

46 MW Mangoli Wind Power Project in Karnataka



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Table of Contents

1	Project Details	3
1.1	Summary Description of the Project and its Implementation Status	3
1.2	Sectoral Scope and Project Type	3
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	4
1.7	Project Scale and Estimated GHG Emission Reductions or Removals	4
1.8	Description of the Project Activity	5
1.9	Project Location	7
1.10	Conditions Prior to Project Initiation	8
1.11	Compliance with Laws, Statutes and Other Regulatory Frameworks	8
1.12	Ownership and Other Programs	9
1.12.1	Project Ownership	9
1.12.2	Emissions Trading Programs and Other Binding Limits	9
1.12.3	Other Forms of Environmental Credit	9
1.12.4	Participation under Other GHG Programs	9
1.12.5	Projects Rejected by Other GHG Programs	9
1.13	Additional Information Relevant to the Project	9
2	Application of Methodology	10
2.1	Title and Reference of Methodology	10
2.2	Applicability of Methodology	10
2.3	Project Boundary	13
2.4	Baseline Scenario	14
2.5	Additionality	15
2.6	Methodology Deviations	24
3	Quantification of GHG Emission Reductions and Removals	24
3.1	Baseline Emissions	24
3.2	Project Emissions	24
3.3	Leakage	25
3.4	Estimated Net GHG Emission Reductions and Removals	25
4	Monitoring	26
4.1	Data and Parameters Available at Validation	26
4.2	Data and Parameters Monitored	27
4.3	Monitoring Plan	28
5	Safeguards	30
5.1	No Net Harm	30
5.2	Environmental Impact	30
5.3	Local Stakeholder Consultation	31
5.4	Public Comments	32
6	ACHieVED GHG Emission Reductions and Removals	32
6.1	Data and Parameters Monitored	32
6.2	Baseline Emissions	32
6.3	Project Emissions	34
6.4	Leakage	34
6.5	Net GHG Emission Reductions and Removals	34

1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The project activity is installation of 46 MW wind power project, promoted by Energon KN Wind Power Private Limited. The purpose of the project activity is to generate clean electricity with utilization of wind energy. The project consists of 23 numbers of Vestas V110 Wind Turbine Generators (WTGs) of 2.0 MW capacities each. The project WTGs are installed in the villages Mangoli & Hegadihala in Bijapur district of Karnataka in India.

All the WTGs of the project activity were commissioned on 23/07/2016.

The electricity generated by the project is exported to the Indian electricity grid. The project activity will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. Since wind power is Greenhouse Gas (GHG) emissions free, the power generated will prevent the anthropogenic gas emissions generated by fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas.

There was no activity at the site prior to implementation of the project activity. Hence the scenario existing prior to the project activity is same as baseline scenario which is continual use of highly carbon intensive electricity in the regional grid.

The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only. Thus the project activity leads to an emission reduction of 1,202,680 tCO₂ for the chosen crediting period of 10 years.

The current monitoring period chosen is from 23-July-2016 to 31-May-2018 (inclusive of first & last date) and the GHG emission reductions calculated are 230,174 tCO₂

1.2 Sectoral Scope and Project Type

Sectoral Scope: 1 Energy Industries (Renewable/Non-Renewable Sources)

Methodology applied is ACM 0002 of version 19.0

The project is not a grouped project, it is a standalone 46 MW wind power project by a single project developer.

1.3 Project Proponent

Organization name	Energion KN Wind Power Private Limited
Contact person	Rajesh Gathala
Title	Managing Director
Address	1st Floor, Embassy Icon Annexe, 2/1 Infantry Road, Bangalore- 560001, Karnataka, India
Telephone	080-66454000
Email	-

Organization name	Kosher Climate India Private Limited
Contact person	Vamsi Krishna M
Title	CAB Head
Address	#109, 2nd Floor, 27th Main, Sector – 1, HSR Layout, Bangalore-560102, India
Telephone	011- 30501110-03
Email	vamsi@kosherclimate.com

1.4 Other Entities Involved in the Project

Not Applicable.

1.5 Project Start Date

The project start date for this project is said to be 23rd July 2016. This is the day on which the first machine was commissioned.

1.6 Project Crediting Period

23rd July 2016 to 22nd July 2026 and then for another period of 20 Years (10 years, renewable twice)

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	√ (Yes)
Large project	--

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	120,268
Year 2	120,268
Year 3	120,268
Year 4	120,268
Year 5	120,268
Year 6	120,268
Year 7	120,268
Year 8	120,268
Year 9	120,268
Year 10	120,268
Total estimated ERs	1,202,680
Total number of crediting years	10
Average annual ERs	120,268

1.8 Description of the Project Activity

The project activity envisages implementation of a 46 MW wind power project consisting of 23 Wind Electric Generators (WTGs) of individual capacity 2.0 MW.

The electricity generated by the project will be exported to the INDIAN electricity grid. The project activity 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 VERs benefits for the project.

The project activity is in line with the sustainable development priorities of the country. The electricity generated from the wind farm will be exported to the INDIAN grid and sold to the state electricity utility, thereby marginally contributing to reducing the energy demand supply gap in the state of Karnataka.

The life time of the Project is 25 years.

Technology

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 project activity is the installation of an environmentally safe and sound technology since there are no GHG emissions associated with the electricity generation.

The technical specifications of the WTGs have been provided as below.

Vestas V110	
Rated power	2000 kW
Average Annual Wind speed	7.5 m/s
Turbulence Intensity I15%	18 m/s
Reference 10 minute wind speed for 50 years	37.5 m/s
Survival wind speed	52.5 m/s
POWER	
Rated power	2000 kW
Average Annual Wind speed	7.5 m/s
Turbulence Intensity I15%	18 m/s
Reference 10 minute wind speed for 50 years	37.5 m/s
Survival wind speed	52.5 m/s
GENERATOR	
Type	Doubly-fed with coil rotors and slip rings
Rated power	2.0 MW
Voltage	690 V AC
Frequency	50Hz/60Hz
Protection class	IP 54
Power Factor	0.95 CAP – 0.95 IND throughout the power range
ROTOR	
Diameter	97 m
Swept area	7390 sq.m
Speed range (variable)	9:19 rpm
TOWER AND FOUNDATION	
Hub height	104 m
Design	Tubular, Four sections
Foundation type	Floating foundation
GEAR BOX	
Type	1 Planetary stage & 2 Parallel stage
Ratio	1:106.8 (50 Hz), 1:127.2 (60 Hz)

Emission Reductions from anthropogenic sources:

The wind power generated from the project site will be displacing the electricity generated from thermal power stations feeding into INDIAN grid and will be replacing the usage of fossil fuels for meeting the power demand in the region. Since wind power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by

