AES SAURASHTRA WINDFARMS

Document Prepared by TATA Power Renewable Energy Limited

Project Title	AES Saurashtra Windfarms
Version	03.3
Report ID	1039
Date of Issue	08-November-2022
Project ID	1039
Monitoring Period	01-September-2012 to 31-August-2018
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

AES Saurashtra Windfarms Private Limited (ASW) has developed a 39.2 MW wind farm in the state of Gujarat in India. The project activity involves development, supply, commissioning and operation of 49 Wind Turbine Generators (WTGs) of rated capacity 800 kW each. The make of the machines used in the wind farm is Enercon E-53. The project activity is producing the electricity which is supplied to the state electricity utility in the state of Gujarat. The project activity assists in promoting sustainable development of the region by providing clean energy to the state electricity grid.

The purpose of the project activity is to harness renewable wind energy for generation of electricity. The project activity leads to reduction of anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere. In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the NEWNE grid (henceforth it will be referred as Indian Grid due to the integration of all regional grids into one grid on 31-December-2013 in India), which are / will be predominantly based on fossil fuels. On the other hand the electricity generation from operation of WTGs is free from emissions. As per the applicable methodology, the baseline scenario for the project activity is the grid based electricity system, which is also the pre-project scenario.

The project activity was commissioned on 07-June-2011, and is in operation since then. The generated power from this project activity is supplied to the Indian grid & the project participant has signed Power Purchase Agreement (PPA) for 25 years period, with Gujarat Urja Vikas Nigam Limited (GUVNL).

In current monitoring period, total GHG emission reductions achieved is 411,162 tCO_2e.

1.2 Sectoral Scope and Project Type

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

Project Type : I - Renewable Energy Projects

This project activity is not a grouped project activity.

1.3 Project Proponent

Organization name	Tata Power Renewable Energy Limited
Contact person	Mr. Prasant Tiwari
Title	Group Head

Address	Tata Power Renewable Energy Limited, Corporate Center B, 34 Sant Tukaram Road, Carnac Bunder, Mumbai-400 009, Maharashtra, India
Telephone	+91 22-67171912
Email	prasant.tiwari@tatapower.com

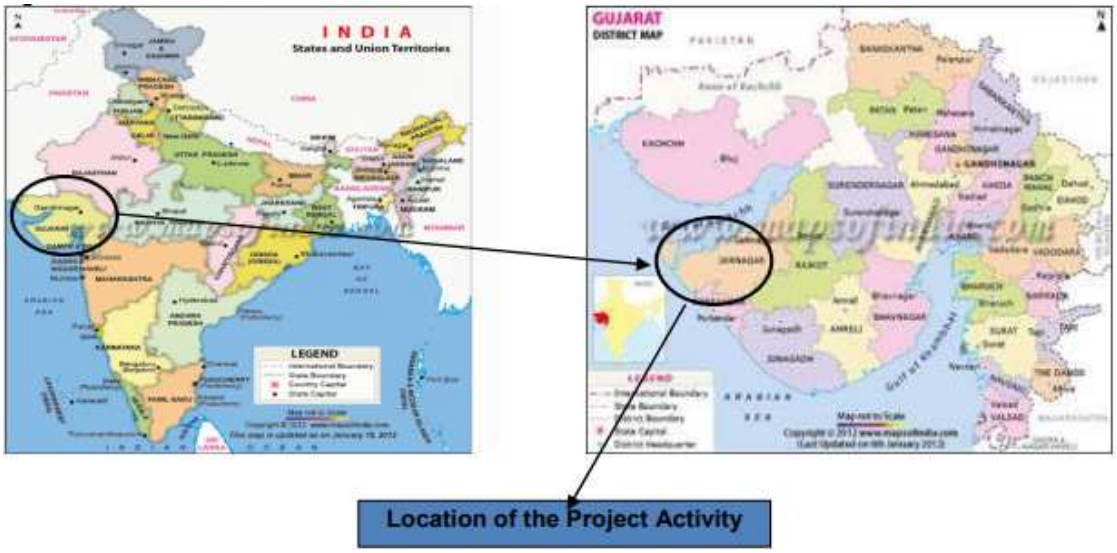
1.4 Other Entities Involved in the Project

Not Applicable

1.5 Project Start Date

07-June-2011 which is start date of actual commercial operation of the project activity.

