	Mulukwadi	Georai	Beed	N19 12 58.0	E75 37 31.5



1.10 Conditions Prior to Project Initiation

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

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

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

1.12 Ownership and Other Programs

Right of Use

The Project is owned by **Panama Wind Energy Godawari Private Limited**, 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 MSEDCL.
- 2) Power Purchase Agreement with respective State Electricity Board for sale of electricity by the PP

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 claimed under the VCS Program.

1.12.4 Participation under Other GHG Programs

The Project has applied for the CDM under the Kyoto protocol which is under validation stage, however currently the PP is not willing to go ahead with CDM and existing contract of CDM validation is terminated.⁴

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

⁴

UNFCCC

web

link:

<http://cdm.unfccc.int/Projects/Validation/DB/3EXK45ZD9TYCX75US5098OUPIT809D/view.html>

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

Further Information

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.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Methodology: ACM0002: Grid-connected electricity generation from renewable sources ---
Version 16.0, Sectoral Scope: 01, EB 81, Annex 9

<https://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHAR6MJ6VEU83>

The project activity also takes reference from following Tools from the tools prescribed by applied methodology:

1. Tool for the demonstration and assessment of additionality --- Version 07.0.0, EB 70, Annex 8 <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

2. Tool to calculate the emission factor for an electricity system --- Version 05.0, EB 87, Annex 09 <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.0.pdf>

2.2 Applicability of Methodology

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

Applicability Criterion	Project Case
1. This methodology is applicable to grid-connected renewable energy power generation project activities that: a. Install a Greenfield power plant; b. Involve a capacity addition to (an) existing plant(s); c. Involve a retrofit of (an) existing operating plants/units; d. Involve a rehabilitation of (an) existing plant(s)/unit(s); or e. Involve a replacement of (an) existing plant(s)/unit(s).	The project activity is installation of a new grid connected wind power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant) and hence this criterion is applicable.
2. The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	The proposed project activity is an installation of a new grid connected wind power plant. Hence this condition is met.
3. In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
4. In case of hydro power plants, one of the following conditions shall apply: a. The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b. The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m²; or	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

c. The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m²; or d. The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	
5. In the case of integrated hydro power projects, project proponent shall: • Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or • Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
6. The methodology is not applicable to: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants/units.	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

7. In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	The project activity is a new grid connected wind power plant ^{Error!} and not a retrofits, replacement or capacity additions and therefore this criterion is not applicable to the project activity.
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";

