



GREEN ENERGY PROJECT AT GUJARAT BY POWERICA LIMITED



Document Prepared by EKI Energy Services Limited

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Project Title	Green Energy Project at Gujarat by Powerica Limited
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CONTENTS

1	PROJECT DETAILS.....	4
1.1	Summary Description of the Implementation Status of the Project	4
1.2	Sectoral Scope and Project Type	4
1.3	Project Proponent	5
1.4	Other Entities Involved in the Project	5
1.5	Project Start Date	5
1.6	Project Crediting Period	6
1.7	Project Location	6
1.8	Title and Reference of Methodology	7
1.9	Participation under other GHG Programs.....	8
1.10	Other Forms of Credit.....	8
1.11	Sustainable Development.....	8
2	SAFEGUARDS	9
2.3	AFOLU-Specific Safeguards	10
3	IMPLEMENTATION STATUS	10
3.1	Implementation Status of the Project Activity	10
3.2	Deviations	12
3.3	Grouped Projects	12
4	DATA AND PARAMETERS.....	12
4.1	Data and Parameters Available at Validation	12
4.2	Data and Parameters Monitored.....	14
4.3	Monitoring Plan.....	16
5	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	18
5.1	Baseline Emissions	18
5.2	Project Emissions	19
5.3	Leakage.....	19
5.4	Net GHG Emission Reductions and Removals.....	19

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity involves installation and operation of a 25.2 MW wind power generation project at Bhachau, in the Kutch district of Gujarat by Powerica Limited. The total installed capacity of 25.2 MW comprises of 14 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 erstwhile NEWNE grid of India.

The WTGs involved in the project activity were commissioned in four phases – the earliest date of commissioning is 25-February-2012.

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 electricity is generated using wind energy resources, 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.

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 total emission reductions achieved by this project activity in the monitoring period from 01-October-2018 to 31-January-2020 73,490 tCO₂e through displacing 77138.856 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 Proponent

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

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Mr. Souvik Mitra
Title	Project Manager
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1.5 Project Start Date

The project start date is 25-February-2012 which is the date of commissioning of the first phase of the 25.2 MW wind power project.

1.6 Project Crediting Period

The project has begun generating GHG emission reductions from commissioning. The crediting period for VCS begins on 25-February-2012 and ends on 24-February-2022.

The project is registered under Clean Development Mechanism (CDM) of UNFCCC with 10 years crediting period (Fixed) (Reference No: 8672¹) on 31-January-2013. The Crediting period of the project under CDM started on 31-January-2013 and ended on 30-January - 2023.

1.7 Project Location

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

¹ <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1355215731.08/view>

WTG ID	WTG No.	Village	District and State	Latitude (°N)	Longitude (°E)
JW 01 New	VWT/1800/11-12/2552	Jangi	Kutch, Gujarat	23° 11' 54"	70° 34' 54"
JW 29	VWT/1800/11-12/2553	Jangi	Kutch, Gujarat	23° 12' 01"	70° 32' 25"
VW 49	VWT/1800/11-12/2554	Lakhapar (Vandhiya)	Kutch, Gujarat	23° 12' 11"	70° 36' 52"
VW 54 New	VWT/1800/11-12/2555	Godpar (Vandhiya)	Kutch, Gujarat	23° 12' 14"	70° 36' 38"
JW 02 New	VWT/1800/11-12/2593	Jangi	Kutch, Gujarat	23° 11' 40"	70° 34' 45"
JW 05 New	VWT/1800/11-12/2594	Jangi	Kutch, Gujarat	23° 11' 49"	70° 35' 07"
VW 80	VWT/1800/11-12/2595	Modpar (Vandhiya)	Kutch, Gujarat	23° 12' 22"	70° 35' 27"
VW 66	VWT/1800/11-12/2607	Vandhiya	Kutch, Gujarat	23° 16' 03"	70° 35' 06"
VW 67	VWT/1800/11-12/2608	Vandhiya	Kutch, Gujarat	23° 15' 25"	70° 35' 45"
VW 79	VWT/1800/11-12/2609	Vandhiya	Kutch, Gujarat	23° 14' 46"	70° 37' 40"
VW 48	VWT/1800/11-12/2610	Lakhdhirga dh (Vandhiya)	Kutch, Gujarat	23° 15' 23"	70° 35' 17"
VW 62	VWT/1800/11-12/2611	Vandhiya	Kutch, Gujarat	23° 15' 45"	70° 34' 56"
VW 63	VWT/1800/11-12/2612	Vandhiya	Kutch, Gujarat	23° 15' 51"	70° 35' 21"
VW 71	VWT/1800/11-12/2613	Vandhiya	Kutch, Gujarat	23° 13' 29"	70° 36' 18"

