5.5 MW Bundled Wind Power Project by WMI Cranes Ltd

Project Title	5.5 MW Bundled Wind Power Project by WMI Cranes Ltd
Version	03
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Monitoring Period	01-Jan-2012 to 20-Oct-2017
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources, to sell the generated electricity to the respective regional electricity grid namely Maharashtra, Gujarat and Tamil Nadu which falls under western region grid and Southern region grid of India and thus leads to CO_2 emission reduction due to the displacement of equivalent amount of electricity.

The present bundled project activity deals with generation of electricity using wind energy by Wind Turbine Generator (WTG). The project utilizes wind energy for generating electricity which otherwise would have been generated through operation of or new addition of alternate fuels (fossil fuel) based power plants in regional grid, which would leads to GHG emissions. The project contributing to reduction in specific emissions (pollutants generated from energy generation) including GHG emissions. Apart from generation of renewable electricity, the project has also conceived for the following:

- To enhance the propagation of commercialization of wind turbines in the region
- To contribute to the sustainable development of the region, socially, environmentally and economically
- To reduce the prevalent regulatory risk for this project through revenues from emission trade

Brief description of the installed technology and equipment's:

The implemented project activity by WMI Power Private Limited Consist of Seven WTGs spread across three states of India. The total installed capacity is 5.50 MW having two WTGs of 1.25 MW and five WTGs of 0.6 MW individual capacities.

The project activity consists of seven Wind Turbine Generators (WTGs) having two WTGs of 1.25 MW (Suzlon make S-70) and five WTGs of 0.6 MW (Vestas Type-PS-600) The project activity does not involve any technology transfer.

During this monitoring period i.e., from 01-January -2012 to 20-October-2017 (First and last date included) the project activity has contributing to the GHG reductions of 22,312 tCO_2e.

The date of commissioning for the project is 30–September - 2006.

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	WMI Power Private Limited
Contact person	Mr. N. L Narsimhan
Title	Vice president
Address	Bhandup (West), Mumbai, Maharashtra ,400078 India
Telephone	91-22 - 2566161
Email	n.narasimhen@wmicranes.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Mrs. Neetu Yadav
Title	Project Manager
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91-9109120945
Email	neetu@enkingint.org / registry@enkingint.org

1.5 Project Start Date

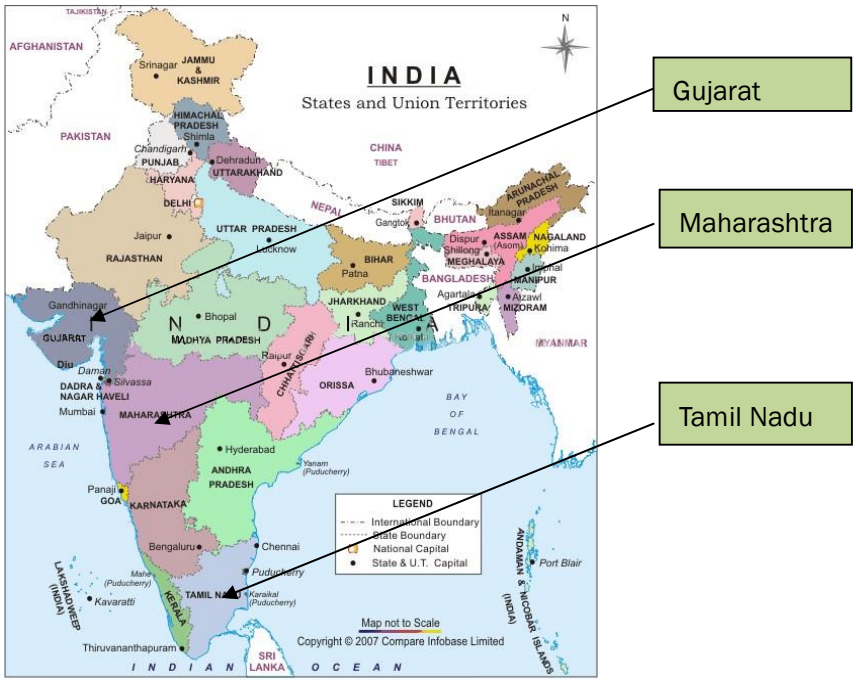
The project start date is 30-September-2006 which is the Commissioning date of first WTG in bundled project activity.

