GREEN ENERGY PROJECT AT KUTCH BY POWERICA LIMITED

Document Prepared by EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity involves installation and operation of a 21.6 MW wind power generation project at Bhachau, in the Kutch district of Gujarat by Powerica Limited. The total installed capacity of 21.6 MW comprises of 12 WTGs, each with a capacity of 1.80 MW. The project provides electricity to the state of Gujarat by effective utilization of renewable resources. The technology has been supplied by Vestas. The project utilizes wind energy for exporting electricity which otherwise would have been generated through alternate fuels (most likely - fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant) including GHG emissions. Electricity produced from the project activity is supplied to NEWNE (Now Indian grid) grid of India.

Emission reductions are claimed on the net electrical energy that is supplied to grid which is metered using meters located at the electrical yard of the respective WTGs. These electrical energy meters are electronic tri-vector meters of appropriate accuracy class. Since these meters are not designed to measure high voltages and currents as generated in the WTG, the WTG output is connected to these meters via transformers (CT/PT) for stepping down the generated voltage and current to ranges which the meters can record. As such, these meters have a multiplying factor which when multiplied to the meter reading provides the actual amount of electricity generated. The technology providers for the project have additionally installed an LCS meter at the WTG controller.

The electricity generated is monitored using electrical meters which provide a measure of the actual electrical energy that would have been sourced from a fossil-fuel based power plants in the absence of the project activity. Hence, the fossil-fuel power based grid is the baseline for the project activity. The annual GHG emission reductions from project activity is estimated to be 52,108 tCO_2e. Thus the proposed project activity leads to an emission reduction of 521,080 tCO_2e over the chosen crediting period of ten years

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. Thus prior to project initiation, there was nothing at site. In absence of project activity, the continuation of current practice i.e. generation of equivalent amount electricity would have been generated from grid connected fossil fuel dominated power plants. Thus for project activity 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.

The total emission reductions achieved by this project activity in the monitoring period from 01-January-2021 to 31-December-2021, are 41,683 tCO_2e through displacing 44,623.91 MWh of electricity from fossil-fuel dominated electricity grid with electricity generation using wind energy resources.

1.2 Sectoral Scope and Project Type

Sectoral Scope 1: Energy Industries (renewable/non- renewable sources)

Project type : Renewable energy project (wind)

The project activity is not a grouped project.

1.3 Project Eligibility

The project activity involves installation and generation of electricity using wind energy resources i.e. by using the renewable sources replacing electricity supply from a fossil-fuel dominated electricity, thus leads to reductions of anthropogenic GHG emissions from atmosphere. Hence the project activity is eligible Sectoral scope 1 i.e. energy industries (renewable/ non-renewable sources) under the scope of the VCS Program.

1.4 Project Design

The project activity involves the total installed capacity of 21.6 MW comprises of 12 WTGs, each with a capacity of 1.80 MW in the state of Gujrat, India. Hence, the project has been designed to include a single installation of an activity and is not a grouped activity

Eligibility Criteria

Not applicable to this project activity as this is not a grouped project.

1.5 Project Proponent

Organization name	Powerica Limited
Contact person	Mr. Pradeep Gupta
Title	Head - Wind Energy Division
Address	9th Floor, Godrej Coliseum, Sion (E) Mumbai – 400022, Maharashtra, India
Telephone	+ 91 22 4001 2000
Email	pradeep.gupta@powericaltd.com

1.6 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Shital Patil
Title	Executive
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91-7972836470
Email	shital@enkingint.org/ registry@enkingint.org

1.7 Ownership

As per VCS Program Definitions version 4, the project ownership is the legal right to control and operate the project activities.

Powerica Limited is the project proponent (PP) of project activity and they have the legal right to control and operate the project activities.

The project ownership has been demonstrated through below supporting document:

Power Purchase Agreement (PPA) – The Power Purchase Agreement (PPA) indicates that PP have the legal right to control and operate the project activities.

Based on above evidences, the project ownership is demonstrated and Powerica Limited is authorized project owner.

1.8 Project Start Date

The project start date is 14-July-2011 which is the date of commissioning of the first phase of the 21.6 MW wind power project.

1.9 Project Crediting Period

The crediting period of the project activity is for 10 years (renewable twice).

The length of first crediting period from 14-July-2011 to 13-July-2021 (Both dates inclusive).

The length of the second crediting period is 14-July-2021 to 13-July-2031 (both dates inclusive).

As per VCS guideline, PP has applied for renewal of crediting period within 2 years from the last date of previous crediting period.

The current monitoring period is 01-January-2021 to 31-December-2021, (monitoring period that spans the two crediting periods) i.e.

CP1 covering 01-January-2021 to 13-July-2021

CP2 covering 14-July-2021 to 31-December-2021.

The project is registered under Clean Development Mechanism (CDM) of UNFCCC with 7 years crediting period (Renewable) (Reference No: 7671[1]) on 22-October-2012. The First Crediting period of the project under CDM starts on 22-October-2012 and ends on 21-October-2019 and while the second crediting period starts on 22-October-2019 and ends on 21-October-2026[2].

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The project activity falls under Large-scale project category.

Project Scale

[1] https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1349877556.69/view

[2] https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1349877556.69/view

Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 2021-22	52,108
Year 2022-23	52,108
Year 2023-24	52,108
Year 2024-25	52,108
Year 2025-26	52,108
Year 2026-27	52,108
Year 2027-28	52,108
Year 2028-29	52,108
Year 2029-30	52,108
Year 2030-31	52,108
Total estimated ERs	521,080
Total number of crediting years	10
Average annual ERs	52,108

1.11 Description of the Project Activity

The project activity involves installation and operation of a 21.6 MW wind power generation project at Bhachau, in the Kutch district of Gujarat by Powerica Limited. The total installed capacity of 21.6 MW comprises of 12 WTGs, each with a capacity of 1.80 MW. The project provides electricity to the state of Gujarat by effective utilization of renewable resources. The technology has been supplied by Vestas. The project utilizes wind energy for exporting electricity which otherwise would have been generated through alternate fuels (most likely - fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant)

including GHG emissions. Electricity produced from the project activity is supplied to NEWNE (Now Indian grid) grid of India.

The technical details of the WTGs involved in the project activity are as below.

Parameters	Value
Make	Vestas
Model	V-100
Rated Power	1800 KW
Rotor diameter	100 m
Swept area	7850 m^2
Cut in wind speed	4 m/s
Cut out wind speed	20 m/s
No. of Blades	3
Rotor Speed	14.4 rpm
Hub Height	80 m
Generator Type	Asynchronous with wound rotor, slip rings

Sl. No	WTG ID	WTG No.	Commissioning Date
1	VW 21	VWT/1800/11-12/2133	19-July-2011
2	VW 32	VWT/1800/11-12/2134	16-July-2011
3	NM82-4	VWT/1800/11-12/2135	14-July-2011
4	JW 27	VWT/1800/11-12/2136	16-July-2011
5	NM82-3	VWT/1800/11-12/2309	29-December-2011
6	JW 30	VWT/1800/11-12/2316	31-December-2011
7	NM82-7	VWT/1800/11-12/2311	29-December-2011
8	JW 09	VWT/1800/11-12/2312	31-December-2011
9	JW 10	VWT/1800/11-12/2313	31-December-2011
10	JW 12	VWT/1800/11-12/2314	31-December-2011
11	JW 13	VWT/1800/11-12/2315	31-December-2011
12	NM 82-06	VWT/1800/11-12/2310	29-December-2011

The WTGs involved in the project activity were commissioned in four phases – the earliest date of commissioning is 14-July-2011.

The project activity is a greenfield project for generation of electrical energy using wind which is a renewable source of energy. In wind energy generation, kinetic energy of the wind is converted into mechanical energy and subsequently into electrical energy. Wind turbines capture the wind's energy with three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind. As the wind blows through the blades of the windmill, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade towards it, causing the rotor to spin. The rotor turns the shaft that further spins the connected generator. The spinning of this generator produces the required electricity. Since power is generated from wind energy, no emissions are attributed to the project emissions and due to that equivalent amount of fossil-fuel dominated grid can be displaced due to the project activity.

Emission reductions are claimed on the net electrical energy that is supplied to grid which is metered using meters located at the electrical yard of the respective WTGs. These electrical energy meters are electronic tri-vector meters of appropriate accuracy class. Since these meters are not designed to measure high voltages and currents as generated in the WTG, the WTG output is connected to these meters via transformers (CT/PT) for stepping down the generated voltage and current to ranges which the meters can record. As such, these meters have a multiplying factor which when multiplied to the meter reading provides the actual amount of electricity generated. The technology providers for the project have additionally installed an LCS meter at the WTG controller.

The total emission reductions achieved by this project activity in the monitoring period from 01-January-2021 to 31-December-2021, are 41,683 tCO_2e through displacing 44,623.91 MWh of electricity from fossil-fuel dominated electricity grid with electricity generation using wind energy resources.