1.8 Title and Reference of Methodology

Methodology: ACM0002 ver. 13.0²

Methodology Title: "Consolidated baseline methodology for grid-connected electricity

² <https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

generation from renewable sources”

The methodology also refers to the latest approved versions of:

- Tool for the demonstration and assessment of additionality, Version 06.1.0, EB 69³
- Tool to calculate the emission factor for an electricity system, Version 02.2.1, EB 63⁴

1.9 Participation under other GHG Programs

The project activity has also been registration with UNFCCC under Clean Development Mechanism (CDM) program, Registration reference number is 8672. The project proponent has provided undertaking that it will not claim any GHG credits for UNFCCC CDM during the current monitoring period.

1.10 Other Forms of Credit

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 8672. 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.

1.11 Sustainable Development

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)⁵ 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.

³ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.1.0.pdf>

⁴ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf>

⁵⁵ Since June 2014, the name of the NCDMA changed to Ministry of Environment, Forests and Climate Change (MoEFCC)

- **New business Opportunity:** The project activity would provide business opportunities to the local population contributing to poverty alleviation of the local community.

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 (CO₂ and CH₄ 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 (SO₂) 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.

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 conducted local stakeholder consultation extensively during registration of the project through identification of stakeholders, invitation of stakeholders for meeting, explanation on the project and resolving comments/suggestions/ grievances of the stakeholders.

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. Besides, the PP has also kept provision for submitting comments/grievances/suggestions from local stakeholders through direct mail. 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.

2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project has been completed and the monitoring equipments were installed to monitor the parameters as described in the registered Project Description (PD). All the WTGs involved in the project activity are already commissioned and operational. The WTGs are under operation since the date of commissioning and no event has been identified which may impact GHG emission reduction.

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
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The WTGs involved in the project activity were commissioned in four phases – the earliest date of commissioning is 25-February-2012. The commissioning dates of all the WTGs are provided as below.

Sl. No		WTG	Commissioning Date
1	JW 01	VWT/1800/11-12/2552	25-February-2012
2	JW 29	VWT/1800/11-12/2553	25-February-2012
3	JW 49	VWT/1800/11-12/2554	25-February-2012
4	JW 54	VWT/1800/11-12/2555	25-February-2012
5	JW 02	VWT/1800/11-12/2593	21-March-2012
6	JW 05	VWT/1800/11-12/2594	21-March-2012
7	JW 80	VWT/1800/11-12/2595	21-March-2012
8	JW 67	VWT/1800/11-12/2608	27-March-2012
9	JW 79	VWT/1800/11-12/2609	27-March-2012
10	JW 66	VWT/1800/11-12/2607	30-March-2012
11	VW 48	VWT/1800/11-12/2610	30-March-2012
12	VW 62	VWT/1800/11-12/2611	30-March-2012
13	VW 63	VWT/1800/11-12/2612	30-March-2012
14	VW 71	VWT/1800/11-12/2613	30-March-2012

The project activity WTGs are connected to substation through Vandhya Line 1, Vandhya Line 2, Sikharpur Line 1 and Sikharpur Line 2 feeder lines. The energy meters are installed at each WTG site and also at substation feeder line.

The WTGs have been in normal operation in the monitoring period including planned and forced shutdowns. Details of major shutdowns of the project activity have been provided in APPENDX 2 of this document.

3.2 Deviations

2.3.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

2.3.2 Project Description Deviations

As per registered VCS PD, the calibration frequency is once in a year. The calibration of meters is not in control of PP and same is done by state electricity board. The state electricity board does not follow any fixed calibration frequency, hence deviation is requested for change in calibration frequency as once in five years. This deviation request was approved by VERRA during last verification. This calibration frequency is as per CEA notification http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf

The change in calibration frequency does not have any impact on ER calculations as during monthly reading state electricity board official and PP representative check the meter conditions. Also both parties accepts the reading and PP raise the invoice to state electricity board based on monthly JMR reading. Thus financial obligations are involved which ensures that meters are running accurately.

Deviation is already approved during second VCS verification.