1.6 Project Crediting Period



Project Crediting Period Start date: 07-June-2011
Project Crediting Period End date: 06-June-2021
Total Crediting Period: 10 Years

1.7 Project Location

The project site is located at villages in Dwarka * Kalyanpur Talukas of Jamnagar district, Gujarat state, India.
The location map is as given below

Details of physical location, including information allowing the unique identification of this project activity:

S.No.	Loc. No.	Latitude(N)	Longitude(E)	Survey No.	Village	Taluk
1	CH-01	21°53'59.2''	69°22'37.8''	416/1	Chachlana	Kalyanpur
2	CH-02	21°54'6.3''	69°22'35.7''	416/1	Chachlana	Kalyanpur
3	CH-03	21°54'13.6''	69°22'23.1''	416/1	Chachlana	Kalyanpur
4	CH-04	21°54'19.0''	69°22'18.6''	416/1	Chachlana	Kalyanpur
5	CH-05	21°54'28.5''	69°22'16.0''	416/1	Chachlana	Kalyanpur
6	CH-06	21°54'33.4''	69°22'12.0''	416/1	Chachlana	Kalyanpur
7	CH-07	21°54'40.8''	69°22'11.0''	416/1/P1	Chachlana	Kalyanpur
8	CH-09	21°54'48.4''	69°21'55.7''	416/1	Chachlana	Kalyanpur
9	CH-15	21°54'56.0''	69°21'43.3''	416/1/P1	Chachlana	Kalyanpur
10	JO-44	21°59'52.2''	69°17'22.6''	38	Jodhpar	Kalyanpur
11	JO-45	21°59'43.6''	69°17'27.2''	38	Jodhpar	Kalyanpur
12	JO-54N	21°58'59.3''	69°17'44.7''	8/1/P2	Jodhpar	Kalyanpur
13	JO-58	21°59'28.3''	69°17'24.0''	69/P1/P1	Jodhpar	Kalyanpur
14	JO-74	22°0'22.1''	69°16'45.3''	182/1	Hadmatiya	Kalyanpur
15	JO-75	22°0'33.8''	69°16'59.8''	182/P4/P1	Hadmatiya	Kalyanpur
16	GO-01	22°8'19.6''	69°3'19.4''	181/P1	Gorinja	Dwarka
17	GO-02	22°8'26.3''	69°3'17.6''	181/P1	Gorinja	Dwarka
18	GO-03	22°8'34.8''	69°3'19.1''	181/P1	Gorinja	Dwarka
19	GO-04	22°8'39.1''	69°3'11.0''	181/P1	Gorinja	Dwarka
20	GO-05	22°9'0.6''	69°3'17.6''	181/P1	Gorinja	Dwarka
21	GO-06	22°8'53.2''	69°3'17.7''	181/P1	Gorinja	Dwarka
22	GO-07	22°8'47.1''	69°3'23.2''	181/P1	Gorinja	Dwarka
23	GO-08	22°8'41.4''	69°3'28.4''	181/P1	Gorinja	Dwarka
24	GO-09	22°8'35.8''	69°3'33.5''	181/P1	Gorinja	Dwarka
25	GO-10	22°8'29.8''	69°3'39.0''	181/P1	Gorinja	Dwarka
26	GO-12	22°8'50.2''	69°3'43.2''	181/P1	Gorinja	Dwarka
27	GO-11	22°8'56.5''	69°3'38.9''	181/P1	Gorinja	Dwarka
28	GO-16	22°9'46.5''	69°2'4.4''	278/P1	Gorinja	Dwarka
29	VA-17	22°9'52.7''	69°1'59.0''	351/P1	Vachhu	Dwarka
30	VG414	21°52'52.2''	69°21'40.3''	180/P1	VirpurGangadi	Kalyanpur

31	VG415	21°53'0.7''	69°21'26.6''	180/P1	VirpurGangadi	Kalyanpur
32	VG416	21°52'55.8''	69°21'5.4''	180/P1	VirpurGangadi	Kalyanpur
33	VG422	21°53'36.7''	69°20'46.3''	19P	VirpurGangadi	Kalyanpur
34	VG423	21°53'48.6''	69°20'51.0''	19P	VirpurGangadi	Kalyanpur
35	VG424	21°53'59.7''	69°20'50.6''	19P	VirpurGangadi	Kalyanpur
36	VG426	21°54'9.5''	69°20'50.5''	19P	VirpurGangadi	Kalyanpur
37	LA 448	21°54'53.3''	69°17'58.1''	415/1/2	Lamba	Kalyanpur
38	LA 456	21°55'22.7''	69°18'46.3''	30/P1	Lamba	Kalyanpur
39	HA 551	22°1'2.7''	69°18'27.6''	182/P1	Hadmatiya	Kalyanpur
40	HA 552	22°0'48.3''	69°18'27.2''	182/P1	Hadmatiya	Kalyanpur
41	HA 553	22°0'40.4''	69°18'28.0''	182/P1	Hadmatiya	Kalyanpur
42	HA554	22°0'38.8''	69°18'42.4''	182/P1	Hadmatiya	Kalyanpur
43	JO750	21°58'14.9''	69°17'26.4''	144/P7	Jodhpar	Kalyanpur
44	KU 742	22°3'38.1''	69°9'19.1''	125/1	Kurunga	Dwarka
45	KU 743	22°3'43.3''	69°9'12.4''	125/1	Kurunga	Dwarka
46	OK 744	22°5'3.0''	69°7'8.7''	24P	Okhamadhi	Dwarka
47	OK 745	22°5'20.2''	69°6'42.6''	131P	Okhamadhi	Dwarka
48	OK 746	22°5'25.3''	69°6'35.2''	131P	Okhamadhi	Dwarka
49	OK 747	22°5'30.0''	69°6'32.0''	131P	Okhamadhi	Dwarka

1.8 Title and Reference of Methodology

Title: Consolidated baseline methodology for grid-connected electricity generation from renewable sources[1].