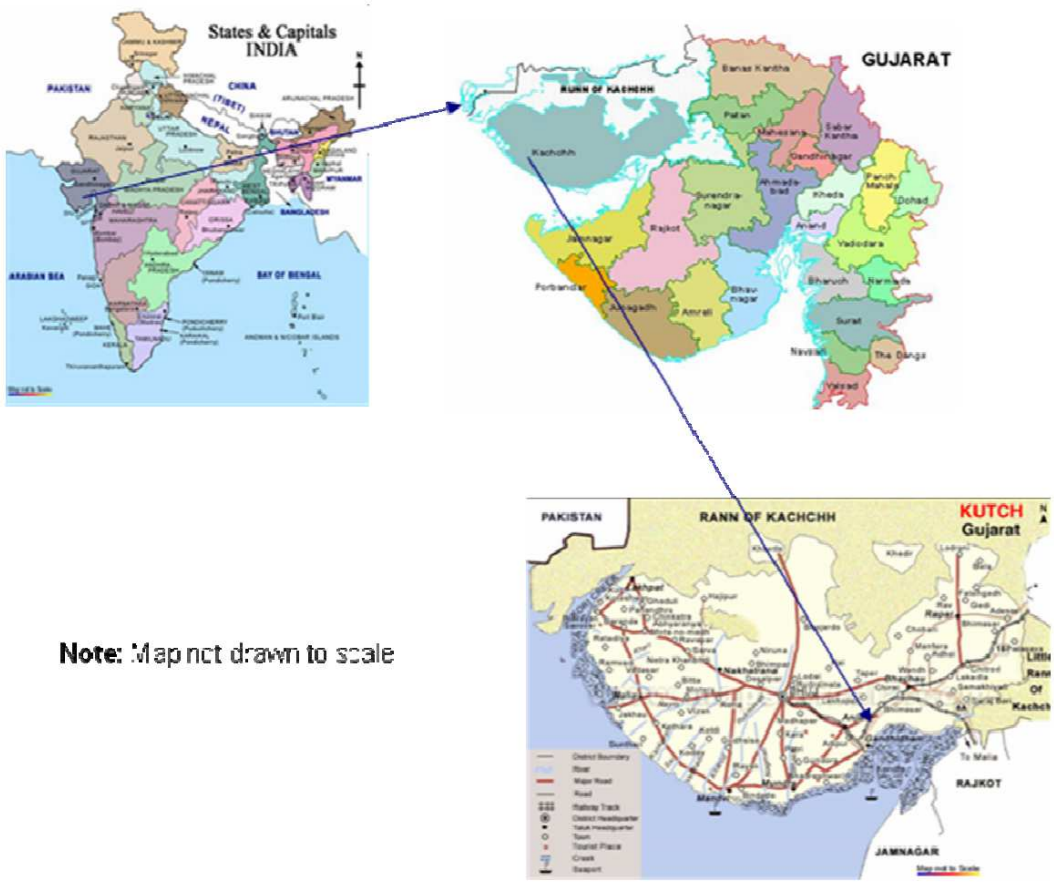
The electricity generated is monitored using electrical meters which provide a measure of the actual electrical energy that would have been sourced from a fossil-fuel based power plants in the absence of the project activity. Hence, the fossil-fuel power based grid is the baseline for the project activity.

1.12 Project Location

The project activity is located at Village – Jangi, Lakhapr and Vadhiya, Taluka – Bhachau, District - Kutch in the state of Gujarat. The geo-coordinates of each WTG are as follows:

Serial No.	WTG ID	Latitude	Longitude
1	JW 10	23°11'56"	70° 32'48"
2	JW 12	23°12' 29"	70°32' 13"
3	JW 13	23°12'12"	70°32' 16"
4	JW 27	23°12' 49"	70° 33' 35"
5	JW 30	23°11' 59"	70° 31'55"
6	JW 09	23°12 '3"	70° 33' 2"
7	NM 82-3	23°11'53"	70° 35'26"
8	NM82-4	23°12'5"	70° 35' 19"
9	NM82-6	23°11'59"	70° 35' 47"
10	NM82-7	23°11'53"	70° 35' 58"
11	VW 21	23°12' 20"	70° 37'30"
12	VW 32	23°12'12"	70° 37' 12"

The project location and wind Map is as follows



Note: Map not drawn to scale

1.13 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. Thus prior to project initiation, there was nothing at site. In absence of project activity, the continuation of current practice i.e. generation of equivalent amount electricity would have been generated from grid connected fossil fuel dominated power plants. Thus for project activity 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.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received all the necessary approvals for development and commissioning for the proposed project from the State Nodal Agencies and is in compliance to the local laws and regulations.

The Project has received necessary approvals for development and commissioning for wind power project from the state Nodal agencies and is in compliance to the local laws and regulations.

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

- Electricity Act 2003
- National Electricity Policy 2005

- Tariff Policy 2006

As per Central Pollution Control Board (Ministry of Environment, Forest and Climate Change (MoEF & CC), Govt. of India), final document on revised classification of Industrial Sectors under Red, Orange, Green and White Categories (February 29, 2016).

The newly introduced White category of industries pertains to those industrial sectors which are practically non-polluting such as Biscuit trays etc. from rolled PVC sheet (using automatic vacuum forming machines), Cotton and woolen hosiers making (Dry process only without any dying/washing operation), Electric lamp (bulb) and CFL manufacturing by assembling only, Scientific and mathematical instrument manufacturing, Solar power generation through photovoltaic cell, wind power and mini hydel power (less than 25 MW).

There shall be no necessity of obtaining the Consent to Operate'' for White category of industries. An intimation to concerned SPCB / PCC shall suffice. Since project activity falls under white category and the non-polluting nature of project fulfils the compliance to the local laws and regulations.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project activity has also been registration with UNFCCC under Clean Development Mechanism (CDM) program, Registration reference number is 7671. The project proponent has provided undertaking that it will not claim any GHG credits for UNFCC CDM during the current monitoring period.

1.15.2 Projects Rejected by Other GHG Programs

The Project is not rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

India is Non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM and UNFCCC (Registration ID 7671). The project proponent (PP) has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. PP has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.16.2 Other Forms of Environmental Credit

Project has been registered with UNFCCC under Clean Development Mechanism program. Registration reference number is 7671. Project Proponent has submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GOI) under the Ministry of Environment and Forests (MoEF) has mentioned four indicators for the sustainable development. The project participant's view on the contribution of this project activity towards sustainable development is explained below:

Social well-being:

- Generating Local Employment: The installation of wind power project in rural areas will result in generating local employment opportunities and capacity building of the local employees. The project activity would create both direct and indirect employment throughout the life-cycle of the project activity.
- Encouragement to entrepreneurs: The project will provide encouragement to other entrepreneurs to invest into renewable energy sources.

Economic well-being:

- Rural Development: The installation of wind power project will result in rural and infrastructural development in the surrounding rural areas
- Economic Development: The generation of wind power will result in improvising the reliability of the NEWNE Grid and thereby enhance economic development in the region.

Environment well-being:

- Reduction in the consumption of fossil fuels: The installation of power plant generating electricity through renewable resource such as wind power, would lead to reduction in usage of fossil fuels e.g. Coal, oil, natural gas.
- Reduction in GHG emission: The reduction in usage of fossil fuels for electricity generation will result in reduction of the release of associated GHG emissions (CO_2 and CH_4 emissions).
- Improvement of Air Quality: The use of renewable energy for power generation will avoid the emission of air pollutants such as Suspended Particulate Matter (SPM), Sulphur Dioxide (SO_2) and Nitrogen Oxides (NO_x) thereby improvising the surrounding air quality
- Conservation of Natural Resources: Installation of wind power plant will result in conserving fast depleting natural resources such as coal, oil etc.

Technological well-being:

- Advanced Technology: The project activity involves installation and operation of state-of-art wind turbine generators (WTGs) of Vestas make. The implementation of these new technologies will help in increasing reliability of renewable energy generation and encourage development of even better technology in the future.
- Safe and Sound Technology: The project activity deploys the technology, which is environmentally safe and sound, as it does not produce greenhouse gases and any toxic or radioactive waste.

1.17.2 Sustainable Development Contributions Activity Monitoring

According to the Appendix 2- the document history mentioned in the VCS Standard Version 4[3]. (latest version), it is clearly mentioned that Project Proponent is required to demonstrate contributions to a minimum of three SDGs, effective immediately for all projects registered on or after 20 January 2023. Since this is the 4th Verification of this project and it is registered before 20 January 2023, SDG reporting is not required for the current version and the PP will demonstrate contribution to at least three SDGs by 20 January 2025.

1.18 Additional Information Relevant to the Project

Leakage Management

Not applicable to this project activity.

Commercially Sensitive Information

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

Further Information

There are no information or incidents that will have 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 SAFEGUARDS

2.1 No Net Harm

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

2.2 Local Stakeholder Consultation

Project Proponent had invited different stakeholders to a meeting to explain the proposed project activity and benefits associated with it on 06-May-2011.