3.3 Grouped Projects

The project is not a grouped project thus this is not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Weighted average of 3 years (2008-09, 2009-10 and 2010-11) CO ₂ Operating Margin emission factor of the grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 07, January 2012
Value applied	0.9842

Justification of choice of data or description of measurement methods and procedures applied	Obtained from the CEA database on CO ₂ Baseline for Indian Power Sector, Version 07 as the weighted average of Operating Margin (incl. imports) for years 2008-09, 2009-10, 2010-11
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor of grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 07; January 2012
Value applied	0.8588
Justification of choice of data or description of measurement methods and procedures applied	Obtained from the CEA database on CO ₂ Baseline for Indian Power Sector, Version 07 (not adjusted for imports)
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor for grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 07; January 2012
Value applied	0.9528
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM}$ The following default values should be used for w_{OM} and w_{BM}: For Wind power generation project activities: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ for the selected crediting period Data compiled in CEA

	CO ₂ CDM database is in line with the requirements Version 02.2.1 of “Tool to calculate the emission factor for an electricity system”
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

4.2 Data and Parameters Monitored

Data / Parameter	EG _{facility, y}											
Data unit	MWh											
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 Wind farm issued by GETCO											
Description of measurement methods and procedures to be applied	Measured and Calculated Energy exported and imported from the project activity is measured &recorded by the energy meter located at the Vandhya and Shikarpur substations. Measurement methods and procedures: Data Typed: Measured Monitoring: Energy Meter is used for monitoring Meter Calibration Frequency: Once in three years Archiving Policy: Paper & / Electronic											
Frequency of monitoring/recording	Continuous monitoring and monthly recording											
Value monitored	<table><tr><td>Year</td><td>Net Electricity Supplied to grid(MWh)</td></tr><tr><td>2018</td><td>7564.618</td></tr><tr><td>2019</td><td>65417.919</td></tr><tr><td>2020</td><td>4156.319</td></tr><tr><td>Total</td><td>77138.856</td></tr></table>		Year	Net Electricity Supplied to grid(MWh)	2018	7564.618	2019	65417.919	2020	4156.319	Total	77138.856
Year	Net Electricity Supplied to grid(MWh)											
2018	7564.618											
2019	65417.919											
2020	4156.319											
Total	77138.856											

Monitoring equipment	Monitoring Equipment: Monitored through the main meter and check meter readings. Both the energy meters are bi-directional tri-vector meters. Monitoring: a) At WTG yard: Electrical Energy Meters which are electronic tri-vector meters of accuracy class 0.5s or above b) At substation: Electrical Energy Meters which are bidirectional electronic tri-vector ABT meter of accuracy class 0.5s or above. The meters are calibrated once in five years as per the registered PD. Details of energy meters are given below: <table border="1" data-bbox="735 695 1154 1402"> <tbody> <tr><td>JW 01</td><td>GJU64156</td></tr> <tr><td>JW 29</td><td>GJU64155</td></tr> <tr><td>JW 49</td><td>GJU64157</td></tr> <tr><td>JW 54</td><td>GJU64158</td></tr> <tr><td>JW 02</td><td>GJU62542</td></tr> <tr><td>JW 05</td><td>GJU64802</td></tr> <tr><td>VW 48</td><td>GJU64809</td></tr> <tr><td>VW 62</td><td>GJU64805</td></tr> <tr><td>VW 63</td><td>GJU64812</td></tr> <tr><td>VW 66</td><td>GJU64804</td></tr> <tr><td>VW 67</td><td>GJU64807</td></tr> <tr><td>VW 71</td><td>GJU64813</td></tr> <tr><td>VW 79</td><td>GJU64806</td></tr> <tr><td>VW 80</td><td>GJU64803</td></tr> </tbody> </table>	JW 01	GJU64156	JW 29	GJU64155	JW 49	GJU64157	JW 54	GJU64158	JW 02	GJU62542	JW 05	GJU64802	VW 48	GJU64809	VW 62	GJU64805	VW 63	GJU64812	VW 66	GJU64804	VW 67	GJU64807	VW 71	GJU64813	VW 79	GJU64806	VW 80	GJU64803
JW 01	GJU64156																												
JW 29	GJU64155																												
JW 49	GJU64157																												
JW 54	GJU64158																												
JW 02	GJU62542																												
JW 05	GJU64802																												
VW 48	GJU64809																												
VW 62	GJU64805																												
VW 63	GJU64812																												
VW 66	GJU64804																												
VW 67	GJU64807																												
VW 71	GJU64813																												
VW 79	GJU64806																												
VW 80	GJU64803																												
QA/QC procedures to be applied	The Quantity of net electricity generation from the certificates for share of electricity are cross-checked with the invoices for the sale of power by Powerica Limited.																												
Purpose of the data	Calculation of baseline emissions																												
Calculation method	--																												

Comments

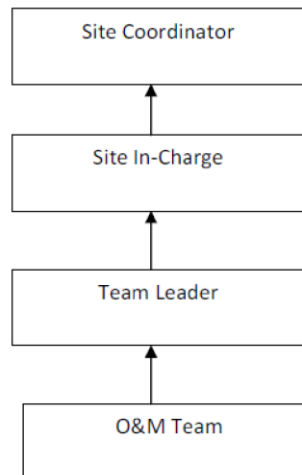
The Monitored Data to be kept for a minimum of two years after the end of the crediting period or the last issuance whichever is later.