Reference: ACM0002

Version: 12.3.0, EB 66

Tools:
Tool for the demonstration and assessment of additionality[2] (Version 5.2.1, EB 39, Annex 10)

Tool to calculate the emission factor for an electricity system[3] (Version 2.2.1, EB 63, Annex 19)

1http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

2https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

1.9 Participation under other GHGPrograms

This is a registered CDM project. The reference no. for the project is 5777 and it was registered on 09-November-2012. The web link for the same is mentioned below

https://cdm.unfccc.int/Projects/DB/DNV-CUK1328700673.83/view

This project claimed GHG credits under CDM program for the generation between 01-March-2012 to 31-August-2012& the complete details can be verified from the CDM project link mentioned above.

1.10 OtherForms of Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program

1.11 Sustainable Development Contributions

Contribution to Sustainable Development:
The implementation of this project activity would contribute to the sustainable development of the region in the following ways as stipulated by the Ministry of Environment Forests and Climate Change (MoEFCC) in the interim approval guidelines for CDM projects. Ministry of Environment Forestsand Climate Change, Govt. of India has stipulated the social wellbeing, economic wellbeing, environmental wellbeing and technological wellbeing as the four indicators for sustainable development in the interim approval guidelines host country approval eligibility criteria for Clean Development Mechanism (CDM) projects.

Social well-being:

• The project activity is generating employment opportunities for professional, skilled and unskilled labour for development, engineering, procurement operation and maintenance of the project activity.

• The development of project specific infrastructure results in employment and income generation activities for local personnel.

Economic well-being:

• The project activity promotes the application of windenergy-based power generation investment which is a significant investment in a green field project in the region.

• This power plant will use wind energy as resource for generation of power helps conserve foreign exchange by reducing the need to import fossil fuels to meet the country's growing energy demand.

Environmental well-being:

3https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

• Wind energy based power generation system is a robust clean technology involving latest state of the art renewable energy options to be used for the purpose of electricity generation.

• This project activity is using the available wind potential for power generation process, which has no associated GHG emissions. This is certainly have a positive impact on the environment both at local and global level.

• The project implementation will lead to a reduction of SOx, NOx and particulate matter (PM) emissions. It therefore results in an improvement in air quality and human health.

Technological well-being:

• The project leads to utilization of environmentally safe and sound technologies in similar sector projects. Setting up of this project will also increase the private sector participation in this project category thereby contributing to more green power to the grid system

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Not Applicable	Not Applicable	Not Applicable
2)	8.5	Average hourly earnings of female and male employees by occupation, age and persons with disabilities	Not Applicable	Not Applicable	Not Applicable
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Not Applicable	Not Applicable	Not Applicable

2 SAFEGUARDS

2.1 No Net Harm

The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean, renewable energy technology for electricity generation.

The report on "Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects" prepared by MNRE dated September 2013. This report clearly mentioned that wind project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same[4]

2.2 Local Stakeholder Consultation

A local stakeholder meeting was conducted in Porbandar, Gujarat on 29-October-2010 to invite comments from local stakeholders and to understand their concerns with regard to the project activity. An advertisement was placed in the local newspaper "Sandesh" on 14-October-2010 inviting the local stakeholders for the meeting. The personal invitations were also sent to the local villagers. The local stakeholders were notified 15 days in advance (notice period) to the actual date of the local stakeholder consultation meeting. The stakeholders included the members of the local village Panchayats and, resident villagers of the area, EIL representatives as well as Project Participant (ASW) representative. The meeting was presided over by Mr. Rahul Mishra (ASW), Mr. Manoj Panda (EIL) and Mr. Alpesh Patel (EIL).

The meeting commenced with Mr. Alpesh of EIL welcoming all the stakeholders and explaining that basic purpose and the agenda for convening the meeting.

Mr. Manoj Panda of EIL proceeded by asking the attendees to elect a chairperson for the meeting. Mr. Kandoria Murubhai H was chosen as the chairperson. The stakeholders were presented, in vernacular (Gujarati), with an overview of CDM and the project activity as well as the technological, economic, environmental and social issues associated with it. This was followed by a speech by representative of ASW, Mr. Rahul Mishra, further explaining the project activity.

The stakeholders were then invited to give their comments, suggestions and concerns regarding the project activity. A questionnaire was circulated to all the stakeholders. A representative of the CDM consultant was also present at the stakeholder meeting.

The stakeholders gave their opinion on the project through the filled questionnaires. Overall a positive response was received from the stakeholders. The attendees identified development of local area, generation of employment opportunities and more awareness about these kinds of projects as potential benefits from the project activity.

A list of all the questions and replies asked along with the name of the person who raised the question and the name of the person who responded is also attached.