The stakeholders identified for the project activity are as follows:

1. Vestas employees
2. Local Villagers
3. Government officials (District Magistrate, etc.)

These In order to address and incorporate the concerns of the local stake-holders, Powerica Limited directly handed over the invitation letters to the identified stake-holders on 26-April-2011. The timeframe given to stakeholders was 9 days and the stakeholders could provide their comments during the stakeholders meeting. The local stakeholders were chosen from all factions

[3] https://verra.org/wp-content/uploads/2022/01/VCS-Summary-of-Effective-Dates-2022-Q1.pdf

of the society. The invitation letter contained information of the date & site of the meeting along with a clear picture of the agenda of the meeting along with a broad description of the project activity. An advertisement for the meeting was displayed in the Kutch Mitra newspaper on 15-April-2011.

The stakeholder meeting was conducted on 06-May-2011.

Powerica Limited received all necessary approvals / clearances / permissions from various local bodies which represent the local stakeholders. The stake holders meetings was conducted at the respective project sites and was attended by the office bearers and residents of the nearby villages and those employed in the project activity. Powerica Limited has taken care of all the conditions stipulated in the relevant clearances and no adverse comment has been raised. The local villagers and the office bearers expressed their happiness with the setting up of an environment friendly power project in their village as it had resulted in generation of direct and indirect employment opportunities both for literate and illiterate people. Development of infrastructure in the locality was highly appreciated. The employees hired for the project activity from the local area stated that the project activity has provided them with a means of livelihood in their own village and will help them in getting equipped with technical skills.

The process of local stakeholder consultation is continuous. During the current monitoring period, the project proponent has kept grievance register in plant site office and sought comments/grievances/suggestions from local stakeholders including local community, government agencies and NGOs. However, no major comments/grievances/suggestions have been received from the aforementioned stakeholders during the current monitoring period and all such minor suggestions have been take care by the PP, The same approached will be followed during second crediting period of the project activity

2.3 Environmental Impact

Please refer to D 1 and D 2 of PDD (version 6 dated 02/09/2012) of the UNFCCC registered CDM project with reference no. 7671.

The web link of the same is given below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1349877556.69/view?cp=1

2.4 Public Comments

The Global Stakeholder Consultation commenting period had been completed before first crediting period. No comments had been received in the commenting period. Project got registered under CDM with reference no. 7671.

The web link of the same is given below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1349877556.69/view?cp=1

2.5 AFOLU-Specific Safeguards

Not Applicable

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title: Consolidated baseline methodology for grid-connected electricity generation from renewable sources

Reference: ACM0002, Version 20.0[4] , EB 105

The methodology also refers to the latest approved versions of:

- "Tool to calculate the emission factor for an electricity system", Version 07.0.0[5], EB 100
- "Tool for the demonstration and assessment of additionality", Version 07.0, EB 70
- "Guidelines for the reporting and validation of plant load factors", Version 01, EB 48

3.2 Applicability of Methodology

The project activity involves generation of grid connected electricity from renewable wind energy. The project activity has a proposed capacity of 21.6 MW which will qualify for a large scale CDM project activity under Type-I of the large scale methodologies. The project status is corresponding to the methodology ACM0002 version 20.0 and applicability of methodology are discussed below.

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 a RenewableEnergy Project i.e. Wind Power Project which falls under applicability criteria option 1 (a) i.e., "Install a Greenfield power plant". Hence the project activity meets the given applicability criterion.
2. The methodology is applicable under the following conditions: (a) 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; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except	The option (a) of applicability criteria 2is applicable as project is renewable energy wind power plant/unit.

[4] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG
[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

	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.	
3.	In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2; 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 (7), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m^2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	The project is installation of new wind based electricity generation plants (not a hydro power plant). Hence this criteria is not applicable.
4.	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 project is wind power project and thus the criterion is not applicable to this project activity.
5. 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/units.	(a) The project activity is Greenfield and there is no switching of fossil fuel to renewable energy. Hence the criteria is not applicable to the project activity (b) The project is not a biomass fired power plant. Hence the criteria is not applicable to the project activity.
6. 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".	Not applicable, the wind project is a Green field project activity and this project is not the enhancement or up gradation project.
7. In addition, the applicability conditions included in the tools referred to below apply.	Please refer tables below.

Tool to calculate the emission factor for an electricity system - Version 07.0 (EB 100, Annex 04)

Applicability Criterion	Project Case
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).	The project is a grid connected Greenfield wind power project and thus the tool is applicable.
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, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified	Steps involved in calculation of Emission Factor is included in section B.6.2 of the PDD as per the requirement of the tool

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 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.	Project is located in non-Annex 1 country and hence the tool is applicable
Applicability Criterion Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	Project Case The project is a wind power project and there is no involvement of biofuels.

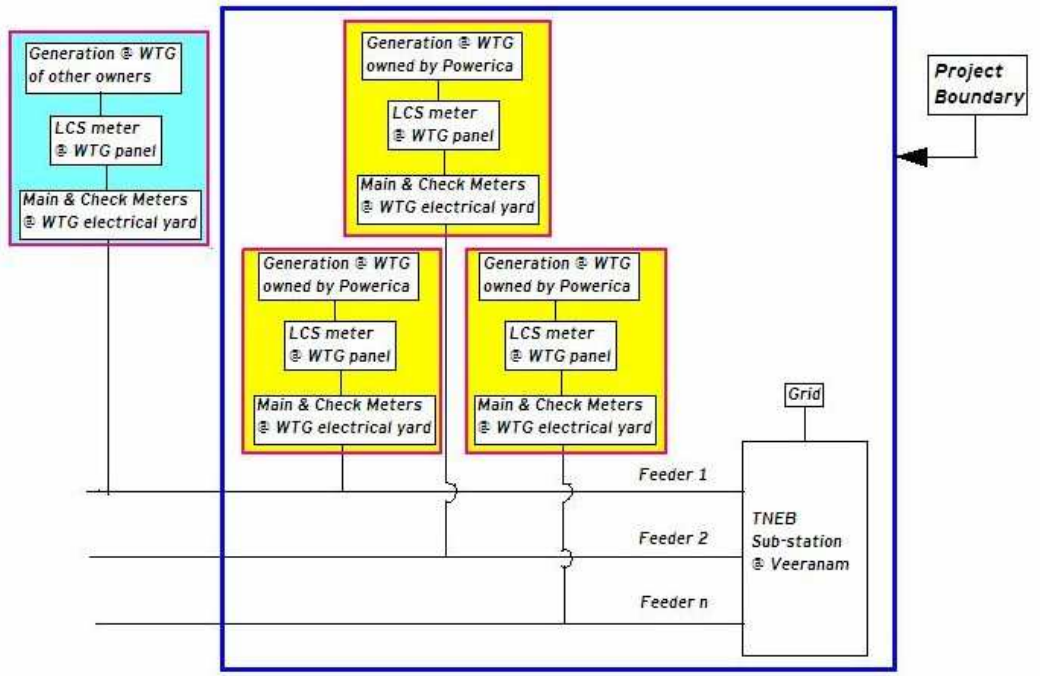
Methodological Tool- Tool for the demonstration and assessment of additionality- Version 07.0.0 Applicability Criteria has been demonstrated in section on additionality below;

The project activity qualifies as Type I during every year of the crediting period in accordance with applicable provisions for project activity eligibility as discussed above. Also the total installed capacity of project activity is 21.6 MW which is applicable as per large scale project activities methodology ACM0002: Grid-connected electricity generation from renewable sources Version 20.0 The project capacity will be always remain the same and hence the project activity will always be large scale project activities throughout the crediting period and thereafter.

3.3 Project Boundary

The project boundary includes the wind turbine generator, sub-stations and grid. The proposed project activity will evacuate power to the INDIAN grid[6].Therefore the entire INDIAN grid and all connected power plants have been considered in the project boundary for the proposed CDM project activity. The project boundary is shown below:

[6] Prior to January 2014, southern grid (that includes the state of Tamilnadu) was not connected to the then Nation grid (it then included Northern, Eastern, Western and North-Eastern regional grids), in the beginning of January 2014, Southern grid was connected to the national grid and all those regional grids including the Southern grid, together form the INDIAN grid



The above metering arrangement is indicative , earlier there were check meters also installed as back up meters, however state electricity board had removed that check meters and only main meters are used for export, import values. Gases and sources considered in the project activity:

The table provided below shows the gases and sources considered in the project activity

Source		Gas	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_2O	No	Minor emission source
Project Activity	For dry or flash steam geothermal power plants, emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.
	For binary geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.

	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained inthe heat exchangers	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.
	CO_2 emissions from combustion of fossil fuelsfor electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Not applicable as project activity is wind power project.
		CH_4	No	Not applicable as project activity is wind power project.
		N_2O	No	Not applicable as project activity is wind power project.