1.6 Project Crediting Period

Project activity has fixed crediting period of 10 years 0 month (21 -October -2007 to 20 - October - 2017).

1.7 Project Location

Sr. No.	Name of Project Promoter	WTG Location No.	GPS coordinates	WTG locationVillage	District
Bundle I	M/s.WMI Power Private Limited	K 233	21°16'N 74°19'E	Kaltek,Sakri	Dhule
		K 231	21°16'N 74°19'E	Kaltek,Sakri	Dhule
Bundle II		VRRB-600/07-08 733	23°13'N 70°42'E	Khumbariya, Surajbari	Kutch
		VRRB-600/07-08 734	23°13'N 70°42'E	Khumbariya, Surajbari	Kutch
		VRRB-600/07-08 735	23°13'N 70°42'E	Khumbariya, Surajbari	Kutch
Bundle III		WEG HT SC. No. 2277	09°01'N 77°26' E	Vellalankulam, Sankarankoil	Tirunelveli
		WEG HT SC. No. 2281	09°01'N 77°26' E	Vellalankulam, Sankarankoil	Tirunelveli



1.8 Title and Reference of Methodology

Title: AMS-I.D. "Grid connected renewable electricity generation" (Version 13)[1]

Sectoral Scope: 1, Energy industries (Renewable / non-renewable sources)

[1] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

Type: Renewable Energy Project (Small Scale)

Reference: Appendix B of the simplified M & P for small scale CDM project activities

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 2682[2]. The project proponent has provided undertaking that it will not claim any GHG credits for UNFCC 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 2682[3]). 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.

The project "5.5 MW Bundled Wind Power Project by WMI Cranes Ltd" developed by WMI Cranes Limited having VCS ID 662 and CDM ID 2682 is undergoing VCS verification for the monitoring period 01-Jan-2012 to 20-Oct-2017. The project's monitoring period from 01-Jan-2012 to 31-May-2013 is webhosted on the UN page however WMI Power Private Limited is not carrying out CDM verification for this period under CDM. Thereby we confirm that emission reduction will not be double accounted for monitoring period 01-Jan-2012 to 20-Oct-2017. WMI Power Private Limited is claiming carbon credits for period 01-Jan-2012 to 20-Oct-2017 in VCS mechanism only.

1.11 Sustainable Development Contributions

Contribution to sustainable development:

Apart from generation of renewable electricity, the project activity would contribute to the sustainable development of the region - socially, environmentally and economically. Ministry of Environment, Forest and Climate Change has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

Social well-being: The project helps in generating employment opportunities during the construction and operation phases. The project activities leads to development in infrastructure in the region like development of roads and also promoted business with improved power generation.

[3] https://cdm.unfccc.int/Projects/DB/SGS-UKL1244624606.95/view

Economic well-being: The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity has helped to reduce the demand supply gap in the state. The project activity creates local employment generation which helps economic well-being of local people.

Technological well-being: The successful operation of project activity would lead to promotion of solar based power generation and would encourage other entrepreneurs to participate in similar projects

Environmental well-being: Solar being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Not Applicable-	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*

According to the Appendix 3- the document history mentioned in the VCS Standard Version 4.3[4] (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 project 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. Thus, for current monitoring period, this is not applicable.

[4] https://verra.org/wp-content/uploads/2022/06/VCS-Standard_v4.3.pdf

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

As a part of continual improvement process, feedback from the associated stakeholders is vital, therefore a dedicated Visitor register cum grievance register has been placed at the project site which is accessible to stakeholders to provide their feedback on the project. It is appropriate publicly accessible location at which local stakeholders can provide their feedback on the project. This location is also conducive to continuous and regular checks for stakeholder comments.