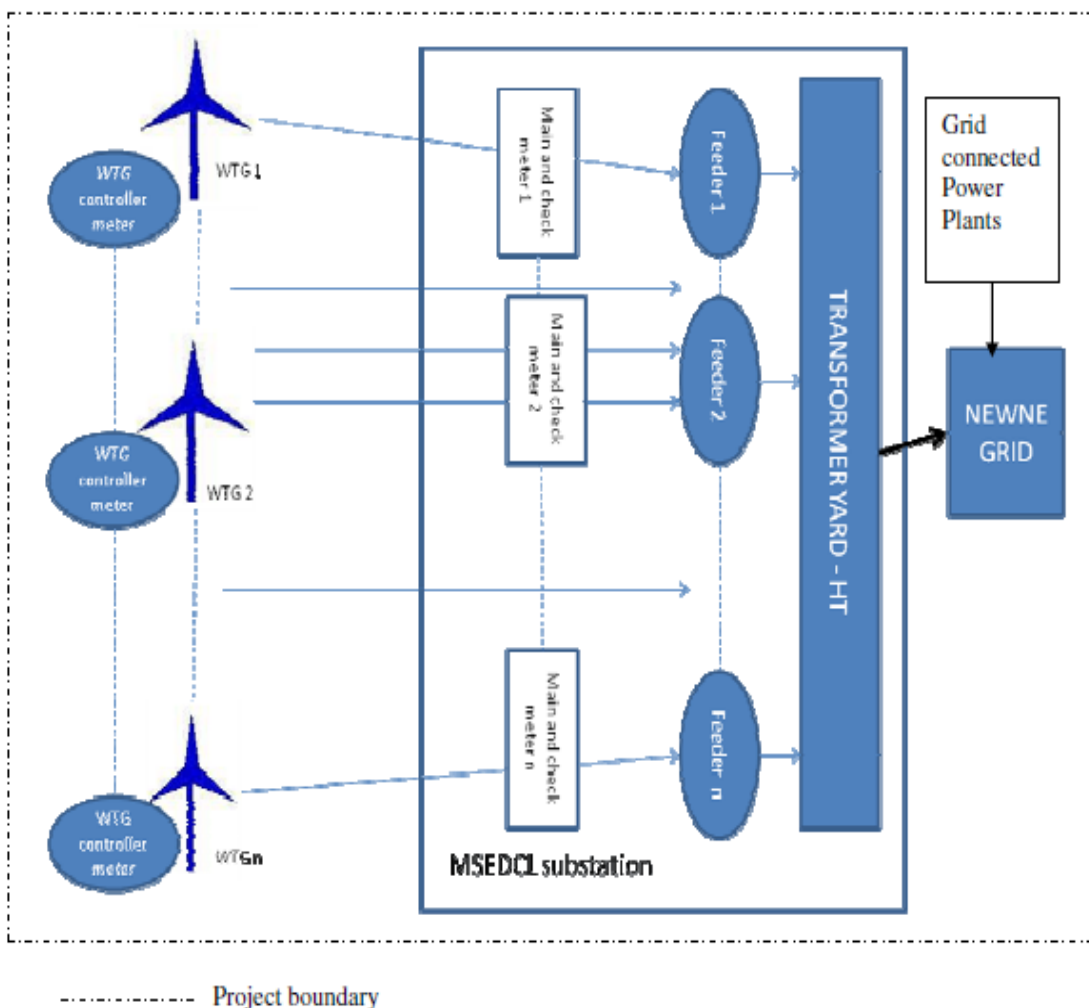
2.3 Project Boundary

As per the para 20 of the applicable methodology ACM0002 (Version 16.0.0) “*The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to*”.

Therefore, the project boundary includes all the 40 numbers of WTGs along with the WTGs of the other project proponents connected to the sub-station, which is further connected to the network of the NEWNE grid, i.e. the project boundary also includes the NEWNE grid. Thus, the project boundary further includes all the power plants physically connected to the NEWNE grid

Source		GHGs	Included?	Justification/Explanation
Baseline Scenario	Grid-connected electricity generation	CO ₂	Yes	Major emission sources.
		CH ₄	No	Excluded for simplification. This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
Project Scenario	Greenfield Wind energy conversion system	CO ₂	No	The project activity does not emit any emissions.
		CH ₄	No	No methane generation is expected to be emitted.
		N ₂ O	No	No nitrous oxide generation is expected to be emitted.

Project Boundary Diagram:



2.4 Baseline Scenario

As per para 23 of ACM0002 version 16.0; If the project activity is the installation of a Greenfield power plant

"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

2.5 Additionality

In line with VCS Standard version 3.5, the additionality of the Project activity is ascertained in line with the applicable guidance from the UNFCCC. The demonstration of additionality for the proposed Project activity is being carried out in accordance with the additionality tool provided by

the UNFCCC i.e. “Tool for demonstration and assessment of Additionality” Version 07.0.0,. The tool provides a step-wise approach to demonstrate additionality which is displayed below:

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

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

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

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

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

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

The PP could proceed with the implementation of the project without Carbon credit benefits. The electricity produced from the renewable energy project would have been sold to the grid. This is in compliance with all applicable legal and regulatory requirements and can be a part of the baseline. However, the Project activity is not feasible without revenues from sale of Carbon Credits. This argument has been discussed in step 2 of the Additionality section.

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

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

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

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

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

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

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

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

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

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

Step 2: Investment analysis

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

Sub-step 2a: Determine appropriate analysis method

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

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

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

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

Choice of Financial Indicator:

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

Choice of Benchmark:

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

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

Default Value Benchmark Calculations:

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

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

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

$$\text{Nominal Benchmark}^5 = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

Where:

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

Inflation Forecast as per RBI:

WTG Owner	WPI Inflation Forecast (Median) ⁶		Benchmark	
	5 Years	10 Years	5 Years	10 Years
Panama Wind Energy Godawari Private Limited	6.50%	6.00%	19.01%	18.46%

As a conservative approach, benchmark of 18.46% has been selected for this project activity.