3.4 Baseline Scenario

Identification of the baseline scenario
The project activity is the installation of a new wind power plant. This project is not a modification/ retrofit of any existing electricity generation facility. Hence, in accordance to the approved methodology ACM0002, Version 20.0, the baseline scenario for new installation facility is described as:

"Electricity delivered to the grid by the project 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."

Updated baseline for the second crediting period in line with the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required of Project Standard version 4.2.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was the 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 into the grid. Thus this project activity was a voluntary investment which intends to replace equivalent amount of electricity at grid from renewable source. PP was not bound to incur this investment; hence absence of project activity (i.e. the investment) does not lead to any continued baseline practice for PP within their scope whereas the continued operation of the project activity would continue to replace equivalent amount of electricity at grid. Hence, the same baseline as identified in the previous crediting period is still valid for the project. Therefore, the assessment of the changes in market characteristics is not required for the renewal of the project's crediting period under CDM.

Nevertheless, there is an impressive growth attained by the Indian Power Sector within the recent years, the installed capacity has grown from mere 1,713 MW in 1950 to 382,151.22 MW as on 31.03.2021, consisting of 234728.22 MW Thermal, 94,433.79 MW Renew and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 19 that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO2 emissions in the country by increased use of renewable energy sources.

Furthermore, project participant has considered the latest available CO_2 Baseline Database (CEA database, version 17) at the time of requesting renewal of the crediting period for establishing the baseline emission factor, which itself considered all the new circumstances. Hence, the new circumstances do not have an impact on the baseline emission. As per below table, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original.

Table 1: Sector- wise installed capacity (MW) as on 31-March-2021 (CEA Database version 17)

Sector	Thermal					Nuclear	Hydro	RES	Total
	Coal	Lignite	Gas	Diesel	Total				
State	65931.50	1150.00	7087.36	236.01	74404.86	0.00	27069.50	2395.27	103869.64
Central	62570.00	3640.00	7237.91	0.00	73447.91	6780.00	15646.72	1632.30	97506.93
Private	74173.00	1830.00	10598.74	273.70	86875.45	0.00	3493.00	90406.21	180774.66
All India	202674.50	6620.00	24924.01	509.71	234728.22	6780.00	46209.22	94433.79	382151.22

Thus current baseline remain same and there is no impact if circumstances, existing at the time of requesting renewal of crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

As explained in step 1.2, the baseline scenario was the electricity import/generation from the power plants connected to the electricity grid. The project activity in green field project and there is no any baseline equipment or investment involved in project activity. Therefore this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that “Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission

factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity."

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database available at the time of PDD submission for renewal.

In line with the project standard version 4.2, the impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant EB guidance with regard to renewal of the crediting period at the time of requesting renewal of crediting period; and the correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period

Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the existing laws. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the Enactment of the act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003 was in force at the time of the completion of the baseline study for the registered PDD.

Section 3 of the said act required the Central Government to prepare the national electricity policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. In accordance with the section 3 of the Electricity Act 2003, the Central Government notified the National Electricity Policy10 on 12th February 2005 which was in force at the time of completion of the baseline study as stated in the registered PDD of the project activity. This policy has not been revised since then and is currently in force as well.

In addition to the above policies, State Electricity Regulatory Commissions (SERCs) have announced preferential tariffs and Indian Renewable Energy Development Agency (IREDA) provides term loan assistance towards establishing biomass power projects. All these fiscal and financial incentives were in force at the time of completion of the baseline study for the registered PDD of the project activity and still continue to exist.

The state electricity regulatory commission issues tariff order in respect of procurement of power generated wind generators and there is no mandatory national and/or sectoral policies have come into effect that would affect the compliance of the current baseline. Hence, it can be concluded the current baseline complies with all relevant mandatory national and/or sectoral policies that have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period.

However, in spite of the financial incentives given by the government to renewable power projects in India the generation from the low cost must run resources connected to the Indian Grid has not increased to such an extent that this would lead to more than 50% contribution from the low cost must run resources towards the total generation from the Indian Grid.

The approved consolidated baseline methodology, ACM0002 (Version 20.0), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "Tool to calculate the emission factor for an electricity system" (version 07.0) has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

As per CEA database version 17, the fossil fuel dominated electricity is more than renewable sector and is continuing with same pattern. In light of the above discussion it is to be concluded that in accordance with relevant guidelines stipulated in the Project Standard version 4.2, national and/or sectoral policies and circumstances had been considered towards formulating the OM & BM baseline scenario .Hence the baseline scenario as applied for the present project activity remains justified.

As per the approved consolidated methodology ACM 0002,

If the project activity is the installation of a new grid-connected renewable power plant/unit, 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 "TOOL07: Tool to calculate the emission factor for an electricity system".

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 by the state grid (part of Indian grid), which is fed mainly by fossil fuel fired plants.

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

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 17 is the latest available data at the time of PD submission to DOE for validation, hence same is considered for emission factor calculations.

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

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9305 tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline CO_2 Emission Database, Version 17.0, Oct. 2021 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9522 tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y	Calculated as the last 3 year (2018-19, 2019-20, 2020-21) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 17.0, Oct. 2021 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8653 tCO_2/MWh	Build margin CO_2 emission factor for the project	Baseline CO_2 Emission Database, Version 17.0, Oct. 2021 published by Central Electricity

		electricity system in year y	Authority (CEA), Government of India

3.5 Additionality

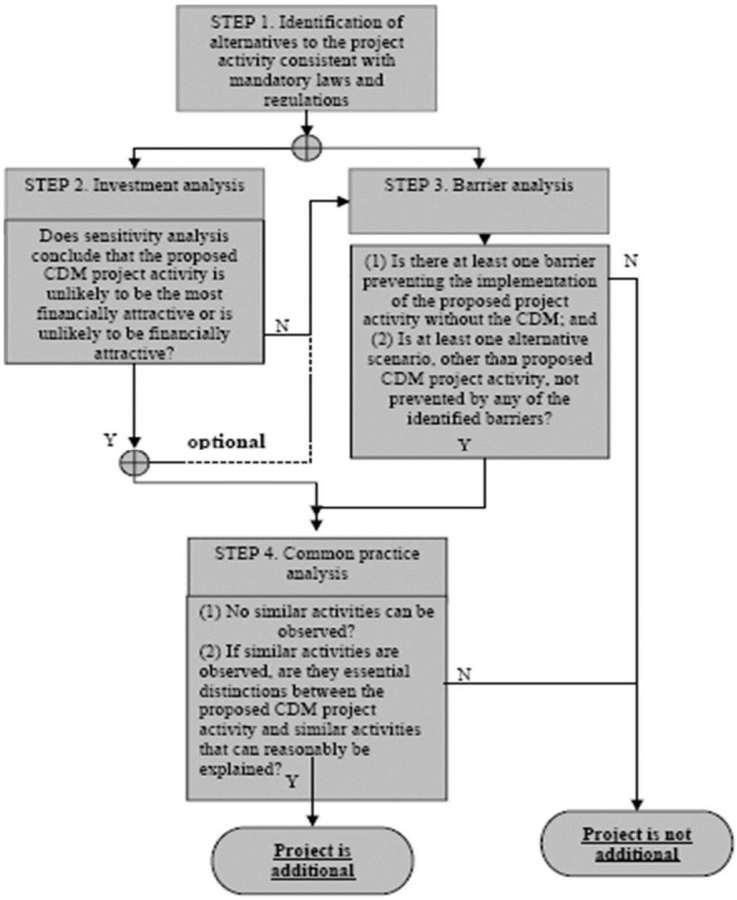
Regulatory Surplus Demonstration:

In India, there is no any regulation to install the wind projects and the project activity is a voluntary step taken by PP. In India, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original. As discussed in section 3.4 of VCS PD, there is no any Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity and project activity is additional as per CDM Tool for the demonstration and assessment of additionality and as per VCS Program rules.

There are no certain laws and regulations which give comparative advantage to more emission intensive technologies or less emission intensive technologies. There are no any Type E+ and E- policies applicable to the project activity which prevent the implementation of local laws and regulations that would seek to contribute towards climate change mitigation. The project activity is in compliance with local laws and regulations. As explained in section 3.4, the current baseline complies with all relevant mandatory national and/or sectoral policies.

The project activity has been conceived as a CDM project since its inception. Powerica has taken CDM revenue right from the onset of this wind project. The evidence of the same can be verified by the Designated Operational Entities (DOE) at the time of project validation.

The additionality of the proposed project activity has been demonstrated below in accordance with the "Tool for the demonstration and assessment of additionality, Version 06.0.0 and as described in the following flow chart. This is followed by the descriptions of baseline and project scenarios and how emission reductions would occur in the project activity. The steps as per the additional tool are provided in the figure below:



Steps	Additionality Requirements	Status of Additionality Check
1.Identification of alternative to the project activity consistent with mandatory laws and regulations		
Sub-step 1(a): Define alternatives to the project activity Sub-step 1(b): Consistency with mandatory laws and regulations	Powerica has set up a 21.6 MW wind power project in order to generate electricity and supply the same to the state electricity grid. As per approved methodology ACM 0002 Version 12.3.0: "If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following: 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"." Thus as per the approved methodology, no other alternative scenariosare required to be identified or assessed. Further, the project activity conforms to all the applicable laws and regulations in India: • Power generation using wind energy is not a legal requirement ora 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	The additionality check has crossed Step 1 and may proceed to Step 2 (Investment Analysis) followed by Step 4 (Common Practice Analysis). In the project case, Step 2 has been used for additionality check, followedby Step 3 and 4.