[4] http://mnre.gov.in/file-manager/UserFiles/report-on-developmental-impacts-of-RE.pdf

Sl.No.	Question	Asked by	Responded by	Response
1	What are all the benefits that the villagers can expect from this the project?	Kandoria Murubhai H	Mr. Rahul Mishra (ASW)	The social as well as economic development of the nearby villages will take place as a result of all the employment opportunities created by the project activity during the construction phase as well as the operation phase. As a private company, ASW will also undertake initiatives as part of it Corporate Social Responsibility.
2	Will the local infrastructure like roads suffer any harm because of the construction of the project activity?	Narun Karamsinh	Mr. Alpesh Patel (EIL)	No local infrastructure will bear any harm from the project activity. As a matter of fact, local infrastructure, such as roads will be improved.
3	How is electricity generated from windmills and climate change related?	Dubhi Bhikhu Muruji	Mr. Manoj Panda (EIL)	Wind energy is a renewable form of energy and is clean. It does not generate any greenhouse gas emissions. Therefore, as compared to energy generated from fossil fuels like coal, wind energy helps in reducing greenhouse gas emissions and hence in mitigating adverse effects of climate change.
4	Will there be any facilities available at the windfarm which can be beneficial to the local villagers?	Sumaniya Mayabhu Karanbhu	Mr. Alpesh Patel (EIL)	Under their respective corporate social responsibility initiatives, EIL and ASW will promote development in the nearby areas.

Also, there is a dedicated e-mail ID "tatatpower@ethics-line.com" available for local stakeholders to lodge their complaints along with the toll-free helpline numbers 0008001004382 and 0008001008277. Also, accessible at normal domestic call rates within India: +91-11-71279005.

Also, the local stakeholders can reach through the third-party website: www.tip-offs.com& the physical mails can be addressed to "Delotte Touche Tohmatsu India LLP, C/o Arjun

Rajagopalan, Partner (Ethics Helpline Services), 19th Floor, 46-Prestige Trade Tower, palace Road, High Grounds, Bengaluru – 560001.

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 activity involves the installation and operation of 49 Enercon 800 kW, E-53 WTGs, to generate power which is transmitted via internal electrical lines to the local power evacuation facility from where the power is distributed for use. The project activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The average life time of the WTG is around 20 years as per the industry standards& the project started commercial operations from 07-June-2011. The other salient features of the state-of-art-technology are:

E 53 Specifications:

Turbine model	Enercon E-53
Rated power	800 KW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Direct driven, horizontal axis wind turbine With variable rotor speed
Power regulation	Independent pitch system for each blade
Cut in windspeed	3m/s
Rated wind speed	12.6m/s
Cutout Wind speed	28m/s
Extreme Wind Speed	59.5m/s
Rated rotational speed	29 rpm
Operating range rot. speed	11-29.5rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fiber Glass Epoxy reinforced
Gear box type	Gearless
Generator type	Synchronous generator
Braking	Aerodynamic
Yaw System	Active yawing with 4 electric yaw drives With brake motor

Tower	74 m concrete

In the absence of the project activity, the equivalent amount of electricity would have been generated from the connected/ new power plants in the Indian grid, which are/ will be predominantly based on fossil fuels, hence baseline scenario of the project activity is the grid-based electricity system, which is also the pre-project scenario. Since the project activity involves power generation from wind, it does not involve any GHG emissions for generating electricity.

3.2 Deviations

3.1.1 Methodology Deviations

No methodology deviation is applied during the monitoring period

3.1.2 Project Description Deviations

PP is requesting for permanent deviation in registered monitoring plan as follows.

The parameters viz., $EG_{clustermeter,Export,}$ $EG_{clustermeter,Import}$$EG_{GETCO,Export}$&$EG_{GETCO,Import}$ were included in the registered monitoring Plan at the time of project registration stage. However, later on the Government Agency &discom, GEDA/GETCO changed their procedure and now they are directly issuing the share certificate & these parameters are not coming to PP at all. Whatever PP gets is the direct value of net export to the grid. These parameters are being monitored in order to calculate the net export by apportioning which is not under the control of PP & neither these values come to the PP. Hence, the values of these parameters are not being reported & only direct value of net export alone is being reported.

So, PP requesting for a permanent deviation from the registered monitoring plan & these parameters will not be monitored further.

Also, PP is requesting for 2 more permanent deviations as the Project Description Deviations -

1. The change in the Project Proponent (from “AES Saurashtra Windfarms Private Limited” to “Tata Power Renewable Energy Limited”) due to the acquisition of the former by the current PP.