Based on input parameters, the IRR comes out to be:

WTG Owner	Equity IRR without CDM	Benchmark
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⁵ Asper Pg.320 of Corporate Finance, Second Edition of Aswath Damodaran

⁶ <https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/01SPFMD291012.pdf>

Panama Wind Energy Godawari Private Limited	13.22%	18.46%
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Sub-step 2c: Sensitivity Analysis:

As per Guidance 20 and 21 of Annex 5 of EB 62 Annex 5, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Guidance also states, "All parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude". The Annex also states, as a general point of departure, variations in the sensitivity analysis should at least cover a range of +10% and –10%, unless this is not deemed appropriate in the context of the specific project circumstances.

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

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

The results of sensitivity analysis are as follows:

Variation %	-10%	Normal	10%	Breaching Value
PLF	9.97%	13.12%	16.47%	15.70%
O&M Cost	13.64%	13.12%	12.59%	-106.99%
Project Cost	16.33%	13.12%	10.71%	-15.25%
Tariff Rate	10.15%	13.12%	16.28%	16.59%

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

	Probability to breach the benchmark
PLF	Not possible as the PLF has been reported as per the Third Party Report based on long term data and hence a PLF fluctuation of more than 10% is unlikely to happen. Moreover, the project activity has considered higher PLF than what the applicable MERC order ⁷ considers.
O&M	With the country experiencing 6.50% inflation on an average, the question of O&M coming down is ruled out. Moreover, the purchase orders provide for a

⁷ [http://www.mercindia.org.in/pdf/Order%2058%2042/MERC_RE%20Tariff%20Order%20\(SuoMotu\)_for%20FY2012-13_Case%20No.%2010%20of%202012.pdf](http://www.mercindia.org.in/pdf/Order%2058%2042/MERC_RE%20Tariff%20Order%20(SuoMotu)_for%20FY2012-13_Case%20No.%2010%20of%202012.pdf)

	5% escalation in the cost every year. Even the tariff order of Maharashtra provides for a higher 5.72% escalation in the O&M cost.
Project Cost	The total project cost is -10.15% higher than considered at the time of decision making cost. Since the project cost is firm, there is no possibility of project cost going below this level. However, we have conducted sensitivity analysis for project cost being 10% less than that considered during decision making. Still, the IRR does not breach the Benchmark.
Tariff Rate	The tariff is determined by PPA which is fixed for years mentioned as per the State Electricity Board's tariff order. Hence, there is no probability to get variation for the same.

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice Analysis

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

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

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

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

Range	Capacity	Unit
+50%	120.00	MW
Capacity of the proposed project activity	80.00	MW
-50%	40.00	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 Maharashtra, India. Therefore, country has been chosen for analysis.
- (b) The project activity is a green-field wind power project and uses measure (b) “Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies”.
Therefore, all projects applying same measure (b) as the proposed project activity are candidates for similar projects.
- (c) The energy source used by the project activity is wind. Hence, only wind energy projects have been considered for analysis.
- (d) The project activity produces electricity; therefore, all power plants that produce electricity are candidates for similar projects.
- (e) The capacity range of the projects is within the applicable capacity range from 40.00 MW to 120.00 MW.
- (f) The start date of the project activity is 31/03/2014. As Kyoto Protocol was ratified by India on 26/08/2002⁸, therefore projects, which had started commercial operation between 26/08/2002 to 31/03/2014, have been identified.

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

Particulars	No. of Projects	Source
N _{Wind}	29	Directory - Indian Wind Power published by CECL, Bhopal -2013

Sources:

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

⁸http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

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

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

Thus $N_{all} = 23$

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 project activity is located in the state of Maharashtra of India and the policy applicable for the wind projects is regulated by Maharashtra Electricity Regulatory Commission. 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 states other than Maharashtra 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 $N_{all} = 23$; thus $N_{diff} = 21$

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

Calculate $F = 1 - N_{diff}/N_{all} = 0.0870$

As $N_{all} = 23$ thus and $N_{all} - N_{diff} = 2$;

Outcome of Step 5:

As,

- i. $F = 0.0870$ which is less than 0.2;
- 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 BaselineEmissions

As per para 46 of ACM0002 version 16.0, 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 (tCO 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 16.0),

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

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 16.0) has procedures for calculation of $EG_{PJ,y}$ for the following cases:

- Greenfield plants,
- Retrofits and replacements, and
- Capacity additions.