<table>
<tr><td></td><td>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.</td><td></td></tr>
<tr><td colspan="3">Step 2: Investment Analysis</td></tr>
<tr><td>Step 2 (a): Determine appropriate analysis method</td><td>The project proponent proposes to generate the revenue by selling electricity to state electricity board. Hence a simple cost analysis is not applicable in the present situation.

Further, as per guidance 19 of Annex 5, EB 62, “If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used”

Since the baseline situation for the project activity does not require the project proponent to make an investment, amongst the other two options, Investment Comparison Option and Benchmark analysis, the benchmark analysis has been adopted.

Here, the Net Present Value of the equity for the project activity serves as a financial indicator to assess the attractiveness of the project activity. NPV is the sum of the present values of the individual cash flows. NPV is an indicator of how much value an investment or project adds to the firm. Moreover, calculating the NPV of the equity provides additional information regarding the extent of profit/loss the equity is expected to achieve in absolute terms (INR). It is because of this added information that the PP has chosen NPV as the financial indicator.</td><td>The additionality check has crossed Step 2(a). and can proceed to Step 2(b)</td></tr>
<tr><td>Step 2(b): Option III: Apply benchmark analysis</td><td>An investment analysis of the project activity was conducted by estimating the Net present Value (NPV) of investment involved in the project. The discounting rate for the project has been chosen as 18.44%. This discounting rate is the benchmark applicable to independent power producers in the country implementing similar projects and has been arrived at following the Capital Asset Pricing Model.
Ri = Rf + β * (Rm – Rf)
where,
<table><tr><td>Ri</td><td>Market based returns on equity</td></tr><tr><td>Rf</td><td>Risk-free Return at the time of decision making</td></tr><tr><td>β</td><td>Average of Beta value among 8 power sector companies for 5 year period from 01/02/2006 - 01/02/2011</td></tr><tr><td>Rm</td><td>Risk Premium</td></tr></table>
For the present project activity, the Reserve Bank of India’s average Government yield to maturity rate has been adopted as the risk-free rate of return which stood at 8.3920 % for an investment term of 20 years, as per the report published by the RBI on January 12, 20101.
The Beta value has been taken to be the average of the 5 year beta values of the following companies which are listed on the BSE 500:
1. CESC Ltd.
2. Gujarat Industries Power Co. Ltd
3. KSK Energy Ventures Ltd.
4. Neyveli Lignite Corp.
5. Tata Power Co. Ltd.
6. Torrent Power Ltd.
7. Jaiprakash Power Ventures Limited
8. NTPC</td><td></td></tr>
</table>

<table>
<tr><td></td><td>The average Beta value for all these companies is 1.1502 and this has been considered for the benchmark calculation.
The risk premium value has been arrived at by calculating the Compound Annual Growth Rate for the BSE-500 since its base year (1999) on a base value of 1000. At the time of decision making, the BSE-500 had a low of 6701.52. Hence, the risk premium value is
= Rm = {(6701.52/1000)^(1/12.03) – 1} = 17.13%
Wherein, 11.83 years has been the gap between the base year and the date of decision making for the project activity.
Hence, Ri = 8.3920 + 1.1502* (17.13 – 8.3920) = 18.44%</td><td></td></tr>
<tr><td>Step 2 (c): Calculation and comparison of financial indicators</td><td>The following assumptions have been made for conducting the financial analysis:
<table>
<tr><td>Capacity of the wind project</td><td>21.6 MW</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>No. and capacity of machines</td><td>12 Nos. X 1.8 MW</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Gross Annual Generation</td><td>62.08 Lakh kWh/WTG</td><td>Quotes provided by WTG provider[2]</td></tr>
<tr><td>Transmission losses</td><td>4%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Machine Availability</td><td>95%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Grid Availability</td><td>95%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Wind Uncertainty</td><td>6%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Net Annual Generation incl. of above loss factors</td><td>50.57 Lakh kWh/WTG</td><td>Calculated</td></tr>
<tr><td>Annual O&M Costs</td><td>INR 28 Lakh/WTG</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>% Escalation in O&M charges p.a.</td><td>7.5%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Power Tariff</td><td>INR 3.56/kWh</td><td>GERC Order dated 30-01-2010[3]</td></tr>
<tr><td>Tax holiday u/s 80IA available for</td><td>15 years</td><td>Income Tax Law[4]</td></tr>
<tr><td>Total Project Cost including land cost</td><td>INR 16080 Lakh</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Fund</td><td>Equity 100 %
Debt 0 %</td><td></td></tr>
<tr><td>Book Depreciation</td><td>5.28%</td><td>Schedule XIV of the Company's Act 1956</td></tr>
<tr><td>IT Depreciation</td><td>100%</td><td>Income Tax Act 1961
80% depreciation (http://www.gwec.net/fileadmin/images/India/IWEO_2011_lowres.pdf, page 19) + 20% additional depreciation as per (http://www.taxmanagementindia.com/</td></tr>
</table></td><td></td></tr>
</table>

			visitor/detail_article.asp?ArticleID=1544)
	Corporate tax rate	33.22%	As per local tax laws[5]

The Equity NPV works out to INR -3310.72 Lakhs keeping the above data in consideration without CDM Revenues.

Step 2 (d): Sensitivity Analysis

As per paragraph 20 of "Guidelines on the Assessment of Investment Analysis" Version 05, EB 62, Annex 5, "the purpose of the sensitivity analysis is to determine in which scenarios the project activity would pass the benchmark or become more favourable than the alternative". Further, "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 reasonablevariation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude)".

Thus, for this project activity, the following parameters areconsidered for the sensitivity analysis:

i) Capital cost
ii) O&M cost
iii) Tariff
iv) Generation

This guideline also states that, "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" and "a scenario resulting in the project activity passing the benchmark or becoming a financially attractive alternative needs to be assessed.

Thus, a sensitivity analysis has been performed by applying avariation of ±10% to the above parameters:

Also, based on the above parameters, the project activity becomes a financially attractive or a feasible option when the value of the equity NPV, becomes zero or positive.

The results of sensitivity analysis for the project activity can be summarized as:

Parameter Varied forNPV (Lakh INR) w/o CDM	Variation	
	10%	-10%
Capital Cost	-4668.32	-1953.13
O&M	-3461.92	-3159.53
Tariff	-2426.75	-4213.34
Generation	-2426.75	-4213.34

i) Capital cost:

The capital cost for this project activity has been considered for the sensitivity analysis. A 24.38% reduction in the capital cost causes the NPV of the project to cross zero.

However, it may be noted that the Project cost considered for the investment analysis for this project activity is based on the quotations provided by suppliers and a variation of more than 10% in this value is unlikely. Thus, applying a sensitivity of +/- 10% gives the values of NPV which are far from crossing zero.

O&M:

	A 192% reduction in the O&M cost will make the project activity financially viable. For this to happen, the O&M costs would have to be negative, which is not possible. Hence changes in the value of O&M will not make the NPV cross zero. Tariff: The tariff considered for the investment analysis for this project activity is as per the Power Purchase Agreement (PPA) signed by the PP with the state electricity board. A 35.67% increase in the tariff rate causes the NPV of the project activity to cross zero. However, as per this agreement, the tariff rate is fixed throughout the lifetime of the project. Hence, sensitivity analysis on the tariff is not appropriate. Generation: A 35.67% increase in the generation causes the NPV of the project activity to cross zero. A sensitivity of +10% i.e. a generation of 55.62 lakh kWh still gives an NPV of INR -2426.75 lakh. A sensitivity of 10% also covers the generation estimated by the third party wind assessment report. Thus, a variation of more than 10% is unrealistic and unlikely. As can be seen from the above analysis there is significant risk associated with the project activity that impacts the viability of the project activity. Thus, it can be concluded that the project activity is not the most financially attractive option.	
Step 4: Common Practice Analysis		
a) Analyze other activitiessimilar to proposed project activity	**Sub-step 4a: Analyze other activities similar to the proposed project activity:** As per the approved methodological tool, common practice analysis includes: "Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment withrespect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis" In the context of the present project activity, the following parametersare defined in line with paragraphs 5 – 10 of this approved methodological tool: **Measure**: As per paragraph 6, 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 renewableenergies);" **Output:** As per paragraph 7, "power generation" may be considered to be the output in the context of the project activity. Further as per Step 1 of paragraph 47 of the same tool, the applicable output range will be 10.8 MW to 32.4 MW, i.e. ±50% of installed capacity of the project activity (21.6 MW) **Different technologies** in the context of the project activity: a) Energy source/fuel: In this case, the source of energy is wind power b) Feed Stock: This criterion is irrelevant in the context of the project activity as no feed stock is involved c) Size of installation: Since the installed capacity of the project activity is	

greater than 15 MW, the installation size shall be considered as "Large"

d) Investment climate:
   i. Access to technology: Access to the wind power generation technology is fairly same across the host country
   ii. Subsidies or other financial cash flows: Though not applicable in the case of wind power, subsidies are regulated by the Ministry of New & Renewable Energy, India for the entire host country
   iii. Promotional policies: Though not applicable in the case of wind power, subsidies are regulated by the Ministry of New & Renewable Energy, India for the entire host country
   iv. Legal regulation: As per the Electricity Act 2003, the state electricity regulatory commissions are responsible for formulating legislations for various renewable energy power projects coming up in the respective state. Since such regulations vary from state-to-state, the same renewable energy power project will be subjected to different regulations depending upon its location. In light of this, it may be appropriate to consider the pre-2003 era of the Indian power sector as a different investment climate altogether
e) Other features: No additional aspects of variance are observed for similar project activities

Applicable geographical area: As per paragraph 5, the host country is to be considered as the default geographical area.