Stakeholder meetings are organized on regular intervals in order to identify the major challenges around the area, stakeholders are invited well in advance through printed invitation, calls, meeting and a notice is placed around the local common areas. Various CSR activities around site are carried out with proper stakeholder requirements meeting. The stakeholders are also requested to share their experiences and grievances on continuous basis. Registers is used to records the grievances and feedback.

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 commissioning dates of all the WTGs are provided as below.

Sr. No.	Name of Project Promoter	Installed Capacity (MW)	WTG Location No.	Commissioning Date	Village, District
1	WMI Power Private Limited	1.25	K-231	30-Sept-2006	Kaltek, Dhule
2		1.25	K-233	13- Nov-2006	Kaltek, Dhule

3		0.6	VRRB-600/07-08 733	28-Dec-2007	Khumbariya, Kutch/Kachchh
4		0.6	VRRB-600/07-08 734	07-Feb-2008	Khumbariya, Kutch/Kachchh
5		0.6	VRRB-600/07-08 735	03-Oct-2007	Khumbariya, Kutch/Kachchh
6		0.6	WEG HT SC. No. 2277	29-Mar-2007	Vellalankulam, Tirunelveli
7		0.6	WEG HT SC. No. 2281	29-Mar- 2007	Vellalankulam, Tirunelveli

Two of the turbines in Maharashtra are S70 Suzlon make and have been developed by Suzlon Energy Ltd. The other five – 3 in Gujarat and 2 in Tamil Nadu are Vestas RRB PS-600 KW turbines developed by Vestas RRB India Limited (Pawan Shakti). The technology used is indigenous in all the three cases.

Salient features of Suzlon (S-70) 1250 KW WTG

Rotor diameter	69.1 m
Installed electrical output	1250 kW
Cut –in wind speed	3 m/s
Rated wind speed	12 m/s
Cut-out wind speed	20 m/s
Rotor swept area	3750 m2
Rational speed	13.2/19.8
Rotor material	GRP
Regulation	Pitch
Generator	Asynchronous generator, 4/6 poles
Rated output	250/1250 kW
Rotational speed	1010/1515 rpm
Operating voltage	690 v
Frequency	50 Hz
Protection	IP 56
Insulation class	H
Cooling system	Air -cooled
Gear box	3 stage gear box, 1 planetary and 2 helical
Manufacturer	Winergy
Gear Ratio	77.848
Nominal load	1390 kW
Type of cooling	Oil cooling system
Yaw drive system	4 active electrical yaw motors
Yaw bearing	Polyamide slide bearing
Safety system	
Aerodynamic brake	3 times independent pitch regulation
Mechanical brake	Spring powered disc brake, hydraulically released fail safe
Control unit	Microprocessor controlled, indicating actual operating conditions, UPS back up system
Design standards	GL/IEC

Salient features of Pawan Shakati PS-600 KW WTG

Rated Power	600 kW
Cut in wind speed	4 m/s
Cut out wind speed	25 m/s
Survival wind speed	70 m/s
Tips speed	64 m/s
Rotar speed	26.2 rpm
Hub height	50 m/65 m
Nacelle tilt angle	5 degrees
Regulation	Pitch
Gear Box	
Type	Planetary /Helical
Gear Ratio	1:58:02
No. of Steps	3
Generator	
Rated power output	600 kW
Type	Single wound Asynchronous
Voltage	690 V
Revolutions	1527 rpm
Frequency	50 Hz
Tower Type Height Material Section	Lattice 48.1m/63.1m Steel 6/9
Nacelle Cover	Fiberglass Reinforced polyester
Rotor No. of blades Diameter Swept area	 3 47 m 1735 sq.m
Power Regulation	Pitch regulated
Break System Aerodynamics Mechanical Yaw System	 Full feathering of blade Disc Brake Slewing system with gear Motor yawing
Controls	Microprocessor based