As the proposed project activity is Greenfield plant, option (a) as provided in the methodology ACM 0002 (Version 16.0) shall be applicable and is described below:

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

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

Where:

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

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

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

The methodology ACM0002 (Version 16.0) 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 10⁹ (December, 2014). The values for OM, BM, CM are given excluding and including imports. For the present project activity, including imports are considered.

STEP 1: Identify the relevant electricity power systems

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

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

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

⁹http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf

for the purpose of estimation of the baseline emission factor, the NEWNE grid has been chosen as the relevant electricity system.

Table: Grid Classification

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

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

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

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

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

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

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

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

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

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

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

2009-10	2010-11	2011-12	2012-13	2013-14
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NEWNE	15.9%	17.6%	19.0%	17.2%	18.0%
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Data Source: Central Electricity Authority (CEA) database Version 10, Dec'2014

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of three most recent years) for the NEWNE and Southern 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)			
	2011-12	2012-13	2013-14
NEWNE	508,004,381	546,941,372	569,215,756

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

Weighted Generation Operating Margin	
NEWNE	0.9862

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

Option 1 as described above is chosen to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

Build Margin (tCO ₂ /MWh) (not adjusted for imports)	
	2013-14
NEWNE	0.9495

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

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

Combined Margin – The combined margin is the weighted average of the simple operating Margin and the build margin. In particular, for intermittent and non-dispatchable generation types such as wind and solar photovoltaic, the Tool to calculate the emission factor for an electricity system, Version 05.0.0, EB 87, Annex 9, allows to weigh the operating margin and Build margin at 75% and 25%, respectively.

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

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

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

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

Where,

W_{OM}	75% weight of operating margin emissions factor (%)
W_{BM}	25% weight of operating margin emissions factor (%)
$EF_{grid,OM,y}$	Build margin CO ₂ emission factor of a particular grid in year y; calculated as described in Steps 3&4 above (tCO ₂ /MWh)
$EF_{grid,BM,y}$	Build margin CO ₂ emission factor of a particular grid in year y; calculated as described in Steps 5 above (tCO ₂ /MWh)

Baseline Emission factor (NEWNE Grid)

$$\begin{aligned} EF_{NEWNE, CM, y} &= 0.75 * 0.9862 + 0.25 * 0.9495 \\ &= 0.9770 \text{ tCO}_2/\text{MWh} \end{aligned}$$

Therefore, Baseline Emissions:

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

$$BE_y = 140,160 \times 0.9770 = 136,936 \text{ tCO}_2$$

3.2 ProjectEmissions

The project emission calculation as per para 35 of ACM0002 version 16,

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

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 16, "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 16, No leakage emissions need to be considered for the project activity.

3.4 Estimated Net GHG Emission Reductions and Removals

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

$$ER_y = BE_y - PE_y$$

Where:

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

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

$$ER_y = BE_y - PE_y$$

$$ER_y = 136936 - 0$$

$$= 136936 \text{ tCO}_2$$

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	136,936	0	0	136,936
Year 2	136,936	0	0	136,936
Year 3	136,936	0	0	136,936
Year 4	136,936	0	0	136,936
Year 5	136,936	0	0	136,936
Year 6	136,936	0	0	136,936
Year 7	136,936	0	0	136,936
Year 8	136,936	0	0	136,936
Year 9	136,936	0	0	136,936
Year 10	136,936	0	0	136,936
Total	1,369,360	0	0	1,369,360

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 10, December 2014 ¹⁰
Value applied:	0.9862 (NEWNE Grid)
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 05.0.0" as 3-year generation weighted average using data for the years 2011-2012, 2012-2013 & 2013-2014. The data are obtained from "CO ₂ Baseline Database for Indian Power Sector" version 10.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014

¹⁰http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

Value applied:	0.9495 (NEWNE Grid)
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per “Tool to calculate the emission factor for an electricity system, version 05.0.0” for the year 2013-2014. The data is obtained from “CO ₂ Baseline Database for Indian Power Sector” version 10.0, 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	Combines Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014 ¹¹
Value applied:	0.9770 (NEWNE 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 by MSECDCL
Description of measurement methods and procedures to be applied	The value of net electricity generation supplied to the grid as per Joint Meter Reading Report forms the basis for calculation of the emission reductions; which can be cross checked from the invoice raised to DISCOM. Net electricity supplied to grid will be calculated as the difference of the measured values of “export” and “import” of electricity through the dedicated SEB energy meter installed at the delivery point (i.e. the connected substation). Net electricity generated and supplied by the project (Wind) plant/unit to the grid = Electricity Export to the grid - Electricity Import from the grid Monthly meter readings are taken from the main and check meter installed at the substation and certified by the representatives of