Thus, as per paragraph 47 of the methodological tool,
Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity

The applicable output range is 10.8 MW to 32.4 MW (i.e. +/- 50% of 21.6MW).

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number Nall. Registered CDM project activities shall not be included in this step

In this step, all the plants in India delivering power in the applicable output range of 10.8 MW to 32.4 MW have been considered. Further, all the CDM registered project activities and project activities undergoing validation have been excluded

Technologies	N_{all}
Hydroelectric	239
Thermal	78
Nuclear	0
Wind	25
Biomass & Bagasse	131
Total (N_{all})	473

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number Ndiff.

<table>
<tr>
<td></td>
<td>In this step, those project activities that apply technologies different from that of the project activity (as defined above “Different technologies”) have been identified
<table>
<tr><th>Technologies</th><th>N_{diff}</th></tr>
<tr><td>Hydroelectric</td><td>239</td></tr>
<tr><td>Thermal</td><td>78</td></tr>
<tr><td>Nuclear</td><td>0</td></tr>
<tr><td>Wind</td><td>0</td></tr>
<tr><td>Biomass & Bagasse</td><td>131</td></tr>
<tr><td>Total (Ndiff)</td><td>448</td></tr>
</table>
Step 4: Calculate factor F=1-Ndiff/Nall representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity
In this step, the factor F is evaluated as below:
F = 1 – (Ndiff/Nall)
= 1- (448/473)
= 0.053
Thus, the results of the analysis are as follows:
F < 0.2
Nall – Ndiff > 3
Since both the conditions of paragraph 47 of the approved methodological tool are not fulfilled, the present project activity is not a “common practice” within a sector in the applicable Geographical area.</td>
<td></td>
</tr>
<tr>
<td>Step 4b: Discuss any similar options that are occurring:</td>
<td>As is evident from the above, the project activity is not a common practice project, the project is additional and not the same as baseline scenario and would not have occurred without the CDM. The approval and registration of the proposed project activity as a CDM project would lead to additional revenue thereby improving the returns from the project activity alleviating investment and regulatory policy risk to a certain extent. The successful registration also provides an incentive for other proponents to invest in wind power projects. Thus the CDM revenue acts as a risk mitigation tool in overcoming barriers.</td>
<td></td>
</tr>
</table>

A brief chronological sequence of the project activity is as follows:

Sl. No.	Event	Date
1.	Quotation from WTG supplier	25-January-2011
2.	Board Approval for project	10-February-2011
3.	Intimation to DNA	07-March-2011
3.	Intimation to UNFCCC	07-March-2011
4.	Supply Agreement (Financial Closure[8])	31-March-2011
5.	Stakeholders’ Consultation	06-May-2011
6.	Appointment of DOE	23-July-2011
7.	GEDA clearance	03-September-2011
8.	Commissioning	03-March-2012
9.	Letter of Approval from DNA (MoEF)	03April-2012

3.6 Methodology Deviations

There is no any methodology deviation applicable for the project activity.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline Emissions:

Baseline Emissions Calculations:

As per of ACM0002, Version 20.0 para 39, the baseline emissions are to be calculated using the following formula

Baseline Emissions (BEy) = $EG_{PJ,y}$ x $EF_{Grid,CM,y}$

Where,

BEy= 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 of ACM0002, Version 20.0, for Greenfield renewable energy power plants,

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

Where,

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

Thus, Baseline Emissions = $EF_{Grid,CM,y}$ x $EG_{facility,y}$

Method of calculation of combined margin emission factor: "Tool to calculate the emission factor for an electricity system", Version 07.0, EB 100 (Annex 4).

The combined margin calculations estimate the baseline emission factor for grid. It consists of a combination of operation margin (OM) and build margin (BM) factors obtained from publication issued by Central Electricity Authority (CEA) of India- CO_2 Baseline Database for the Indian Power Sector, Version 17,dated Oct.2021.

Calculation of the Baseline Emission Factor

Step 1: Identifying the relevant electricity system

As described in tool "For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO_2 Baseline Database. As of 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Table 1 Geographical Scope of Indian Electricity Grid

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

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

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

The project proponent wishes to include only grid power plants in the calculation, while off-grid plants will be excluded.

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

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

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

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

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

	2013-14	2014-15	2015-16	2016-17	2017-18
India	18.6%	16.8%	15.1%	14.6%	14.3%

Data Source: Central Electricity Authority (CEA) database Version 17, Oct'2021

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of the total generation. Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

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

OR

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

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the 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: Calculation of the Operating Margin Emission Factor according to the Simple OM method
The operating margin emission factor has been calculated using a 3 year data vintage:

Net Generation in Operating Margin (GWh) (incl. Imports)			
	2018-19	2019-20	2020-21
INDIAN Grid	9,95,957	9,65,009	9,58,218

Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
	2018-19	2019-20	2020-21
INDIAN Grid	0.9603	0.9555	0.9405

Weighted Generation Operating Margin	
INDIAN Grid	0.9522

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. This may be calculated by any of the two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system. This option can only be used if:

a) The necessary data for Option A is not available; and

b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

Net electricity generation and fuel consumption of each power plant is available through the data provided by the Central Electricity Authority (CEA), an official data source.

Assumptions:

The following assumptions have been made in case of unavailability of data at station level

- Net generation: In case of stations where only gross generation is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation data.
- GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been in case of unavailability of data at unit level:

Net generation: The data is not monitored at a unit level and hence the following assumptions have been made

1. The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:
   a) All units of a station fall into the build margin; or
   b) All units of a station have the same installed capacity; or
   c) The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.
2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.
3. Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO2 emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach:

The Simple OM has been calculated using the following formula:

$$EF_{grid\ ,OMsimple,\ y}=\frac{\sum_{M} EGm,y \times EFEL,M,Y}{\sum_{m} EG\ M,y}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = All power units serving the grid in year y except low-cost / must-run power units

y = The relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$

The emission factor of each power unit m should be determined as follows:

- Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC\ im,y \times NCV\ i,j \times EFco2,i,y}{\sum EG\ M,y}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

$FC_{i,m,y}$ = Amount of fossil fuel type "i" consumed by power plant / unit m in year y (mass or volume unit)

$NC_{Vi,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units

i = All fossil fuel types combusted in power plant / unit m in year y

y = The three most recent years for which data is available at the time of submission of the PDD to the DOE for validation (for ex ante option)

$EF_{Grid,OM,y}$ = 0.9522 tCO_2/MWh

Step 5: Calculate the build margin emission factor

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 72:

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1 - for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2 - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third

crediting period, the build margin emission factor calculated for the second crediting period should be used.

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

Build Margin (tCO2/MWh) (not adjusted for imports)	
	2020-21
INDIAN Grid	0.8653

With regards to data vintage, the project participant wishes to use Option 1 viz., for the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group "m" at the time of CDM-PDD submission to the DOE for validation.

The sample group of power units m used to calculate the build margin has been determined as per the following procedure, consistent with the data vintage selected above:

a) The set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET5-units) was identified and their annual electricity generation (AEGSET-5-units, in MWh) was determined;

b) The annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEGtotal, in MWh) was determined. The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEGtotal (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) was identified and their annual electricity generation (AEGSET-≥20%, in MWh) was determined;

c) From SET5-units and SET≥20% the set of power units that comprises the larger annual electricity generation (SETsample = SET≥20%) was selected.

Since none of the power units in SETsample started to supply electricity to the grid more than 10 years ago, this set SETsample has been used to calculate the build margin.

The data pertaining to the units thus identified are detailed in the Version 6 of the Baseline Carbon Dioxide Emissions database of the CEA.