3.2 Deviations

3.2.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

3.2.2 Project Description Deviations

During the current verification, the following deviations are taken:

Deviation-1:

Since the project is also registered under CDM mechanism and as per the revised monitoring

plan approved on 27 Jun 12[5], the accuracy metering will be carried out through electronic trivector meters of accuracy class varies from 0.2s to 0.5s depending upon the availability of meters with SEB for Maharashtra, Gujarat and Tamil Nadu State required for the project, thereby during the current monitoring period the deviation in accuracy class for Tamil Nadu and Gujrat site has occurred from registered CDM PDD i.e from 0.2s it has been changed to 0.5s accuracy. These metering arrangement, accuracy class of meters are under state electricity Board and PP do not have any control on it. This deviation is in line with revised monitoring plan approved by UNFCCC.

Deviation-2:

Maharashtra Site - This deviation is sought for Maharashtra site WTGs monitoring approach. Since PP is getting direct value of net electricity supplied to grid by project activity WTGs, the below parameters are removed from monitoring plan.

1. $EG_{,my}$, (summation of total Electricity Generated (MWh) from all the wind turbines connected to a particular feeder as measured at the individual controllers (including project activity WTGs)
2. EG_{ny} (The summation of total Electricity Generated (MWh) at the controller from all the wind turbines of the project proponent at a particular site)
3. $EG_{JMR,export}$ (Total export as measured at the substation feeder for all wind turbines connected to the same feeder)
4. $EG_{JMR,import}$ (Total import as measured at the substation feeder for all wind turbines connected to the same feeder)

The above parameters were used by state electricity board for apportioning formula and PP do not have any control on this apportioning procedure. Also, PP may not be available all parameters used for apportioning formula; hence these parameters have been removed from section 4.2. As per methodology requirement, the net electricity supplied to grid is determined as difference of export and import of project activity WTGs and this ese parameters are kept as this parameter data is no longer available with the PP also it has no impact on the Emission reduction calculation.

Gujarat Site: For this project activity, monitoring plan has been revised and approved by UNFCCC on dated 27/06/2012. Hence. for Gujarat sub-bundle the parameter "$EG_{(Net\ export\ by\ project\ activity)}$" has been considered. Please refer below link

https://cdm.unfccc.int/UserManagement/FileStorage/X73BF46HRIN29MKUJSDEC1Z8YOGLAT

Also, for verification of Pre CDM VCU for period 21-October-2007 to 14-June-2010, deviation has been taken for Gujarat sub-bundle parameter.

Please refer "footnote 7 and 8" of pre CDM VCU MR for more details

Monitoring parameters of Maharashtra, Gujrat and Tamilnadu has been mentioned separately in section 4.3 of the MR for better clarity

[5] https://cdm.unfccc.int/Projects/DB/SGS-UKL1244624606.95/view

Deviation 3: The registered VCS PD mentioned crediting period as 21- October-2007 to 14- June-2010 which is till one day before the start date of CDM crediting period, however since the project is registered in VCS in standard 2007.1, thus as per standard, the crediting period of 10 years is applicable for this project. Hence the corrected VCS crediting period is from 21- October-2007 to 20- October-2017.

The PP considered 21-October-2007 as the start date of the crediting period and therefore the monitoring period. It was confirmed that the date of completion of validation is 20-October-2009, based on the final approval and signature date in the validation report dated 13-October-2009 deemed complete by the UNFCCC; thus, two years prior to the completion of validation is 21-October-2007. Also, this date is later to 28-March-2006, thus date 21-October-2007 as start date for the monitoring period considered for present monitoring period is found appropriate. Please refer the CAR #1 raised (section 3 – Verification findings) in the previous verification report.