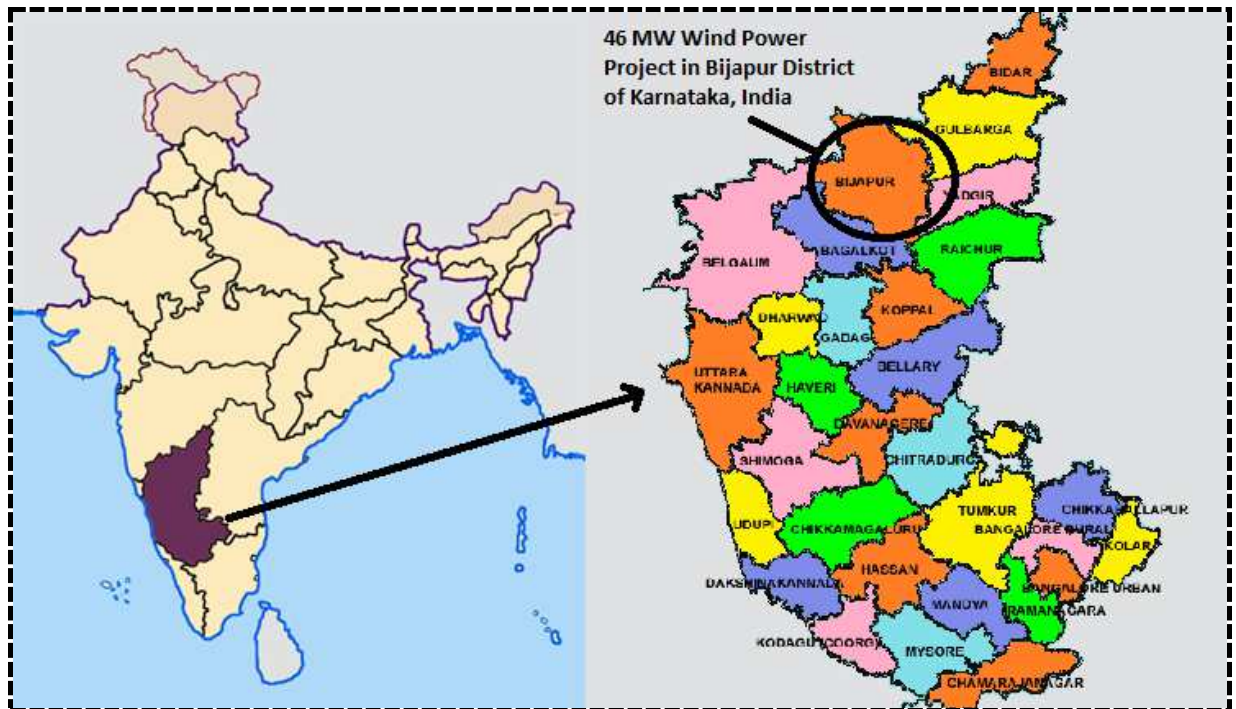
the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only.

1.9 Project Location

The project activity is located at Bijapur district of Karnataka State, India. The geo-coordinates of the project location are as follows:

S.No	WTG No	Village	Taluk	District	Latitude	Longitude
1	Loc-1	Mangoli	Basavana Bewadi	Bijapur	16.662860	75.840409
2	Loc-2	Mangoli	Basavana Bewadi	Bijapur	16.668194	75.840142
3	Loc-3	Mangoli	Basavana Bewadi	Bijapur	16.670061	75.847783
4	Loc-4	Hegadihala	Bijapur	Bijapur	16.674754	75.845131
5	Loc-5	Mangoli	Basavana Bewadi	Bijapur	16.675373	75.839536
6	Loc-6	Hegadihala	Bijapur	Bijapur	16.676985	75.843378
7	Loc-7	Mangoli	Basavana Bewadi	Bijapur	16.680614	75.842325
8	Loc-8	Mangoli	Basavana Bewadi	Bijapur	16.685977	75.841392
9	Loc-9	Mangoli	Basavana Bewadi	Bijapur	16.695548	75.841743
10	Loc-10	Hegadihala	Bijapur	Bijapur	16.698493	75.844476
11	Loc-11	Mangoli	Basavana Bewadi	Bijapur	16.701300	75.843250
12	Loc-12	Mangoli	Basavana Bewadi	Bijapur	16.688500	75.829933
13	Loc-13	Mangoli	Basavana Bewadi	Bijapur	16.692902	75.825638
14	Loc-14	Mangoli	Basavana Bewadi	Bijapur	16.696307	75.826131
15	Loc-15	Mangoli	Basavana Bewadi	Bijapur	16.701433	75.832728
16	Loc-16	Mangoli	Basavana Bewadi	Bijapur	16.706362	75.832121
17	Loc-17	Hegadihala	Bijapur	Bijapur	16.703868	75.827411
18	Loc-18	Hegadihala	Bijapur	Bijapur	16.709387	75.837377
19	Loc-19	Mangoli	Basavana Bewadi	Bijapur	16.711336	75.849307
20	Loc-20	Mangoli	Basavana Bewadi	Bijapur	16.716030	75.839704
21	Loc-21	Mangoli	Basavana Bewadi	Bijapur	16.715510	75.825088
22	Loc-22	Mangoli	Basavana Bewadi	Bijapur	16.712659	75.826126
23	Loc-23	Mangoli	Basavana Bewadi	Bijapur	16.708829	75.823108

The geographical location of the project site is as shown below:



1.10 Conditions Prior to Project Initiation

The project is Greenfield project. There was no project installed prior to commissioning of this project. The project activity is set up to produce clean power from the wind energy converters (WEC's) which can be also named as Wind Turbine Generator (WTG). The project activity involves supply, erection, commissioning and operation of 23 machines of rated capacity 2MW each totalling an installed capacity of 46 MW.

The project does not generate any GHG emissions and hence it can be said that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction.

In the absence of the project activity the equivalent amount of electricity sold to grid would have been generated by grid connected power plants (which is predominantly based on fossil fuels) and by the addition of new generation sources.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Indian Electricity Act, 2003¹, does not restrict the choice of fuel for power generation. Moreover, it does not mandate electricity generation from wind projects, although there are specific state policies to promote the utilisation of renewable sources of energy, so as to cut dependence on coal, which is the mainstay fuel for power generation in India. Hence no national or sectoral policies prevent the implementation of either the baseline or the project activity. Given that the project activity is generation of electricity using wind energy and exporting the same to the grid system, which is also fed by other fuel sources such as fossil and non-fossil types.

¹ http://www.cea.nic.in/reports/electricity_act2003.pdf

Emission reductions due to the project activity are considered to be equivalent to the emissions avoided in the baseline scenario by displacing the grid electricity. Emission reductions are related to the electricity exported by the project and the actual generation mix in the grid system.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The project activity comprises of 23 WTGs owned by “Energon KN Wind Power Private Limited”.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not Applicable. The project activity has applied for registration under VCS programme only and hence GHG emission reductions and removals generated by the project will not be used for compliance under such programs or mechanisms. Further it is clarified that GHG emissions from Project activity are not included in any other emissions trading program or any other mechanism that includes GHG allowance trading.

1.12.3 Other Forms of Environmental Credit

Not Applicable.

1.12.4 Participation under Other GHG Programs

The project is not seeking registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

No, the project activity is not rejected by other GHG programs

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Not Applicable.

Leakage Management

Not Applicable.

Commercially Sensitive Information

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

Sustainable Development

Social wellbeing: The project helps in generating employment opportunities during the construction and operation phases. The project activity leads to development in infrastructure in the region like development of roads and also may promote locals business with improved power

generation. The project proponent will contribute 2% of net revenue realised from sale of VERs towards community development initiatives.

Economic wellbeing: 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.

Environmental Wellbeing: 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 wellbeing: 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.

Further Information

Not applicable as, there are no 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

The methodology applied for the project is Approved Large Scale Consolidated Methodology: ACM0002 "Grid-connected electricity generation from renewable sources" (Version 19.0, EB100)²

ACM0002 draws upon the following tools which have been used in the PD:

- Methodological Tool: Tool to calculate the emission factor for an electricity system - Version 7.0, EB 100, Annex 6³.
- Methodological Tool: Tool for the demonstration and assessment of additionality - Version 07.0.0, EB 70 Annex 8⁴.