The build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

$$EF_{grid\ ,\ BM\ ,\ y} = \frac{\sum_{M} EGm,y \times EFEL,M,Y}{\sum_{m} EG\ M,y}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which electricity generation data is available

The Build Margin has been calculated ex ante during the crediting period. For ex ante calculation the most recent data available has been used and the build margin thus calculated is 0.8653for the Indian Grid grid. Therefore,

$EF_{Grid,BM,y}$ = 0.8653 tCO_2/MWh

Step 6: Calculation of the Combined Margin Emission Factor

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 81:

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

PP has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor

The combined margin emission factor is calculated as follows:

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

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%) The default values to be used for Wind Power projects are w_{OM}= 0.75 w_{BM}= 0.25

Hence, the Baseline Emission Factor is calculated as below:

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

= 0.75 * 0.9522 + 0.25 * 0.8653

= 0.9305 tCO_2/MWh

The Baseline Factor thus calculated is fixed for the first crediting period.

The net export expected from the project activity is on an annual basis is 56,000 MWh. Hence the baseline emissions are calculated as below:

Baseline Emissions (BEy) = 0.9305 tCO_2e/MWh * 56,000 MWh

= 52,108 tCO_2e (Round down value)

Project Emission Calculations:

According to ACM0002, Version 20.0,

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

Where:

PE_y = Project emissions in year y (tCO_2e)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non- condensable gases in year y (tCO_2e)

$PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year y (tCO_2e)

As the project activity is the generation of power using renewable wind energy, there is no fossil fuel consumption in the project activity.

Hence, $PE_{FF,y} = 0$

$PE_{GP,y} = 0$

$PE_{HP,y} = 0$, Thus project Emissions for ex ante calculations have been assumed as zero. Hence, $PE_y = 0$.

Leakage Emission Calculation:

The project proponents have identified no anthropogenic greenhouse gases by sources outside the project boundary that are significant, measurable and attributable to the project activity. Hence, no leakage is considered from the project activity.

$LE_y = 0$

Emission Reduction Calculation:

ER= BEy – PEy

= 52,108 – 0

= 52,108 tCO_2e

4.2 Project Emissions

According to the chosen baseline methodology AMS-I.D., for wind energy based renewable energy project activities, PEy = 0.

4.3 Leakage

According to AMS-I.D., leakage emissions are considered only for biomass projects to quantify leakages pertaining to the use of biomass residues. As this project activity is a wind power project, no leakage emissions are considered. LEy= 0.

4.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2021-22	52,108	0	0	52,108
2022-23	52,108	0	0	52,108

2023-24	52,108	0	0	52,108
2024-25	52,108	0	0	52,108
2025-26	52,108	0	0	52,108
2026-27	52,108	0	0	52,108
2027-28	52,108	0	0	52,108
2028-29	52,108	0	0	52,108
2028-29	52,108	0	0	52,108
2030-31	52,108	0	0	52,108
Total	521,080	0	0	521,080

5 MONITORING

5.1 Data and Parameters Available at Validation

For First crediting period

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin emission factor for Indian grid
Source of data	Calculated from CEA database, Version 14, Dec 2018[7]
Value applied:	0.9610
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 07" as 3-year generation weighted average using data for the years 2015-16, 2016-17 & 2017-18. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 14, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the Calculation of baseline emissions
Comments	Data will be kept for crediting period + 2 Years.

[7] https://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	CO2 Built Margin emission factor of the Indian Grid
Source of data	Calculated from CEA database, Version 14, Dec 2018
Value applied:	0.8644
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 07" as per the latest data available for the most recent year 2017-18. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 14, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the Calculation of baseline emissions
Comments	Data will be kept for crediting period + 2 Years.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin emission factor for the Indian grid
Source of data	Calculated from CEA database, Version 14, Dec 2018
Value applied:	0.9368
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: $EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh) $EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/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 baseline emissions
Comments	Data will be kept for crediting period + 2 Years.

For second crediting period

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin emission factor for Indian grid
Source of data	Calculated from CEA database, Version 17, Oct 2021[8]-March-
Value applied:	0.9522
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 07" as 3-year generation weighted average using data for the years 2018-19, 2019-20 & 2020-21. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 17, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	Data will be kept for crediting period + 2 Years.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	CO2 Built Margin emission factor of the Indian grid
Source of data	Calculated from CEA database, Version 17, Oct 2021[9]-March-
Value applied:	0.8653

[8] https://cea.nic.in/wp-content/uploads/baseline/2022/02/database_17_.zip

[9] https://cea.nic.in/wp-content/uploads/baseline/2022/02/database_17_.zip

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 07" as per the latest data available for the most recent year 2020-21. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 17, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	Data will be kept for crediting period + 2 Years.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin Grid emission factor for the Indian grid.
Source of data	Calculated from CEA database, Version 17, Oct 2021-March-
Value applied:	0.9305
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 CO_2 emission factor in year y (tCO_2/MWh) $EF_{grid,OM,y}$= Operating margin CO_2 emission factor in year y (tCO_2/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	Data will be kept for crediting period + 2 Years.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/year

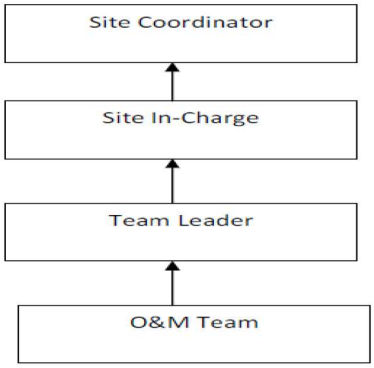
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Certificate for share of electricity generated by the State Electricity Board (GETCO)
Description of measurement methods and procedures applied	Monitoring: a)At WTG yard: Electrical Energy Meters which are electronic tri-vector meter of accuracy class 0.2s b)At substation: Electrical Energy Meters which are electronic tri-vector ABT meter of accuracy class 0.2s Data type: Measured & Calculated. Archiving: Paper & Electronic Monitoring Frequency: Continuous measurement and at least monthly recording Responsibility: a)At WTG yard: The O&M site-in-charge shall be responsible for the regular recording of data *b)*At substation: The representative of the state electricity board at the Vandhiya substation shall be responsible for the regular recording of data Calibration Frequency: The meters shall be calibrated once in five years.
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value applied:	56,000
Monitoring equipment	**Monitoring Equipment:** Monitored through the main meter and check meter readings. Both the energy meters are bi-directional tri-vector meters. At WTG Yard Secure make and at Substation L&T make meter are installed. Meter accuracy: 0.2s of the meter at respective substations that are used for the exported electricity metering. 0.2s of the meter at respective WTG yards that would be used for the electricity metering. The meters are calibrated once in five year as per CEA notification and deviation. Calibration details mentioned in Appendix 1.
QA/QC procedures applied	The Quantity of net electricity generation from the certificate for share of electricity will be cross-checked with the invoices for the

	sale of power by Powerica. Meter calibration shall be conducted once in five year.
Purpose of data	Calculation of baseline emissions
Calculation method	--
Comments	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. In the case of the crediting period start & end dates of the project activity falls in – between the billing cycles, then for emission reduction calculations, the daily generation reports provided by the O&M service provider, shall be considered.

5.3 Monitoring Plan

The project activity is in accordance with approved large scale methodology ACM 0002, Version 20.0, and therefore, can use the monitoring methodology for the same.

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 electricity exported to the grid. The Project is operated and managed by Vestas Wind Technology India Private Limited (Vestas). Vestas has a designated Site-In-Charge (O&M) on site who is responsible for monitoring the electricity exported from the project activity. The organizational structure of the O&M team by Vestas is as follows.



The roles and responsibilities of the O&M team may be elaborated as follows:
O&M Team: The team comprises of site engineers who are directly responsible for carrying out the O & M activity of WTG. They execute the preventive maintenance and attend to break downs as per O&M Manual & Procedures. They respond to breakdown calls and resolve customer

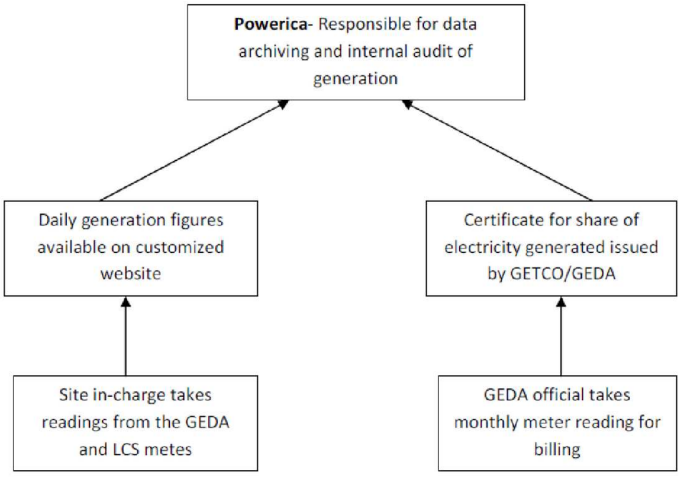
complaints. They record all the readings and prepare documentations for Reports, Logs and Daily Generation Reports.