¹¹http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

	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:	140,160MWh
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 year¹² and faulty meters will be duly replaced immediately. - All the energy meters are under the control of state utility and calibration of energy meters is also under the jurisdiction of state utility. - The Net electricity exported to the grid will be cross checked against the invoice raised by the PP towards the DISCOM
Purpose of data	Calculation of Baseline emissions
Calculation method	-
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

4.3 Monitoring Plan

Aim of monitoring:

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

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

Monitoring roles and responsibilities

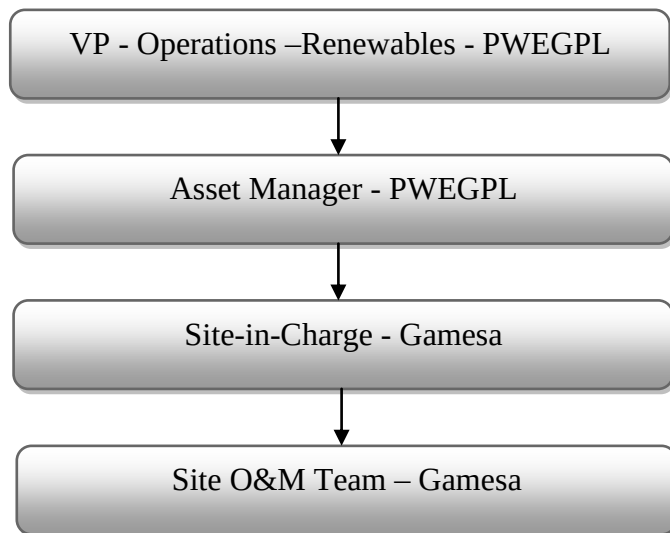
The operational and management structure implemented for data monitoring is as follows:

The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected wind power project being implemented in Maharashtra, India. The monitoring plan, which will be implemented by the project proponent

¹²As per CEA regulation

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 Gamesa wind turbines private limited.

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 MSEB. 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 MSEDCL. The meters are calibrated by MSEB at-least once in three 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.

A monthly joint meter reading of the energy meters is taken by MSEDCL officials and O&M contractors (representatives of the project investor). Apportioning of net electricity generation from each WTG connected to NEWNE grid is then determined as follows:

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

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

Emergency Preparedness and Uncertainty Procedure:

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

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

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

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

5 ENVIRONMENTAL IMPACT

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

6 STAKEHOLDER COMMENTS

The stakeholders of the project activity were invited to attend the stakeholder meeting on 27/06/2013 through newspaper advertisement (in Lokprasna, dated 20/06/2013). Personal invitations were also sent to the prominent members of the regions in the vicinity.

A stakeholder meeting was held at Beed district on 27/06/2013, involving the local stakeholders. The meeting was attended by local villagers, panchayat members and representatives of Panama Wind Energy Godawari Private Limited.

The stakeholders were explained about the project activity and the various benefits arising out of the project activity. A discussion was held in which the views of the local stakeholders were addressed.

Summary of comments received

The villagers were happy with the fact that the installation of such a project would bring about development in the region. The queries raised by the local stakeholders were:

- Has the project affected the ground water level?
- Does this wind project affect rainfall?
- How other sources of power generation lead to pollution?
- How will CDM benefit the society?

Report on consideration of comments received

The queries of the stakeholders were answered satisfactorily by the project proponent representatives through scientific and logical explanations. The responses were as below.

- Wind power projects do not affect either the ground level or drinking water quality of nearby area of the project
- No, such project does not affect the rainfall by any chance. Clouds bearing rainfall are usually at the height of 300m and the WTG is of 90 m height, which remotely removes the chance of affecting the rainfall.
- Conventionally, power is generated from thermal power plants using fossil fuels. This leads to emission of NOx, CO2 and SO2.
- CDM helps in reducing the emission of GHGs and in sustainable improvement of the country. This will also decrease the further demand of coal for the generation of electricity and will result in financial and environmental benefits.