2.2 Applicability of Methodology

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

Applicability Criteria	Applicability status
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install Greenfield power plant; (b) involve a capacity addition to (an) existing plant(s); (c) involve a retrofit of (an)	The proposed project activity is a Green field, Indian grid connected renewable power plant.

² <http://cdm.unfccc.int/methodologies/DB/VJ19AX539D9MLOPXN2AY9UR1N4IYGD>

³ http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf/history_view

⁴ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

existing plant(s)/unit(s); (d) involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) involve a replacement of (an) existing plant(s)/unit(s)	Therefore, it confirms to the said criteria
The methodology is applicable under the following conditions: 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 project activity is the installation of a new grid connected renewable wind power project. Thus, it meets the first applicability condition
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 or 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 new wind power plant/unit. Therefore, the said criteria is not applicable
In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or (b) The project activity is implemented in an 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 calculate equation (3), is greater than 4 W/m². (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density of 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 4W/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% of the total installed capacity of integrated hydro power project	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
In the case of integrated hydro power projects, project proponent shall:	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said

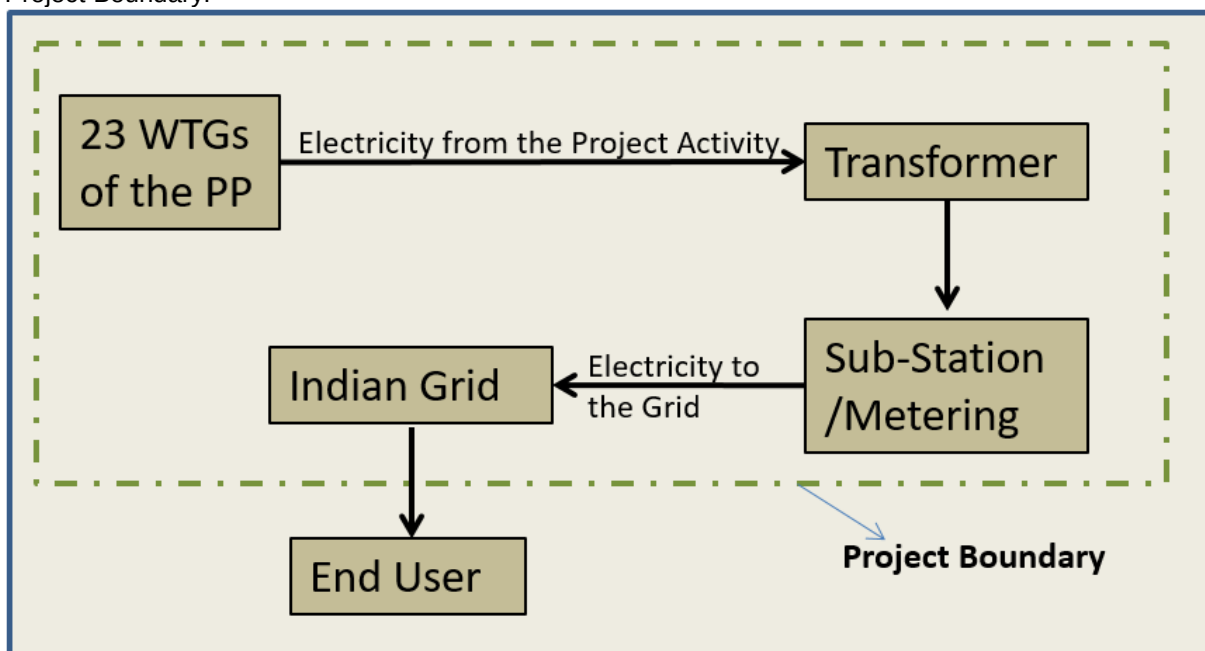
(a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all 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 indifferent 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.	criterion is not applicable
The methodology is not applicable to: (a) 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; (b) Biomass fired power plants;	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The proposed project activity is the installation of a green field wind power plant. Therefore, the said criterion is not applicable.
In addition, the above applicability conditions the applicability conditions of tool referred in the methodology ACM0002, version 19.0 has been referred here under:	
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid(e.g. demand-side energy efficiency projects).	This condition is applicable. OM, BM and CM are estimated using the tool for calculating baseline emissions.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity	Since the project activity is grid connected, this condition is applicable and the emission factor has been calculated accordingly.

generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project activity is located in India, a non-Annex I country. Therefore, this criterion is not applicable for the project activity
Under this tool, the value applied to the CO ₂ emission factor of bio fuels is zero	The project activity is a grid connected wind power project and therefore, this criterion is not applicable for the project activity

2.3 Project Boundary

Source		GHGs	Included?	Justification/Explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project	For dry or flash steam geothermal power plants, emissions of CH ₄ and CO ₂ from noncondensable gases contained in geothermal steam	CO ₂	No	Main emission source
		CH ₄	No	Main emission source
		N ₂ O	No	Minor emission source
	For binary geothermal power plants, fugitive emissions of CH ₄ and CO ₂ from noncondensable gases contained in geothermal steam	CO ₂	No	Main emission source
		CH ₄	No	Main emission source
		N ₂ O	No	Minor emission source
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	Low GWP hc/ refrige-rant	No	Main emission source
		CO ₂	No	Main emission source
		CH ₄	No	Minor emission source
	CO ₂ emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	N ₂ O	No	Minor emission source
		CO ₂	No	Minor emission source
		CH ₄	No	Main emission source
	For hydro power plants, emissions of CH ₄ from the reservoir	N ₂ O	No	Minor emission source

Project Boundary:



2.4 Baseline Scenario

As per the approved consolidated Methodology ACM0002 (Version 19.0, EB 100, Annex 6) para 22:

"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", Version 7.0, EB 100, Annex 4.

The project activity involved setting up of WTGs to harness the power of wind to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied to the electricity grid by the operation of grid-connected power plants (mainly by fossil fuel fired plants) and by the addition of new generation sources, as reflected in the combined margin (CM) calculations.

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

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9475 tCO ₂ /MWh	Combined margin CO ₂ emission	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25)

		factor for the project electricity system in year y	values, sourced from Baseline CO ₂ Emission Database, Version 13.0 published by Central Electricity Authority (CEA), Government of India
EF _{grid,OM,y}	0.9726 tCO ₂ /MWh	Operating margin CO ₂ emission factor for the project electricity system in year y	Calculated as the last 3 year (2014-15, 2015-16 & 2016-17) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 13.0, published by Central Electricity Authority (CEA), Government of India
EF _{grid,BM,y}	0.8723 tCO ₂ /MWh	Build margin CO ₂ emission factor for the project electricity system in year y	Baseline CO ₂ Emission Database, Version 13.0, published by Central Electricity Authority (CEA), Government of India

The baseline case is in compliance with all applicable legal and regulatory requirements references.