2. The change in the project crediting period (from 07-June-2011 – 29-February-2012 to 07-June-2011 – 06-June-2021)

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	Operating Margin Emission Factor of Indian Electricity Grid
Source of data	CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at https://cea.nic.in/
Value applied	1.0049
Justification of choice of data or description of measurement methods and procedures applied	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance withACM0002 (Version 12.3.0, EB 66)
Purpose of Data	Calculation of baseline emissions
Comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin Emission Factor of Indian Electricity Grid
Source of data	CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at https://cea.nic.in/
Value applied	0.6752
Justification of choice of data or description of measurement methods and procedures applied	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002 (Version 12.3.0, EB 66).
Purpose of Data	Calculation of baseline emissions
Comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh

Description	Combined Margin Emission Factor of Indian Electricity Grid
Source of data	CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at https://cea.nic.in/
Value applied	0.9225
Justification of choice of data or description of measurement methods and procedures applied	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002(Version 12.3.0, EB 66), and Tool to Calculate the emission Factor for an Electricity System.
Purpose of Data	Calculation of baseline emissions
Comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,y}$ / $EG_{facility,y}$
Data unit	MWh
Description	Net Quantity of Electricity exported to the grid
Source of data	Share certificate issued by SLDC/GETCO
Description of measurement methods and procedures to be applied	The procedures for metering will be as per the provisions of the power purchase agreement. The WTGs of a single customer (ASW in this case) at a particular site are connected to a cluster meter at the Vacuum Circuit Breaker metering yard (VCB) which in turn connects to a feeder that ultimately leads to the shared main GETCO meter (also known as revenue meter) at the substation maintained by EIL in Bhogat. Data monitoring takes place at the cluster meters at the VCB metering yard and GETCO meter at the Bhogat substation. The electricity metered at the GETCO meter is proportionally divided by GEDA among the customers connected to the Bhogat substation on the basis of the prorated readings taken at the VCB end. The net electricity generated is calculated by GEDA on the basis of GETCO main meter reading (the net electricity supplied to the grid for the wind farm) and the meter readings taken at VCB metering yard after adjusting transmission loss. GEDA gives this data to GETCO/SLDC who certifies this data. The net electricity generated by the project activity is taken directly from the share certificate issued by SLDC/GETCO on monthly basis.
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value monitored	445,709.13

Monitoring equipment	Substation meter-Accuracy class: 0.2s Please refer Annexure – I for details
QA/QC procedures to be applied	Calibration of all the meters will be undertaken at least once in three years as per PPA. Faulty meters will be duly replaced. The ASW CDM coordinator will oversee that the calibration is done as per the appropriate time frequency and proper procedures as mentioned in the PD
Purpose of the data	Calculation of baseline emissions
Calculation method	Not Applicable
Comments	None

Data / Parameter	$EG_{clustermeter,Export}$
Data unit	kWh
Description	Electricity export recorded at the 0.2s accuracy class cluster meter at the Vacuum Circuit Breaker (VCB)yard
Source of data	Daily generation from individual cluster meter is recorded by EIL and is provided to GEDA on monthly basis.
Description of measurement methods and procedures to be applied	The WTGs of the individual project owners at a particular site connect to a cluster meter at the VCB metering yard. Each project owner have exclusive cluster meter at VCB metering yard.
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value monitored	Not Applicable, please refer deviation 01 in section 3.1.2 of the Monitoring Report
Monitoring equipment	Cluster Meter - Accuracy class: 0.2s Please refer Annexure – I for details
QA/QC procedures to be applied	Calibration of all the cluster meters are carried out at least once in three years in accordance with the PPA and all faulty meters will be duly replaced.
Purpose of the data	This reading is adjusted for the transmission loss by GEDA for computing net electricity exported by the project activity and is not directly used for the calculation of emission reductions
Calculation method	Not Applicable
Comments	The data will be archived for the entire crediting period plus two years

Data / Parameter	$EG_{clustermeter,Import}$
Data unit	kWh
Description	Electricity export recorded at the 0.2s accuracy class cluster meter at the Vacuum Circuit Breaker (VCB)yard
Source of data	Daily generation from individual cluster meter is recorded by EIL and is provided to GEDA on monthly basis.
Description of measurement methods and procedures to be applied	The WTGs of the individual project owners at a particular site connect to a cluster meter at the VCB metering yard. Each project owner has exclusive cluster meter at VCB metering yard.
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value monitored	Not Applicable, please refer deviation 01 in section 3.1.2 of the Monitoring Report
Monitoring equipment	Cluster Meter - Accuracy class: 0.2s Please refer Annexure – I for details
QA/QC procedures to be applied	Calibration of all the cluster meters are carried out at least once in three years in accordance with the PPA and all faulty meters will be duly replaced.
Purpose of the data	This reading is adjusted for the transmission loss by GEDA for computing net electricity exported by the project activity and is not directly used for the calculation of emission reductions
Calculation method	Not Applicable
Comments	The data will be archived for the entire crediting period plus two years

Data / Parameter	$EG_{GETCO,Export}$
Data unit	kWh
Description	Net Electricity export recorded at GETCO meters at the EIL Bhogat Substation
Source of data	Joint Meter Reading (JMR)
Description of measurement methods and procedures to be applied	The meter reading is taken jointly by the representatives of EIL and GEDA/GETCO in the form of JMR at the Bhogat Substation.
Frequency of monitoring/recording	Continuous measurement and monthly recording
Value monitored	Not Applicable, Please refer deviation 01 in section 3.1.2 of the Monitoring Report

Monitoring equipment	GETCO Meter - Accuracy class: 0.2s
QA/QC procedures to be applied	The GETCO meters shall be calibrated at least once in three years as per the PPA.
Purpose of the data	Calculation of baseline emissions
Calculation method	Not Applicable
Comments	None