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

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

7 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

7.1 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:	192,164.27
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years

7.2 Baseline Emissions

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

Where:

BE_y : Baseline emissions in year y (tCO_2e/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_2e/MWh)

Parameter	Unit	Value
$EG_{PJ,y}$	MWh	192,164.27
$EF_{grid, CM, y}$	tCO_{2e}	0.9770
	=	$192,164.27 * 0.9770$
	=	187,744

7.3 Project Emissions

$PE_{FF,y} = 0$, As per para 37 of ACM0002 version 16, "For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected"

$$PR_{FF,y} = 0$$

7.4 Leakage

As per para 60 of ACM0002 version 16, No leakage emissions need to be considered for the project activity.

7.5 Net GHG Emission Reductions and Removals

$$ER_y = BE_y - PE_y$$

Where:

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

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

$$ER_y = BE_y - PE_y$$

$$ER_y = 187,744 - 0$$

$$= 187,744 \text{ tCO}_2$$

Vintage wise GHG emission reduction for the monitoring period starting from 31-March-2014 to 01-March-2016 is as follows

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2014	34,597	0	0	34,597
2015	141,720	0	0	141,720
2016	11,427	0	0	11,427
Total	1,877,44	0	0	1,877,44

APPENDIX I: CO₂ DATABASE OF CEA

From CO₂ database of CEA, Version 10 published by Government of India, Ministry of Power Central Electricity Authority, Government of India

CENTRAL ELECTRICITY AUTHORITY: CO ₂ BASELINE DATABASE	
VERSION	10
DATE	6-Dec-14
BASELINE METHODOLOGY	ACM0002 / Ver 16.0 and "Tool to Calculate the Emission Factor for an Electricity System", Version 5.0

Net Generation in Operating Margin (MWh) (incl. Imports)			
	2011-12	2012-13	2013-14
NEWNE	508,004,381	546,941,372	569,215,756

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports) (1) (2)			
	2011-12	2012-13	2013-14
NEWNE	0.9699	0.9919	0.9953

Weighted Generation Operating Margin(tCO ₂ /MWh)	
NEWNE	0.9862

Build Margin (tCO ₂ /MWh) (not adjusted for imports)			
	2011-12	2012-13	2013-14
NEWNE	0.9331	0.9813	0.9495

Combined Margin Emission Factor(tCO ₂ /MWh)	
NEWNE	0.9770

ANNEX 01- FINANCIAL PARAMETERS

Assumption and financial of the project			
Details of the project		Source	Link
State where the project is situated	Maharashtra	As Per Offer Letter	
No. of machines	40	As Per Offer Letter	
Capacity /machine (MW)	2	As Per Offer Letter	
Total Capacity (MW)	80.00	Calculated Value	
Expected Date of Commissioning	31-Mar-14	Assumption	
Life of the plant (Yrs.)	25	As per WTG manufacturer specifications	
Generation of electricity			
PLF (%)	20.00%	As per Third Party Report in accordance to EB 48 Annex 11	
Annual generation (kWh)	140,160	Calculated Value	
Deration after 10th year	5.00%	As per TERI report, Page 19	
Tariff rate at the decision making (INR/kWh)	5.67	MERC tariff order dated 30/03/2012	http://www.mercindia.org.in/pdf/Order%2058%2042/MERC_RE%20Tariff%20Order%20(SuoMotu)_for%20FY2012-13_Case%20No.%2010%20of%202012.pdf
GBI Benefit (INR/kWh)	0.50	As per MNRE scheme dt. 04.09.2013,	http://mnre.gov.in/file-manager/grid-wind/gbi-scheme.pdf
Operation and maintenance cost and Insurance			
O & M Expenses (INR Mn.)	-	As Per Offer Letter	
O & M Expenses for WTG in Year 2 (INR Mn.)	112.36	As Per Offer Letter	
O & M Expenses for WTG in Year 3 (INR Mn.)	117.98	As Per Offer Letter	
O & M Expenses for WTG in Year 4	123.88	As Per Offer Letter	