2.5 Additionality

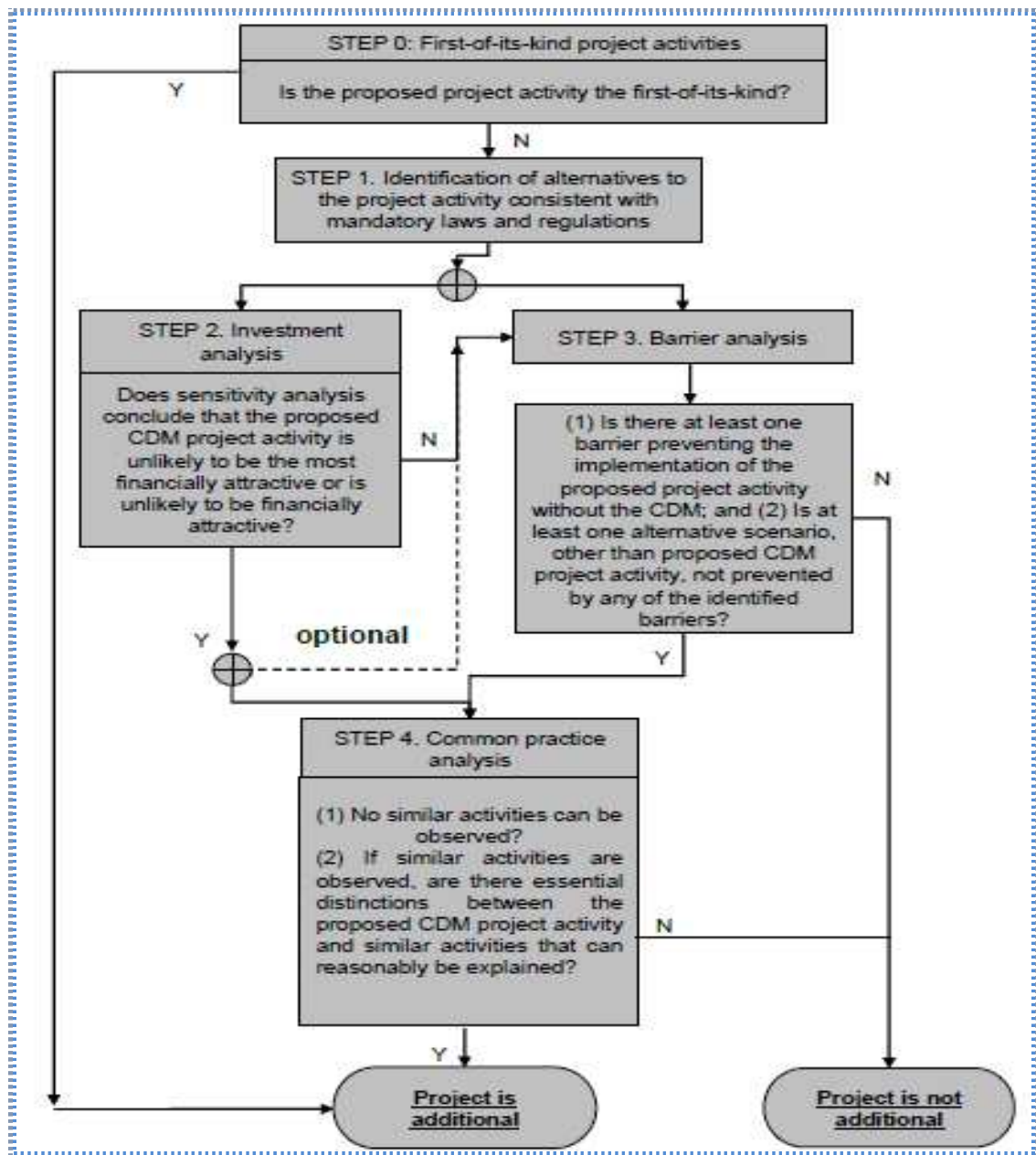
The table below is only applicable if the proposed project activity is a type of project activity which is deemed automatically additional, as defined by the applied approved methodology or standardized baseline.

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 proposed 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 19.00).

The project follows section 5.3.2 which requires the project proponent to determine the additionality based on "Tool for the demonstration and assessment of additionality", Version 07.0.0.

The step-wise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:



As per the applied methodology requirement, Additionality of the project activity is demonstrated using the Methodological tool “Demonstration and assessment of additionality” Version 07.0.0. The tool defines the following steps:

Sub 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 as implementation of wind power project in the State of Karnataka is not first of its kind.

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

As per the applied ACM 0002 version 19.0; Para 22, *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 plant and by the addition of new generation sources.

As the baseline scenario is prescribed by applied methodology, hence no further analysis is carried out to identify alternatives.

Step 2: Investment Analysis

As per para 29 of "Tool for the demonstration and assessment of additionality" v7.0.0, it is determined that the proposed project activity is not an economically attractive or financially feasible option.

To conduct the investment analysis, Methodological tool: Investment analysis, version 8.0, EB 97 Annex 8 has been referred.

Sub-step 2a: Determine appropriate analysis method

As per "Tool for the demonstration and assessment of additionality" (version 07.0.0), for financial analysis of the project, the following three options are available:

Option I: Simple Cost Analysis

Option II: Investment Comparison Analysis

Option III: Benchmark Analysis

The project will generate revenues from sale of electricity, therefore Option I is not applicable in line with para 32 of the Methodological tool: "Tool for the demonstration and assessment of additionality", version 7.0. Same applies to the Option II which is applied in case there are alternatives to the project activity as per para 42 of the "Tool for the demonstration and assessment of additionality", version 7.0.

Since, identified baseline for the proposed project activity is continuation of current practice (i.e. equivalent amount of energy would be generated by grid electricity system through its currently operating power plants and by new capacity addition) and which is outside the direct control of the project participant, hence benchmark analysis (option III), where the returns on investment in the project activity are compared to benchmark returns that are available to any investors in the country is selected as the most appropriate method.

Sub-step 2b: Option III. Apply benchmark analysis

As per Para 15 of EB97, Annex 8 states that Required/expected returns on equity are appropriate benchmarks for equity IRR. The project participant has chosen benchmark analysis to demonstrate the additionality of the project. The project is promoted by limited company and hence the return on equity and the risks associated with the investments for their shareholder is of primary concern. Hence, in order to analyse the financial viability of the project activity, the prime financial indicator that has been used is the post-tax equity IRR of the project activity.

Selection of Appropriate Benchmark

The benchmark has been considered in accordance with Guidance 17 and 18 of EB97, Annex 8, "The values in the table in the Appendix may also be used, as a simple default option".

Methodology deployed for arriving at a suitable value of Benchmark using Default Value has been described below:

- As the proposed project activity generates power utilizing wind energy, Group 1 as per para 5a of Appendix of EB97, Annex 8 has been identified as a suitable category.
- The investment analysis has been carried out in Nominal terms. Accordingly, Default value as given in table under the Appendix, EB97, Annex 8 has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
- In case of inflation data from RBI, Benchmark has been calculated based on WPI median inflation rate. As per Para 16 of EB97, Annex 8, the inflation forecast should be for the duration of the

crediting period. However, since RBI provides forecast inflation only for 5 & 10 years, the project investor has calculated benchmark using 5 year & 10 Years forecast and the most conservative value is considered as Benchmark for the project activity.

The benchmark has been computed in the following manner:

Default Value Benchmark:

The cost of equity is determined by selecting the values provided in the table of the Appendix, i.e. Default values for cost of equity (expected return on equity) in the 'Methodological tool: Investment analysis'.

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 = 10.73% (as per Appendix of EB97, Annex 8)

Inflation Rate forecast for by Reserve Bank of India (RBI) (i.e. Central Bank of India) for India.

Benchmark estimation:

The Cost of Equity has been considered using the "Methodological tool: Investment analysis" available at the time of decision making as well as the latest available value. As a conservative approach, the minimum value of benchmark has been considered as calculated using these 2 approaches.

Table under Appendix in EB97, Annex 8 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **10.73%**⁶

Thus, minimum cost of equity considered for calculation of Benchmark = 10.73%

Inflation Forecast for India as per RBI website⁷ and corresponding benchmark values:

Project Promoters' Name	Inflation Forecast		Benchmark	
	5 Years	10 Years	5 Years	10 Years
Energion KN Wind Power Private Limited	5.30%	5.00%	16.60%	16.27%

As a conservative approach, benchmark of **16.27%** has been selected for this project activity.