Data / Parameter	$EG_{GETCO,Import}$
Data unit	kWh
Description	Net Electricity import recorded at GETCO meters at the EIL Bhogat Substation
Source of data	Joint Meter Reading (JMR)
Description of measurement methods and procedures to be applied	The meter reading is taken jointly by the representatives of EIL and GEDA/GETCO in the form of JMR at the Bhogat Substation.
Frequency of monitoring/recording	Continuous measurement and monthly recording
Value monitored	Not Applicable, please refer deviation 01 in section 3.1.2 of the Monitoring Report
Monitoring equipment	GETCO Meter - Accuracy class: 0.2s Please refer Annexure – I for details
QA/QC procedures to be applied	The GETCO meters shall be calibrated at least once in three years as per the PPA.
Purpose of the data	Calculation of baseline emissions
Calculation method	Not Applicable
Comments	None

4.3 Monitoring Plan

Approved monitoring methodology ACM0002 (Version 12.3.0, EB 66, Annex 35) Sectoral Scope: 1, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", by CDM - Meth Panel is used to monitor the emission reductions.

EIL is the O&M contractor for the project activity. EIL is responsible for the maintaining all the monitoring data on behalf of ASW in respect of the project activity. EIL has implemented the management structure for managing the monitored data.

The approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where ex post determination of grid emission factor has been chosen

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages.

The project activity will have exclusive cluster meters at the VCB metering yard(s) and the meter reading taken at this metering point will be provided by the representatives of EIL to GEDA. These meters are sealed by GEDA and also be calibrated atleast once in three years.

EIL substation at Bhogat has main meter(s) known as GETCO meters (also known as revenue meter) which are connected to the wind turbines installed by the Project Participant (through the PP‟s cluster meters) and wind turbines installed by other project owners (through the other project owner‟s cluster meters). Gujarat Electricity Development Authority (GEDA) apportions the net electricity supplied to the grid at the EIL substation at Bhogat to all the project owners after adjusting transmission loss using the cluster meter reading taken at VCB metering yard. GEDA provides this data to GETCO/SLDC who certifies the data and issues a monthly statement of share of electricity.

The net electricity generated by the project owners is provided by SLDC/GETCO in the form of a share certificate of electricity generated. The value of the net electricity generated by the project activity is taken directly by the Project Participant from the share certificate provided by SLDC/GETCO for calculation of emission reductions.

The GETCO meters at the EIL Bhogat Substation is of 0.5s & / or 0.2s accuracy class and are calibrated at least once in three years. If during meter testing the main meter at the EIL Bhogat substation is found beyond the permissible limit of error, the meter reading is taken from the GETCO meter located at the utility substation (at Bhatia) after addition of average historical transmission loss

If during meter testing the cluster meter (0.2 accuracy class) at VCB metering yard is found beyond the permissible limit of error, the sum LCS meter readings located at each wind turbine of the project activity is provided to GEDA for purpose of apportioning net electricity supplied to the grid.

The Project is operated by EIL (O&M contractor for the project activity) and managed by the PP. The operational and maintenance contract for the project is with EIL. EIL is an ISO 9001:2008 certified Quality Management system from Germanischer Lloyd. EIL follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

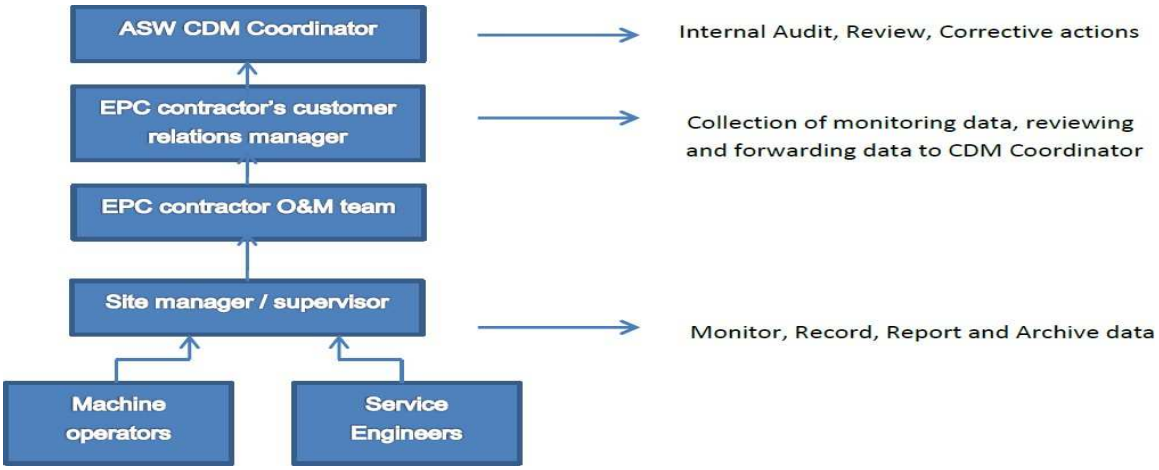
The accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment. EIL is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project Participant. The Project Participant also maintains the records of daily generation report and joint meter report.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Turbine Generators (WTGs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that EIL‟s service staffs are deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The EIL Training Academy provides need- based training to meet the training requirements of EIL projects. The training is contemporary, which results in imparting focused knowledge

leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

Organization structure, responsibilities and competencies:



Monitoring Procedure:

The procedures for metering is as per the provisions of the power purchase agreement. The WTGs of a single customer in this case ASW are divided into clusters and each cluster has dedicated metering system. Different clusters are connected to different Vacuum Circuit Breaker metering yards (VCB) which ultimately lead to the shared & sealed main GETCO meter (also known as revenue meter) at the EIL Bhogat substation maintained by EIL. Data monitoring takes place at the cluster metering points and GETCO main meter at the EIL Bhogat substation.

The net electricity supplied to the grid by the wind farm is calculated by Gujarat Energy Development Agency (GEDA) and certified by State Load Dispatch Centre SLDC (GETCO) on the basis of GETCO main meter reading and the meter readings taken at individual cluster meters after adjusting transmission loss. For adjustment of transmission loss, the electricity metered at the GETCO meter is proportionally divided by GEDA among the customers connected to the revenue meter on the basis of the pro rata readings taken at the cluster meters metering points connected to the Bhogat Substation.

The net electricity generated by this project activity is taken directly from the share certificate issued by SLDC/GETCO on monthly basis.

The meter reading at EIL substation is taken jointly by the representatives of EIL and GEDA/GETCO EIL in the form of JMR. The electricity from EIL's substation is finally supplied to the utility's substation at Bhatia. The net electricity generated by the project owners is provided by SLDC/GETCO in the form of a share certificate.

Frequency of meter reading

The meter reading at the individual WTGs, Cluster meter and main meter at GETCO Bhogat substation is recorded on a monthly basis.

Data collection

- The meter reading of the main meter at the GETCO Bhogat substation and the cluster meters at VCB metering yard of the project activity is taken each month.

- The SLDC/GETCO share certificate which is the source of the data for emission reduction calculation is available at the wind farm site office, as well as at ASW's office.

- In addition, the LCS meter reading is recorded continuously by the online monitoring system provided by EIL. All the monitored data is recorded and filed electronically and in hard format for 2 years beyond the crediting period or last issuance whichever is later.

- The CDM co-ordinator of ASW is responsible for overall review of the monitoring process, including collection of the monthly SLDC/GETCO certificates and ensuring quality of data.

Data archiving

Data is archived electronically. The data would be archived two years after crediting period or last issuance whichever is later.

Meter Testing

- Main meter at EIL Bhogat Substation is tested and calibrated atleast once in three years as per the PPA.

- If during meter testing the main meter at the EIL substation (at Bhogat) is found beyond the permissible limit of error, the meter reading is taken from the main meter located at the utility (GETCO) substation at Bhatia after addition of average historical transmission losses. During current monitoring period the main meter at EIL substation is not found beyond the permissible limit of error.

- The main meter at utility substation at Bhatia is also calibrated atleast once in three years by utility.

- All cluster meters connected to the EIL Bhogat substation is calibrated atleast once in three years as per PPA.

- If during meter testing, any cluster meter is found beyond the permissible limit of error, the sum of LCS meter reading located at each wind turbine of that cluster is provided to GEDA for purpose of apportioning net electricity supplied to the grid. During current monitoring period the cluster meter is not found beyond the permissible limit of error.

- The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WTGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report

- Billing for the failure Period will be adjusted from the month preceding test.

Emergency Preparedness

During the calibration if the cluster meter at the VCB metering yard or the Bhogat substation is found to be outside the permissible limit of error then the meter will be replaced immediately. The error is applied to the monitored data from the date of last calibration. During current monitoring period cluster meter at VCB metering yard is not found outside or beyond the permissible limit of error, so there is no meter replacement take place.

Routine Maintenance Services:

Routine maintenance labor work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and upkeep of the equipment. Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.

Apportioning mechanism followed by GEDA

Transmission losses are incurred from the cluster meters to the GETCO metering point at the Bhogat Substation. The electricity sent out to the GETCO substation meter is lesser than the sum of the electricity generated by all the cluster meters connected to the substation. Therefore, for adjustment of transmission loss, the electricity metered at the GETCO (revenue) meter is proportionally divided by GEDA among the customers connected to the revenue meter on the basis of the pro rata readings taken at the cluster meters metering points connected to the meter Based on the generation recorded in the monthly JMR reports of the primary metering points at the Bhogat substation and the power generation recorded from each of the cluster meters at the VCB metering yards, the transmission losses are proportionally divided to all the cluster meters by GEDA. GEDA provides this apportioned data to GETCO/SLDC and GETCO/SLDC issues monthly share certificates for each individual cluster meter.