(INR Mn.)			
O & M Expenses for WTG in Year 5 (INR Mn.)	130.07	As Per Offer Letter	
Escalation in the operational expenses (%)	5.72%		
Insurance (INR Mn.)	6.90	As per TAC order 2001, Sheet No. 31	http://iib.gov.in/IRDA/tac/tariffs/AIFT2001.pdf
Financial parameters			
TOTAL COST (INR Mn.)	4600.00	As Per Offer Letter	
Loan Amount (INR Mn.)	3220.00	MERC tariff order dated 30/03/2012	http://www.mercindia.org.in/pdf/Order%2058%2042/MERC_RE%20Tariff%20Order%20(SuoMotu)_for%20FY2012-13_Case%20No.%2010%20of%202012.pdf
Equity Investment (INR Mn.)	1380.00	Calculated Value	
Term loan			
Loan Amount (INR Mn.)	3220.00	MERC tariff order dated 30/03/2012 pg 39	http://www.mercindia.org.in/pdf/Order%2058%2042/MERC_RE%20Tariff%20Order%20(SuoMotu)_for%20FY2012-13_Case%20No.%2010%20of%202012.pdf
Interest rate (%)	13.73%		
Loan Tenure (Qtr.)	40		
Moratorium Period (Qtr.)	-		
Repayment Period (Qtr.)	80.500	Calculated Value	
Repayment instalments value (INR Mn.)	105.149	Calculated Value	
1st instalment from (Qtr. end)	30-Jun-14	Considered from the next Quarter End	
Book Depreciation (SLM Method)			
Land	-	As Per Offer Letter	
Gross Depreciable Value (INR Mn.)	6400.00	Calculated Value	
Salvage Value (%)	10.00%	Standard accounting practice	
Salvage value (INR Mn.)	460.00	Calculated Value	
Net Depreciable Value (INR Mn.)	4,140.00	Calculated Value	
Residual Value (INR Mn.)	460.00	Calculated Value	
IT Depreciation			

IT Depreciation (WDV Method) (%)	7.69%	As Per IREDA Operational Guidelines, Pg 5	http://www.ireda.gov.in/writereaddata/OPERATIONAL_GUIDELINES%20for%20Wind%20GBI%20Extension%20Scheme%20%282012-2017%29%281%29.pdf
Income Tax			
Financial Year	FY 2013-14		
Income tax rate (%)	30.00%	As Per Income Tax Rule, Pg 30 Para E(I)	http://indiabudget.nic.in/ub2014-15/fb/bill1.pdf
MAT (%)	18.50%	As Per IT rule Pg 4	http://indiabudget.nic.in/ub2012-13/mem/mem1.pdf
Service Tax (%)	12.00%	As Per Income Tax Rule	http://pib.nic.in/newsite/erelease.aspx?relid=47885
Surcharge (%)	10.00%	As Per Income Tax Rule, Pg 30	http://indiabudget.nic.in/ub2014-15/fb/bill1.pdf
Education cess (%)	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12	http://indiabudget.nic.in/ub2014-15/fb/bill1.pdf
Final Tax rates			
Income tax rate (%)	33.99%	Calculated Value	
MAT (%)	20.96%	Calculated Value	
Service Tax (%)	12.36%	Calculated Value	

ANNEX 2 CALIBRATION DETAILS

Calibration details

WTG ID	Feeder Connectivity	No. of WTGs	Date of commissioning	Main Meter Sr. No.	Check Meter Sr. No.	Meter Make Accuracy Class	Validity of Calibration ¹⁵
Location No. - 38,26,32	Feeder No.1	8	25-Jul-14	5288748	5288752	Elster 0.2s	24-Jul-19
Location No. - 24,25,29,30,31			31-Mar-14				30-Mar-19
Location No. - 21	Feeder No.2	13	05-Oct-14	5288749	5288753	Elster 0.2s	04-Oct-14
Location No. - 5,22,23			06-Sep-14	5288749	5288753		07-Sep-14
Location No. - 33,34,35,36,37,39,40			31-Mar-14	5288749	5288753		30-Mar-14
Location No. - 27,28			25-July-15	5288749	5288753		24-July-15
Location No. - 1,2,3,4,6,7,8,10,11	Feeder No.3	9	7-Oct-14	5288751	5288750	Elster 0.2s	06-Oct-14
Location No. - 9,12,13,16,18,19,20	Feeder No.4	7	7-Oct-14	5288755	5288754	Elster 0.2s	06-Oct-14
Location No. - 17,14,15		3	6-Sep-14	5288755	5288754		

¹⁵ Calibration frequency is of five years, thus for the current monitoring period (31/03/2014 to 01/03/2016) all the meters are calibrated.