Sub-step 2c: Calculation and comparison of financial indicators

The period considered for Post Tax Equity IRR calculations is 25 years, which corresponds to the operational lifetime of the project activity.

Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, is added back to net profits for the purpose of calculating the financial indicator.

The following table illustrates the assumptions used for the calculation of the financial indicator i.e. Post Tax Equity IRR for the given project activity. The use of these parameters indicating if

⁵ As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

⁶ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v7.0.pdf>

⁷ <https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16217>

they are assumed or based on actual figures is explained in the table. All the relevant costs and revenues for the project activity have been considered for calculation of Post Tax Equity IRR.

Particulars	Value	Unit	Source/Remarks
No. of wind turbines	23	nos	Detailed Project Report (DPR) Dated April 2015
Capacity of each wind turbine	2	MW	DPR Dated April 2015
Capacity of the project	46	MW	Calculated
Plant Load Factor	31.50%	%	DPR Dated April 2015
Annual Net generation	126.9324	GWh	Calculated
Project cost	3945.42	INR Million	DPR Dated April 2015
Debt	65%	%	DPR Dated April 2015
Equity	35%	%	
Debt	2564.52	INR Million	Calculated
Equity	1380.90	INR Million	Calculated
Interest rate	11.50%	%	DPR Dated April 2015
Debt Repayment tenure	12	years	DPR Dated April 2015
Moratorium	0	year	
Operation and Maintenance (First Two years)	0.0	INR Million	DPR Dated April 2015
Operation and Maintenance (3rd year) per WTG	2.2	INR Million/WTG	DPR Dated April 2015
Operation and Maintenance (3rd year)	50.6	INR Million	Calculated
Escalation in O & M	5%	%	DPR Dated April 2015
Service tax on O & M fees	0.00%	%	As per prevailing tax rates
Insurance premium	2.00	INR Million / Yr	As per quotation received from Insurance companies for this project activity
Tariff	4.5	Rs/kWh	DPR Dated April 2015
Depreciation Rate (Book) (First 12 years)	5.83%	%	KERC Tariff order dated 24th Feb 2015 (http://www.karnataka.gov.in/kerc/Court%20Orders/OO%202015/WIND-TARIFF-ORDER-24.02.2015.pdf)
Depreciation Rate (Book) (Remaining 13 years)	1.20%	%	KERC Tariff order dated 24th Feb 2015
IT Depreciation Rate	7.69%	%	http://ireda.gov.in/writereaddata/Operational%20Guidelines.pdf
Income tax rate	34.61%	%	Calculated
MAT rate	21.34%	%	Calculated
Salvage Value	10%	%	KERC Tariff order dated 24th Feb 2015
GBI BENEFIT			
GBI Benefit	0.5	Rs/kWh	MNRE GBI Guidelines, 04.09.2013 (http://mnre.gov.in/file-manager/grid-
Max duration for GBI	10	years	

GBI cumulative cap	10	INR Million per MW	wind/gbi-scheme.pdf)
Max. GBI allowed in a year	2.5	INR Million per MW	
GBI cumulative cap	460	INR Million	Calculated
Max. GBI allowed in a year	115	INR Million	Calculated
TAX RATES			
Financial Year	FY 2015-16		
Income tax rate (%)	30.00%	Indian IT Act for FY 2015-16	https://taxguru.in/income-tax/income-tax-slab-financial-year-201516.html
MAT (%)	18.50%	Indian IT Act for FY 2015-16	
Service Tax (%)	14.50%	Indian IT Act for FY 2015-16	https://www.taxdose.com/service-tax-rate-chart-for-fy-2015-16-w-e-f-15-nov-2015-with-new-service-tax-rate-14-5/
Surcharge (%)	12.00%	Indian IT Act for FY 2015-16	https://taxguru.in/income-tax/income-tax-slab-financial-year-201516.html
Education cess (%)	3.00%	Indian IT Act for FY 2015-16	

Post Tax Equity IRR for the WTGs under proposed project activity against the benchmark values are shown in table below. Thus, it is evident that the project is not financially attractive as the equity IRR is less below the benchmark value.

Post tax Equity IRR	12.62%
Benchmark Value	16.27%

Sensitivity Analysis

The robustness of the conclusion drawn above, namely that the project is not financially attractive, has been tested by subjecting critical assumptions to reasonable variation. As required by Annex 08 of EB 97, 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. PP has identified the total revenue from the project activity is dependent on the Tariff, Plant Load Factor, Project Cost and O&M Costs constitute more than 20% of the project costs. These factors have been subjected to a 10% variation on either side and the results of the sensitivity analysis so conducted are given in the following tables.

Factors	-10%	Normal	10%	% Variation to reach benchmark	Value required to reach benchmark
Tariff	10.05%	12.62%	15.20%	14.00%	5.130 (INR/kWh)
PLF	10.00%	12.62%	15.28%	13.57%	35.77%
Project Cost	15.74%	12.62%	10.15%	-11.43%	3494.46 INR (in Mn)
O&M Cost	12.84%	12.62%	12.35%	NA	NA

An analysis has been done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence. Based on sensitivity analysis it can be concluded that the proposed project activity is additional with reasonable variation in values and is not likely to reach the benchmark value. The occurrence of these events is unlikely for the following reasons:

- a) **Tariff:** The Tariff rate of electricity used for investment analysis i.e. 4.50 INR/kWh is sourced from the DPR estimate applicable at the time of investment decision. Furthermore, the project will breach the benchmark value at a tariff variation of 14.00%. However, the electricity tariffs are fixed for the lifetime of the project activity and PPA has already been signed for the tariff rate of 4.50 INR/kwh; hence this is not a likely scenario.
- b) **PLF:** The PLF value considered is based on Third Party PLF report i.e. 31.50% and the IRR breach the benchmark value at a PLF variation of more than 13.57%. The increase in PLF value to breach the benchmark is highly unlikely as the normative PLF for the state of Karnataka published by state electricity regulatory commission as 26.00%⁸ and equity IRR at normative PLF values are less than the benchmark value and given the analysis above its highly unlikely that PLF will increase above breaching value.
- c) **Project Cost:** The project cost considered for investment analysis i.e. 3945.42 million INR. The selected project WTGs, which is state of art technology and hence slightly costlier. The cost is sourced from DPR which is based on the negotiations with Vestas. A variation of - 11.43% is required for IRR to breach benchmark which is not possible as the project is already commissioned. The actual cost incurred in commissioning of the project is realized at 3748.0 million INR which is within the sensitivity applied.
- d) **O&M Costs:** 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. The actual value of O&M is INR 2.0 Mn/WTG from the 3rd year onwards which is almost same as the one estimated (2.15 Mn/WTG). Further, this is within the sensitivity applied.

The above analysis proves that varying the parameters does not lead to a Post Tax Equity IRR without carbon credits revenue, which will cross the benchmark value.

The carbon revenue from the project activity would provide significant amount of returns from the sale of the Emission Reductions accrued from the project activity and in turn increase the financial attractiveness of the project activity and hence make the project activity more financially viable.

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice analysis

Stepwise approach for common practice analysis has been carried out as per Methodological tool "Common Practice", version 03.1 EB84, Annex 7:

- (a) *The projects are located in the applicable geographical area;*
- (b) *The projects apply the same measure as the proposed project activity;*

⁸ <http://www.karnataka.gov.in/kerc/Court%20Orders/OO%202015/WIND-TARIFF-ORDER-24.02.2015.pdf>

- (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.