4.3 Monitoring Plan

The project activity is in accordance with approved large scale methodology ACM 0002, Version 13.0.0, and therefore, can use the monitoring methodology for the same.

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

Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the electricity exported to the grid. The Project is operated and managed by Vestas Wind Technology India Private Limited (Vestas). Vestas will have a designated Site-In-Charge (O&M) on site who will be responsible for monitoring the electricity exported from the project activity. The organizational structure of the O&M team by Vestas is as follows:



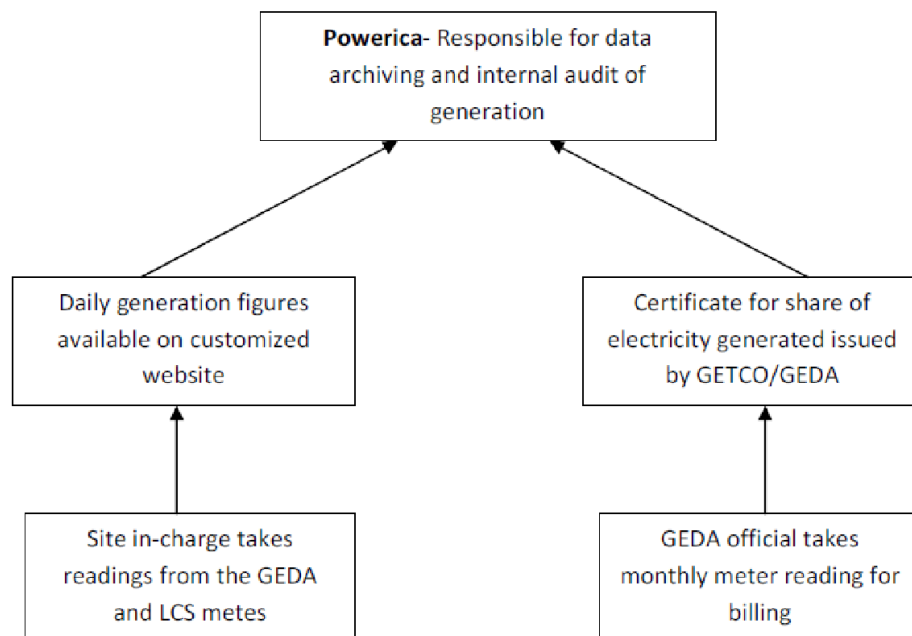
The roles and responsibilities of the O&M team may be elaborated as follows:

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 = $X * Y1 / \sum Yn$ 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

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.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 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.

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

Where,

BE_y = Baseline Emissions (tCO₂/year)

$EG_{\text{facility},y}$ = Net Electricity exported to grid (MWh)

$EF_{\text{grid},CM,y}$ = Baseline Emission Factor (Combined margin CO₂ emission factor for grid)

The calculation of yearly baseline emissions is provided in the table below:

Year	Net Electricity	Baseline Emission Factor	Baseline Emissions
------	-----------------	--------------------------	--------------------

	Export (MWh)	(tCO ₂ /MWh)	(tCO ₂)
01-Oct-2018 to 31-Dec-2018	7,564.618	0.9528	7,206
01-Jan-2019 to 31-Dec-2019	65,417.919	0.9528	62,324
01-Jan-2020 to 31-Jan-2020	4,156.319	0.9528	3,960
Total	77,138.856		73,490

Hence the baseline emission calculated for the reported monitoring period is 73,490 tCO₂
i.e. BE_y = 73,490 tCO₂e

5.2 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.

$$PE_y = 0 \text{ tCO}_2\text{e}$$

5.3 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.

$$LE_y = 0 \text{ tCO}_2\text{e}$$

5.4 Net GHG Emission Reductions and Removals

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

$$ER_y = BE_y - PE_y - LE_y$$

Where,

ER_y = Emission Reduction in tCO₂/year

BE_y = Baseline emission in tCO₂/year

PE_y = Project emissions in tCO₂/year

LE_y = Leakage Emissions in tCO₂/year

For the project activity during the current monitoring period, as per section 5.1

$$BE_y = 73,490 \text{ tCO}_2$$

$$PE_y = 0 \text{ tCO}_2$$

$$LE_y = 0 \text{ tCO}_2.$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2018	7,206	0	0	7,206
2019	62,324	0	0	62,324
2020	3,960	0	0	3,960
Total	73,490	0	0	73,490

The actual VER is about 10.4% lower than the estimated VER. This variation is majorly due to the variations in wind flow pattern, grid availability and other parameters which are not in the control of PP. This is also affected due the application of error factor. The above variations is conservative.