Team Leader: He leads the O&M team and is responsible for attending to the unscheduled breakdown of WTGs and for ensuring that WTG should be restored at earliest. He ensures the proper reading, recording and monitoring of the Generation.

Site-In-charge: He is responsible for the entire site. He has to take timely corrective measures/action to ensure that overall performance of site is met and delivered. He is responsible for the individual site. He executes the preventive maintenance and attends to break downs as per O&M Manual & Procedures. He also checks the daily Generation reports for all the WTGs.

Site Co-ordinator: He is in-charge of overall O&M activities of site. The responsibilities include ensuring complete documentation of the Generation of the site, on-time service delivery, timely response to breakdowns and efficient manpower management for the site.

Further, all new technicians on site are trained by Vestas. Also, the O&M personnel are trained regularly in order to improve their technical skills.



Monitoring Process at Gujarat

Metering of wind power is done as under:

- Joint meter reading is taken at substation meter by representative of GETCO (Gujarat Electricity Transmission Company) and O&M service provider (on behalf of individual wind farm owners). Let the total generation recorded for particular month is 'X' units in sub-station meter.
- Joint meter reading is taken at Local Meter-(transformer yard meter of each WTG) by representative of GETCO (Gujarat Electricity Transmission Company) and O&M service provider (on behalf of individual wind farm owners). Let us assume total generation of Powerica recorded for particular month is 'Y1' units.
- Similarly joint meter reading for other wind farm owners is also taken. Let the generation of individual owner recorded for particular month are 'Y2, Y3,.....Yn' units.
- GETCO distributes 'X' to individual wind farm owners using following formula and issues monthly certificates.

- For Powerica, net units calculated for billing = X * Y1 / ΣYn It must be noted here that the meter readings as mentioned above are calculated as the product of meter multiplication factor and the difference of the current and previous meter readings

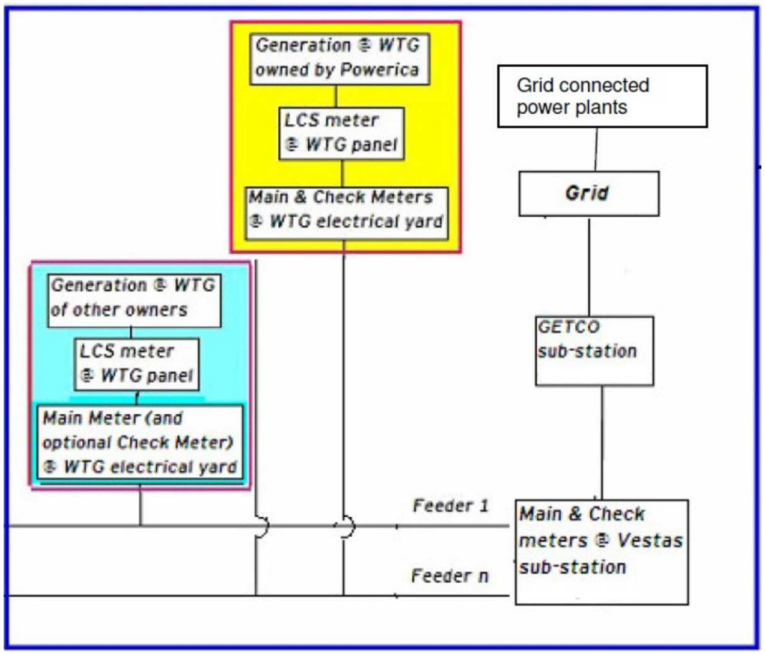


Figure 1 Single line diagram of project activity

Internal audits & Performance review

The records are regularly audited and checked by the senior officials from project proponent basis. The officials monitor readings at site are adequately trained. There are no any discrepancy/inconsistency observed in the values of net electricity supplied to grid value.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/year
Description	Quantity of net electricity supplied to the grid

Value applied:	01-January-2021 to 13-July-2021 – 25,710.73[10] 14-July-2021 to 31-December -2021 – 18,913.18[11] Total – 44,623.91
Comments	Calculation of baseline emissions

6.2 Baseline Emissions

The emission factor value has been fixed Ex-ante and the same shall be used for the monitoring period. Net Electricity Generated is obtained by deducting total import (from grid) from total export (to grid). These values are taken from the "Certificate for Share of Electricity Generated by Wind Farm" issued by state electricity board. This statement is issued on a monthly basis.

Baseline emissions are calculated by multiplying the Net electricity exported to the grid with net baseline emission factor, as given in the registered VCS PD.

$BE_y = EG_{facility,y} \text{ X } EF_{grid,CM,y}$

Where,

BE_y = Baseline Emissions (tCO_2/year)

$EG_{facility,y}$ = Net electricity supplied to the grid in year y (MWh)

$EF_{grid,\ CM,\ y}$ = Baseline Emission Factor (Combined margin CO_2 emission factor for grid)

The calculation of yearly baseline emissions is provided below:

BE_y = 25,710.73MWh * 0.9368 tCO_2/year = 24,085 (the value is rounded down) for the period 01-January-2021 to 13-July-2021.

BE_y = 18,913.18 MWh * 0.9305CO_2/year = 17,598 (the value is rounded down) for the period 14-July-2021 to 31-December-2021.

BE_y = 41,683 tCO_2e (the value is rounded down)

Hence the baseline emission calculated for the reported monitoring period is 41,683 tCO_2

i.e. BE_y = 41,683 tCO_2e

6.3 Project Emissions

No project emissions are applicable to this wind electric power project, since the electricity generation is based on wind resources, which does not involve in combustion or generation of emissions from fossil fuels. Hence, these emission sources are neglected.

PEy = 0

[10] Net energy exported to the grid during this monitoring period and previous crediting period (14/07/2011 to 13/07/2021)

[11] Net energy exported to the grid during this monitoring period and current crediting period (14/07/2021 to 13/07/2031)

6.4 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.

LEy = 0

6.5 Net GHG Emission Reductions and Removals

Quantify the net GHG emission reductions and removals achieved for this monitoring period, summarizing the key results using the table below. Specify breakdown of GHG emission reductions and removals by vintages where the intent is to issue each vintage separately in the VCS registry system.

The Formula used to calculate the net emission reduction for the project activity is

$ER_y = BE_y - PE_y$
Where,

ER_y = Emission Reduction in tCO2/year

BE_y = Baseline emission in tCO2/year

PE_y = Project emissions in tCO_2/year

For the project activity during the current monitoring period

BEy = 41,683 tCO_2e, PEy = 0 tCO_2e ,

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01-January-2021to 31-December-2021	41,683	0	0	41,683
Total	41,683	0	0	41,683

During this monitoring period under previous crediting period – 01-January-2021 to 13-July-2021

During the current monitoring period, actual emission reductions achieved are 24,085 tCO_2e whereas estimated emission reductions was 28,235 tCO_2e. The project witnessed a decrease of 14.70% in emission reductions as compared to ex-ante emissions.

During this monitoring period under current crediting period – 14-July-2021 to 31-December-2021.

During the current monitoring period, actual emission reductions achieved are 17,598 tCO_2e whereas estimated emission reductions was 24,412 tCO_2e. The project witnessed a decrease of 27.91% in emission reductions as compared to ex-ante emissions.

APPENDIX 1: METER CALIBRATION DETAILS

The calibration details for meters involved in the project activity and available with PP are as below. The calibration is under control of state electricity board and PP do not have any control on it.

Make: Secure

Accuracy class: 0.2s

WTG No	Meter Serial No.	Year 2018	Next Due date of Calibration
JW27	GJU61847	09-March-2018	08-March-2023
NM04	GJU64200	07-March-2018	06-March-2023
VW21	GJU61844	14-March-2018	13-March-2023
VW32	GJU61845	14-March-2018	13-March-2023
NM03	GJU65938	07-March-2018	06-March-2023
NM06	GJU74496	07-March-2018	06-March-2023
NM07	GJU74498	07-March-2018	06-March-2023
JW09	GJU64145	09-March-2018	08-March-2023
JW10	GJU64174	09-March-2018	08-March-2023
JW12	GJU64152	09-March-2018	08-March-2023
JW13	GJU64146	09-March-2018	08-March-2023
JW30	GJU64165	09-March-2018	08-March-2023

The bulk meters located at the substation

Meter Sr. No. Make: Accuracy class:	GJ-2311- A L & T 0.2S	GJ-2363 – A L & T 0.2S
Meter Location (Vandhiya 220 KV Substation)	Line - 1	Line -2
Date of Calibration	15-Oct.-2018	15-Oct.-2018
Next due date	14-Oct.-2023	14-Oct.-2023

Meter Sr. No. Make: Accuracy class:	GJ-2369- A L & T 0.2S	GJ-2370 – A L & T 0.2S
Meter Location (Shikarpur 132 KV Substation)	Line - 1	Line -2
Date of Calibration	15-Oct.-2018	15-Oct.-2018
Next due date	14-Oct.-2023	14-Oct.-2023

Considering five years calibration frequency as per CEA notification and as per deviation request, there is no any delay in calibration applicable for the project activity.