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

The capacity of the project activity is 46 MW and hence the output range as per the guideline is selected to be 23 MW to 69 MW

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

- a) As the project is located in India, therefore, the applicable geographical area is India and projects in the host country India have been chosen for analysis.
- b) The projects applying same measure (i.e. only renewable energy through wind) are selected as the proposed project activity is wind power project.
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 23 MW to 69 MW.
- f) The start date of the project activity is 23rd July 2016. As Kyoto Protocol was ratified by India on 26-Aug-2002⁹, therefore projects which had started commercial operation between 26-Aug-2002 to project's start date, have been identified.

Numbers of Similar projects identified, which fulfil above-mentioned conditions are

$N_{\text{wind}} = 13$

The projects considered for analysis are sourced from "Directory - Indian Wind Power published by CECL".

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} .

CDM project activities, which have got registered, submitted for registration or are under validation have been excluded in this step. The list of the power plants identified is provided to the DOE. After excluding the registered, submitted for registration and under validation projects the total number of projects,

$N_{\text{all}} = 7$

⁹ http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

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 Karnataka of India and the policy applicable for the wind projects is regulated by Karnataka 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 Karnataka and 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} .

$$N_{diff} = 6$$

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

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

$$F = 1 - (6/7) = 0.14$$

$$N_{all} - N_{diff} = 7 - 6 = 1$$

Outcome of Step 5:

As,

- i. $F = 0.14$; is less than 0.2
- ii. $N_{all} - N_{diff} = 1$; is not more than 3

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

Chronology:

The below table represents the chronology of the project activity:

Events related to project implementation	VCS relevant events	Dates
Completion of DPR		20 th April 2015
Board decision for investing in Project and securing carbon credits	Investment decision	2 nd May 2015
Placement of the Purchase Orders	Start date of the project activity	10 th June 2015
VCS Compliance	Stakeholder' Meeting	18 to 24 th Feb 2016.
Loan Sanction		--
Signing of PPA		--
Commissioning of Project	Start Date	23 rd July 2016
VCS Compliance	Appointment of the VCS Consultant	05 th March 2017
Appointment of DoE	Validation under VCS	15 th June 2018

2.6 Methodology Deviations

There is no methodology deviation.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The baseline emission is calculated in line with para 42 of ACM0002, Version 19.0, using equation below

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

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 CDM project activity in year y (MWh/yr)
$EF_{grid,CM,y} =$	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO ₂ /MWh)

AS per para 44 of ACM0002, version 19.0, when the project activity is installation of Greenfield power plant, then:

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

Where,

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

3.2 Project Emissions

The project activity involves in harnessing wind power. As per the approved consolidated Methodology ACM0002 (Version 19.0, EB 100, Annex 6) para 34:

"For most renewable energy power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \text{Equation (1)}$$

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 dry, flash steam or binary geothermal power plants 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)"

As the project activity is the installation of a new grid-connected Wind power plant/ unit and does not involve any project emissions from fossil fuel, operation of dry, flash steam or binary geothermal power plants, and from water reservoirs of hydro power plants. Therefore $PE_{FF,y}$, $PE_{GP,y}$, $PE_{HP,y}$ are equal to zero and thus, $PE_y = 0$.

So the emissions from the project are zero.

3.3 Leakage

As per applied methodology no source of leakage emissions identified under proposed project activity.

Hence, $LE_y = 0$

3.4 Estimated Net GHG Emission Reductions and Removals

Emission reduction (ER_y):

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between Baseline emission and Project emission & Leakage emission. As per the applied methodology, leakage emissions are excluded for wind projects and hence the same is not used. The emission reduction is calculated in line with para 57 of ACM0002, Version 19, using equation below:

$$ER_y = BE_y - PE_y$$

Where,

ER_y = Emission Reduction in tCO₂/year

BE_y = Baseline emission in tCO₂/year

PE_y = Project emissions in tCO₂/year

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	120,268	0	0	120,268
Year 2	120,268	0	0	120,268
Year 3	120,268	0	0	120,268
Year 4	120,268	0	0	120,268
Year 5	120,268	0	0	120,268

Year 6	120,268	0	0	120,268
Year 7	120,268	0	0	120,268
Year 8	120,268	0	0	120,268
Year 9	120,268	0	0	120,268
Year 10	120,268	0	0	120,268
Total	1,202,680	0	0	1,202,680

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{OM, y}
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor of INDIAN Grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 13
Value applied:	0.9726
Justification of choice of data or description of measurement methods and procedures applied	Calculated in line with “<i>Tool to calculate the emission factor for an electricity system</i>” using data from Central Electricity Authority of India’s (CEA) “<i>Baseline Carbon Dioxide Emission Database Version 13</i>”. The value used is calculated ex-ante as generation based weighted average of last three years of the operating margin provided in the CEA database. Weighted average $= \frac{\sum_{i=1 \text{ to } n} (\text{Net generation in operating margin in year } i * \text{Simple operating margin in year } i)}{\sum_{i=1 \text{ to } n} (\text{Net generation in operating margin of year } i)}$
Purpose of Data	Baseline Emission calculation
Comments	The operating margin emission factor is a 3-year generation-weighted average (2014-17). The operating Margin is calculated ex ante and fixed during the crediting period

Data / Parameter	EF _{BM, y}
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor of INDIAN grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 13
Value applied:	0.8723
Justification of choice of	Calculated in line with “ <i>Tool to calculate the emission factor for an electricity system</i> ” using data from Central Electricity Authority of

data or description of measurement methods and procedures applied	India's (CEA) "Baseline Carbon Dioxide Emission Database Version 13". The value is calculated ex-ante as most recent build margin provided by the CEA
Purpose of Data	Baseline Emission calculation
Comments	The Build Margin would be calculated ex ante and fixed during the crediting period. For ex ante calculation the most recent data (2016-17) available has been used and the build margin is thus calculated.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor of INDIAN grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 13
Value applied:	0.9475
Justification of choice of data or description of measurement methods and procedures applied	The date has been considered in accordance to the Tool to calculate emission factor of an electricity system. The tool guides to take 75% weightage of EF _{grid,OMsimple} , & 25% weightage of EF _{grid,BM,y} .
Purpose of Data	Baseline Emission calculation
Comments	The combined margin would be calculated ex-ante and fixed for the entire crediting period and the combined margin thus calculated is 0.9475.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{facility,y} ¹⁰
Data unit	MWh/year
Description	Calculated (based on the measured values of electricity exported and imported)
Source of data	Share Certificate Issued by Vestas and JMR (Joint Meter Reading) by EB
Description of measurement methods and procedures to be applied	Net electricity supplied will be calculated based on the difference between calculated values of "export", "import" and "transmission loss" on the EB energy meter at the "evacuation point" and at Government Sub station". Transmission loss is calculated on pro-rata basis as per the readings of "substation & "primary metering Point". (Net Electricity = Export – Import – Transmission Loss)

¹⁰ If the project activity is the installation of a Greenfield power plant, then: $EGPJ,y = EG_{facility,y}$