APPENDIX 1: ENERGY METER CALIBRATION DETAILS

WTG No.	Meter Serial Number	Calibration date 2018	Next due date of calibration
JW01	GJU64156	07-March-2018	06-March-2023
JW29	GJU64155	09-March-2018	08-March-2023
JW49	GJU64157	07-March-2018	06-March-2023
JW54	GJU64158	07-March-2018	06-March-2023
JW02	GJU62542	07-March-2018	06-March-2023
JW05	GJU64802	07-March-2018	06-March-2023
VW48	GJU64809	09-March-2018	08-March-2023
VW62	GJU64805	09-March-2018	08-March-2023
VW63	GJU64812	09-March-2018	08-March-2023
VW66	GJU64804	09-March-2018	08-March-2023
VW67	GJU64807	09-March-2018	08-March-2023
VW71	GJU64813	09-March-2018	08-March-2023
VW79	GJU64806	14-March-2018	13-March-2023
VW80	GJU64803	07-March-2018	06-March-2023

Considering the calibration frequency of once in five years (as provided in Section 2.3.2) there has not been any delay in calibration of the energy meters.

APPENDIX 2; BREAK-DOWN DETAILS

Date from	Date to	Duration (Hours)	Turbine name	Event Allocation	Category	Reason	PAMC Remark
07-Dec-2018	12-Dec-2018	122.20	JW 01	Utility	Force Majeure	--	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged.
07-Dec-2018	12-Dec-2018	122.20	JW 02	Utility	Force Majeure	---	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line

							charged.
07-Dec-2018	12-Dec-2018	122.20	JW 05	Utility	Force Majeure	---	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged.
07-Dec-2018	12-Dec-2018	122.20	VW 49	Utility	Force Majeure	---	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged.
07-Dec-2018	12-Dec-2018	122.20	JW 29	Utility	Force Majeure	---	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 80	Utility	Force Majeure	---	220/33 KV Jangi SS all Feeder tripped due to

							electrical accident. Vestas Investigation work completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 54	Utility	Force Majeure	--	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 67	Utility	Force Majeure	--	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 62	Utility	Force Majeure	--	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work

							completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 66	Utility	Force Majeure	--	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 48	Utility	Force Majeure	--	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 63	Utility	Force Majeure	--	220/33 KV Jangi SS all Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged
07-Dec-2018	12-Dec-2018	122.20	VW 71	Utility	Force Majeure	--	220/33 KV Jangi SS all

							Feeder tripped due to electrical accident. Vestas Investigation work completed and then Line charged
03-April-2019	20-April-2019	405.03	JW 05	Manufacturer	WTG Breakdown	--	WTG Stopped primarily due to Alarm code (335- Ext High Rotor Inv phase: 1); So Vestas Trouble Shooting start & following components are replaced:- 1. Rotor Side IGBT- 03 Nos. replaced. 2. Main Contactor 3. Encoder & IGBT CAN Communication cable replaced. Again Same Alarm code triggered; Finally, Suspecting the Generator Stator Winding Issues; WIP by Vestas with support of Vestas TOS.

28-May-2019	20-June-2019	548.32	VW 79	Manufac turer	Predictive Maintenance	--	WTG stopped due to Alarm code:170: Thermoerr. oil pump F ____/____ $\diamond$ C ; While Primarily Inspected the WTG; found some piece of Metal Particles in Gearbox; After Gearbox Endoscopy Inspection done; then they found Planetary Gear Tooth broken in Gearbox. As per Vestas TOS; Need to be replace the Gearbox with new one; So Finally Renovated Gearbox replaced by Vestas
09-August-2019	12-August-2019	66.32	JW 29	Utility	Internal Grid Failure (IGF)	Earth Fault & Overcurrent	220/33kv ss Feeder-12 trip due to O/C and E/F
09-August-2019	12-August-2019	66.35	VW 80	Utility	Internal Grid Failure (IGF)	Earth Fall and Overcurrent	220/33kv ss Feeder-12 trip due to O/C and E/F
10-August-	12-August-	49.18	JW 05	Manufac	WTG	--	Yaw Signals

2019	2019			turer	Vreakdown		Invalid
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