This accounts for the transmission losses incurred from the cluster meter to the substation meter. The GETCO/SLDC share certificates are taken as the basis for net electricity supplied to the grid by this project activity.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Estimation of Baseline Emissions:

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid- connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows

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

Where:

BE_y	=Baseline emissions in year y (tCO_2e)
$EG_{PJ,y}$	=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) – 445,709.13 MWh for entire monitoring period
$EF_{grid,CM,y}$	=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" (tCO2/MWh) - 0.9225

Since the project activity is the installation of a new grid connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity, the $EG_{PJ,y}$ is calculated as:

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

Where:

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

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

The project activity is in the state of Gujarat which falls under Indian grid, baseline emission factor is calculated as combined margin, consisting of a combination of operating margin and build margin factors according to the procedures prescribed in the latest tool for calculating the emission factor for an electricity system

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

BE_y = 445,709.13 * 0.9225 = 411,162 tCO_2e (calculated for entire monitoring period and applied rounded down function, which gives the conservative value of Baseline Emissions)

Also, the following table gives the annual break-up of electricity generation and baseline emissions data.

Vintage	Net Electricity Generated	Emission Factor	Vintage wise Baseline Emissions
	$EG_{PJ,y}$ / $EG_{facility,y}$	$EF_{grid,CM,y}$	BE_y
01-September-2012 to 31-December-2012	18,376.04	0.9225	16,951
01-January-2013 to 31-December-2013	73,432.81	0.9225	67,741
01-January-2014 to 31-December-2014	74,095.75	0.9225	68,353
01-January-2015 to 31-December-2015	81,778.81	0.9225	75,440
01-January-2016 to 31-December-2016	75,094.26	0.9225	69,274
01-January-2017 to 31-December-2017	74,240.56	0.9225	68,486
01-January-2018 to 31-August-2018	48,690.90	0.9225	44,917
Total	**445,709.13**		**411,162**

5.2 Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 (Version 12.3.0, EB 66, Annex 35), there will be zero project emissions in the project activity

$PE_y = 0$

5.3 Leakage

As per ACM0002 (Version 12.3.0, EB 66, Annex 35), zero leakage has been considered for the calculation of emission factor

$LE_y = 0$

5.4 Net GHG Emission Reductions and Removals

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)
2012	16,951	0	0	16,951

2013	67,741	0	0	67,741
2014	68,353	0	0	68,353
2015	75,440	0	0	75,440
2016	69,274	0	0	69,274
2017	68,486	0	0	68,486
2018	44,917	0	0	44,917
Total	**411,162**	**0**	**0**	**411,162**

It is to be noted here that as per the estimated emission reduction to be achieved from the project activity for the current monitoring period is 482,530 tCO_2e, whereas actual emission reductions achieved are 411,162 tCO_2e, which is approximately 14.79% lower than the estimated emission reductions. The generation of electricity depends upon many other climatic conditions, which are not within the control of the project participant.

APPENDIX I: DETAILS OF METERS

VCB Yard (Cluster Meter Details):

Meter Serial number	GJU07452	GJU60938	18016929
Make	Secure	Secure	Secure
Accuracy Class	0.2s	0.2s	0.2s
Calibration frequency	Once in 3 years	Once in 3 years	Once in 3 years
Date of calibration	14-July-2014	14-July-2014	14-July-2014
Date of calibration	17-June-2018	17-June-2018	17-June-2018
Date of last calibration	14-June-2021	14-June-2021	14-June-2021

Substation / GETCO meter details:

Meter Serial number	GJ-2413A	GJ-2438A	GJ-2439A
Make	Secure	Secure	Secure
Accuracy Class	0.2s	0.2s	0.2s
Calibration frequency	Once in 3 years	Once in 3 years	Once in 3 years
Date of calibration	14-July-2014	14-July-2014	14-July-2014
Date of calibration	17-June-2018	17-June-2018	17-June-2018
Date of last calibration	13-June-2021	13-June-2021	13-June-2021

*There were two instances where the delay in calibration occurred.

1. Delay in calibration from 7-June-2014 to 14-July-2014 - PP applied maximum permissible error factor in calculation of ER for the entire month of June-2014 & July-2014

2. Delay in calibration from 14-July-2017 to 16-June-2018 - PP applied maximum permissible error factor in calculation of ER for the entire months from July-2017 to June-2018

Hence, PP applied maximum permissible error factor in calculation of ER for the total of 14 months of this Monitoring Period due to delay in calibration.

APPENDIX II: BREAKDOWN DETAILS

Site	Date	Total Stoppage Hrs	Status Description
Dwaraka	01-04-2016	96.45	Turbine control bus error.
Dwaraka	01-05-2016	98.75	Excitation error.
Dwaraka	01-06-2016	94.98	Timeout warn message Prot. circuit-breaker tripped
Dwaraka	01-07-2016	91.81	Fault capacitor test Blade A
Dwaraka	01-08-2016	90.48	Mains failure Undervoltage L2
Dwaraka	01-09-2016	98.52	1) excitation error. 2) turbine control error.
Dwaraka	01-10-2016	99.51	Capacitor fault
Dwaraka	01-11-2016	98.66	Feeding fault Earth contact
Dwaraka	01-12-2016	98.92	Blade limit control error.