Frequency of monitoring/recording	Measurement: Continuous Recording: Monthly Monitoring Method: recording in JMR (Joining Meter Reading) The JMR includes, monthly recording of electricity export, import & transmission loss.																											
Value applied:	126,932																											
Monitoring equipment	Energy meters of accuracy class 0.5 or better.																											
QA/QC procedures to be applied	Net electricity supplied to the grid by the project activity will be cross checked with invoices submitted to EB. The meter(s) shall be calibrated and maintained by the state utility as per their own schedule, and this frequency of meter calibration is not within the control of the Project Proponent. Calibration of electricity meters is carried out in-line with the Nation standard¹¹ which recommends at least once in 5 year calibration or whenever abnormal difference/inconsistency is observed between main meter and check meter. Meter & Calibration Details: <table><tr><th>Details</th><th>Main meter</th><th>Check meter</th></tr><tr><td>Meter Number</td><td>16195263</td><td>16195257</td></tr><tr><td>Make</td><td>L&T</td><td>L&T</td></tr><tr><td>Accuracy</td><td>0.2S</td><td>0.2S</td></tr><tr><td>Location</td><td>GSS</td><td>GSS</td></tr></table> Calibration Details <table><tr><th>Meter</th><th>Calibration Date</th><th>Due date</th><th>Calibration agency</th></tr><tr><td>Main meter</td><td>23/07/2016</td><td>22/07/2021</td><td>KPTCL</td></tr><tr><td>Check meter</td><td>23/07/2016</td><td>22/07/2021</td><td>KPTCL</td></tr></table>	Details	Main meter	Check meter	Meter Number	16195263	16195257	Make	L&T	L&T	Accuracy	0.2S	0.2S	Location	GSS	GSS	Meter	Calibration Date	Due date	Calibration agency	Main meter	23/07/2016	22/07/2021	KPTCL	Check meter	23/07/2016	22/07/2021	KPTCL
Details	Main meter	Check meter																										
Meter Number	16195263	16195257																										
Make	L&T	L&T																										
Accuracy	0.2S	0.2S																										
Location	GSS	GSS																										
Meter	Calibration Date	Due date	Calibration agency																									
Main meter	23/07/2016	22/07/2021	KPTCL																									
Check meter	23/07/2016	22/07/2021	KPTCL																									
Purpose of data	Calculation of baseline emissions																											
Calculation method	-																											
Comments	-																											

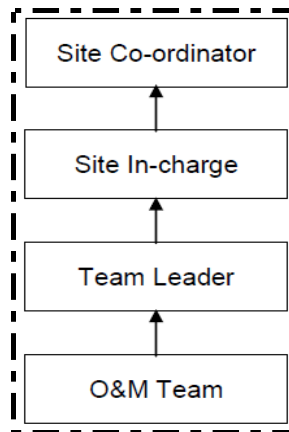
4.3 Monitoring Plan

The project proponent has entered into agreement with the WTG Suppliers (Vestas) for the operation and maintenance of WTGs. The WTG supplier has dedicated and technically well-equipped O&M team for day to day Operation and maintenance of each WTG. O&M contractor will provide a monthly report, which includes generation data, major breakdown events and machine availability. Project manager is responsible for recording of monthly meter readings of export and import. Monthly power export and import data will be sent regularly to sire in charge of each project separately.

Monitoring roles and responsibilities:

¹¹ (Page number 12 of) http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf

The data for the project is compiled by the O&M Contractor and subsequently stored by the PP, the reporting and data flows as per the below mentioned flow chart starting from Site O&M team which monitors day to day operational data and monthly recording. The reporting responsibilities for the project are described as below;



The Site In-charge will be responsible for carrying out internal auditing and QA/QC. All the values from generation record will be checked with JMR and invoices for consistency. In case there are any non-conformances identified. The Site In-charge will investigate the error and revise the record to correct it. In any case where values have slightest of variation in different records the most conservative value will be taken in the project monitoring report.

Personal Training:

The training for operating and maintaining the plant will be provided to the O&M team whenever there would be necessity or any technological up gradation

Monitoring Process at project site

Joint monthly meter reading is taken at the VestasPooling substation (PSS) meters by representative of DISCOM and O&M team/service provider (on behalf of the project proponent). It must be noted here that the meter readings as mentioned above shall be calculated as the product of meter multiplication factor and the difference of the current and previous meter readings.

Currently, the PSS has only the project WTGs and hence there is no need to calculate transmission losses.

(Net Electricity = Export – Import)

However, in future if there are other WTGs connected to the same feeder in PSS with the project WTGs then O&M contractor (Vestas) shall be responsible for calculation of net electricity and arriving at transmission loss. In such a scenario:

(Net Electricity = Export – Import)

Based on the above procedure, the Monthly JMRs shall be provided to the project proponent. This is to be noted that the detail procedure of monitoring is illustrated here for the sake of understanding; for the preparation of monitoring report during periodic verifications, only the net electricity generation value shall be directly used for emission reduction calculation. No other parameters as explained above shall be used and presented in the monitoring report.

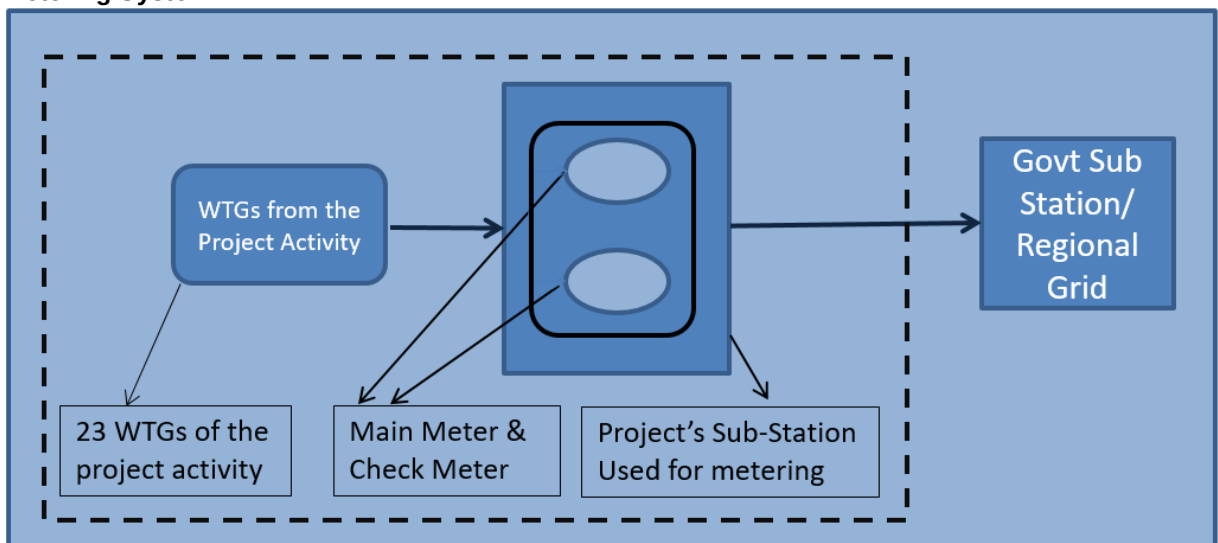
Emergency preparedness:

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 testing, the Check meter will be used for readings

Data recording & archiving: The project proponent shall maintain data both in electronic form and hard copies. The monitored data shall be archived till 2 years after the completion of crediting period.

A schematic diagram indicating the metering system is provided below:

Metering System



5 SAFEGUARDS

5.1 No Net Harm

There were no harm identified from the project and hence no mitigations measures are applicable.

5.2 Environmental Impact

In the applicable EIA notification i.e. S.O. 306712, dated 01/12/2009, Ministry of Environment & Forests (MoEF), Govt. of India, the wind projects are not included in the list of projects that has to get Prior Environmental Clearance (EC) either from State or Central Govt. authorities and hence no EIA study was conducted. The project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. However due weightage has been given to environmental aspects.

¹² <http://moef.nic.in/downloads/rules-and-regulations/3067.pdf>

However, the PP has conducted a detailed ESIA (Environmental & Social Impact Assessment) study for the project activity and some of the significant impacts taken into consideration during the construction and operation of the wind farm are as follows:

1. Land Use: Due consideration has been taken in order to ensure that the land available for the setting up of the wind farm has no considerable alternative use. Furthermore, no forest land was used for the purpose. Stringent measures were followed in order to prevent any soil erosion during the construction phase.
2. Noise Pollution: Typically, the wind farms are located in isolated areas and thereby the noise impacts on the neighbouring population are reduced. Also during the construction phase, suitable noise prevention and reduction measures were employed in order to reduce the ill-effects of noise pollution on the construction labourers.
3. Water Pollution: There were no water bodies within 500 meters of any of the WTGs and hence there is no possibility of impact on water quality due to the project.
4. Air Pollution: The implementation of the project activity will reduce the dependence on fossil fuel generated power and thereby lead to the improvement in air quality during the operational phase.
5. Visual Impact: The social survey revealed that locals were aware about wind project and did not consider them to be of any visual or aesthetic disturbance.
6. Local Flora and Fauna: The land used for the purpose of setting up the wind farm was fallow/barren land and therefore did not require any destruction of local flora. The only vegetation in the vicinity was shrubs and weeds.

Hence it can be concluded that the proposed project activity does not have any major negative impacts.

Further, as per the prevailing Ministry of Environment and Forest laws, the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated 14 September (2006), 38 activities are required to undertake environmental impact assessment studies. Environmental Impact Assessment study is not required for wind mill project as there is no negative environmental impact due to the project activity and wind energy is one of the cleanest sources of energy.

5.3 Local Stakeholder Consultation

The stakeholder consultation meeting was conducted during the social survey as a part of the ESIA study. The consultations were done by identifying the right stakeholders, including, local farmers, villagers, school teachers, government officials, panchayat officials, local NGOs. The stakeholder meeting took place at the gram panchayat of village Mangoli on 18th February-2016.

The purpose of the consultation was to account for the views of the people impacted either directly or indirectly due to the project activity. The objective of the SHC meetings was to inform the stakeholders on the environmental and social impact of the project activity and to discuss their concerns regarding it.

Notices were put up in the local panchayats at least a week in advance of the consultations.

Post consultations the project proponent has also devised an Grievance mechanism to address any concerns of the villagers. A grievance Register with the details of site contact person, Head office HSE person are available at all the panchayat offices in the project location.

5.4 Public Comments

Comments: The project received positive comments from stakeholders; comments received from the stakeholders have been summarized below:

- The presence of the project has also ensured employment opportunities and infrastructure development in the project region.
- The project does not require any displacement of local population.
- The project has added to increased activity in local schools by means of donation of materials and furniture.

Consideration of Comments: The stakeholders expressed their views and welcomed the project activity. They also conveyed their best wishes to the success of the project activity. Since there were no negative comments received from the stakeholders, therefore, it was not necessary to take due account of any comments.

Further, the project was open for public comment from 15/06/2018 – 14/07/2018 on VCS website. No comments were received during VCS Global stakeholders consultation.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _{facility,y}
Data unit	MWh/year
Description	Calculated (based on the measured values of electricity exported and imported)
Value applied:	242,940
Comments	Net electricity supplied to the grid by the project activity is sourced from JMR and cross checked with invoices.

6.2 Baseline Emissions

As per description earlier under this document:

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

EF_{grid,CM,y} is 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” (tCO2/MWh) (i.e, 0.9475 tCO2/MWh).
and;

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

Here,

$$BE_y = 242,940 \text{ MWh} * 0.9475 \text{ tCO}_2/\text{MWh}$$

Monthly calculations of baseline emissions:

Month	Net Electricity (kWh)	Grid Emission Factor tCO ₂ /MWh	Baseline Emissions (tCO ₂) EG _{P,J,y} (MWh)/1000 x EF _{grid,CM,y} (tCO ₂ /MWh)
Jul-16	-6000	0.9475	-5
Aug-16	14802000	0.9475	14,024
Sep-16	16659000	0.9475	15,784
Oct-16	9420000	0.9475	8,925
Nov-16	7068000	0.9475	6,696
Dec-16	7878000	0.9475	7,464
Jan-17	8940000	0.9475	8,470
Feb-17	8751000	0.9475	8,291
Mar-17	9393000	0.9475	8,899
Apr-17	9126000	0.9475	8,646
May-17	13419000	0.9475	12,714
Jun-17	20145000	0.9475	19,087
Jul-17	27651000	0.9475	26,199
Aug-17	19323000	0.9475	18,308
Sep-17	8700000	0.9475	8,243
Oct-17	4602000	0.9475	4,360
Nov-17	6036000	0.9475	5,719
Dec-17	8136000	0.9475	7,708
Jan-18	4962000	0.9475	4,701
Feb-18	8889000	0.9475	8,422
Mar-18	9228000	0.9475	8,743
Apr-18	7854000	0.9475	7,441
May-18	11964000	0.9475	11,335
Total	24,29,40,000.0	0.9475	230,174

Note: All the values of Baseline emissions are rounded down on a monthly basis.

Key Reasons for Downtime during the Current Monitoring Period:

Month-Year	WTG stoppage (Hrs)	Unscheduled Maintenance (Hours)	Scheduled Maintenance (Hours)
Jul-16	822.9	821.4	1.5
Aug-16	630.5	582	48.5
Sep-16	1099.7	1021.4	78.3
Oct-16	432.6	412.2	20.4
Nov-16	417.9	367.5	50.4
Dec-16	140.7	92.4	48.3
Jan-17	335.4	270.3	65.1

Feb-17	218.5	98.2	120.3
Mar-17	314.3	114.1	200.2
Apr-17	239.5	201.1	38.4
May-17	433.3	380.2	53.1
Jun-17	378.3	298	80.3
Jul-17	630.5	582	48.5
Aug-17	1229.6	1137.2	92.4
Sep-17	552.7	482.4	70.3
Oct-17	421.5	381.2	40.3
Nov-17	168.5	101.3	67.2
Dec-17	248.1	210	38.1
Jan-18	201.4	110.2	91.2
Feb-18	230.8	118.3	112.5
Mar-18	288.9	210.8	78.1
Apr-18	419.5	391.4	28.1
May-18	1368.1	296.4	1071.7
Total	11223.2	8680	2543.2

Reasons for Scheduled Maintenance: Manual stop for 6 monthly service of WTG, All voltage lines, Feeder line maintenance, GSS yard billing Bay maintenance, USS Yard maintenance, BOP equipment; Relay Testing & yearly Maintenance work etc

Reasons Unscheduled Maintenance: Power Line shutdown, Grid Failure, Feeder tripping, Initialization fail, Transformer tripping, Overheating in the grid induction, Blade Position Error, Accelerometer vibration issue, other inspection work and emergency maintenance of plant equipment.

6.3 Project Emissions

The project activity involves in harnessing wind power. So, the emissions from the project are zero.

6.4 Leakage

No leakage emissions have been considered and hence the leakage emission is zero.

6.5 Net GHG Emission Reductions and Removals

As per the applied methodology, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where,

ER_y = Emission Reduction in tCO₂e/year

BE_y = Baseline emission in tCO₂/year

PE_y = Project emissions in tCO₂e/year

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)
Year 2016	52,888	0	0	52,888
Year 2017	136,644	0	0	136,644
Year 2018	40,642	0	0	40,642
Total	230,174	0	0	230,174