The current deviations (deviation 1, deviation 2 and deviation 3) do not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

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	Plant Load Factor
Data unit	%
Description	Plant Load Factor considered for the estimation of electricity generation from WTGs in each sub-bundle of the project activity. This has been used for the estimation of CERs from the project.
Source of data	As per tariff orders of the respective sub-bundles.
Value applied	Maharashtra Sub-bundle-I : 20 Gujarat Sub-bundle-II : 23 Tamil Nadu Sub-bundle-III : 26.7
Justification of choice of data or description of measurement methods and procedures applied	Data are used for Baseline calculation
Purpose of Data	--
Comments	-

Data / Parameter	Installed Capacity
Data unit	MW

Description	Total installed capacity of the project
Source of data	Purchase order & Commissioning certificate of the WTGs in different sub-bundles
Value applied	5.5
Justification of choice of data or description of measurement methods and procedures applied	--
Purpose of Data	--
Comments	-

Data / Parameter	Grid Emission Factor
Data unit	tCO2 / MWh
Description	Weighted Average Grid Emission factor
Source of data	Latest available version of Carbon Dioxide baseline database, Published by Central Electricity Authority at the time of current monitoring period
Value applied	0.86 for NEWNE grid and 0.72 for Southern grid
Justification of choice of data or description of measurement methods and procedures applied	The used data is from an official source
Purpose of Data	--
Comments	This value will be used for calculating certified emission reduction from the present project activity. However, the value of grid emission factor may be change; hence latest available value will be used during monitoring period of entire crediting period

The registered monitoring plan mentioned Plant Load Factor, Installed Capacity and Grid emission factor as ex-ante monitoring parameters, however these parameters are not used for emission reduction calculations, hence above parameters are not relevant for this monitoring period. Also Grid Emission Factor is ex-post monitoring parameter, hence this grid emission factor parameter is used as ex-post monitoring parameter and mentioned in section 4.2 of this MR.

4.2 Data and Parameters Monitored

For Maharashtra[6]

Data / Parameter	EG(Net export by project activity)

[6] Deviation to demonstrate only the net electricity generation for the Maharashtra sub bundle has been taken and the details of the same is provided in section 3.2.2 of this report.

Data unit	MWh
Description	Net generation from all the WTGs of the promoter at a particular site connected to same feeder.
Source of data	Joint Meter Reading (windmill's break up energy report) and state electricity bills (Credit reports).
Description of measurement methods and procedures to be applied	Net generation from all the WTGs of the promoter at a particular site connected to same feeder.
Frequency of monitoring/recording	Recorded monthly
Value monitored	19,112.03
Monitoring equipment	The common bulk meters constitute main meter and check meter. Please refer appendix 01 for meter details
QA/QC procedures to be applied	This parameter is calculated by applying apportioning logic on the values that are monitored with the help of metering system involving common bulk meter and inbuilt control panel meter of the WTGs. This apportioning procedure is under control of state electricity board and PP do not have any control on it. The calibration of the common bulk meters (main & check meter) will be done by state utility normally on annual basis or as per the schedule of state utility in PPA signed between PP and state utilities for all the wind turbines of the project activity, however, it will be ensured that it does not go beyond the calibration interval in line with the latest version of General Guidance to SSC CDM Methodologies. The parameter can be also cross checked with the electricity sales invoices issued by PP to state utility.
Purpose of the data	Used for the calculation of $EG_{(Net\ export\ by\ project\ activity)}$ (Baseline calculation)
Calculation method	Net Electricity exported to the grid by the Project Activity is calculated based on the monitoring parameter- $\sum_{0}^{n} EG_{n,y}$, $EG_{Main\ Meter\ reading}$ and $\sum_{0}^{m} EG_{m,y}$. $$EG_{(Net\ export\ by\ project\ activity)} = \frac{\sum_{0}^{n} EG_{n,y} * EG_{(Main\ Meter\ reading)}}{\sum_{0}^{m} EG_{m,y}}$$ $EG_{Main\ Meter\ reading}$ = Total net generation from all wind turbines of the project activity at the common metering point as calculated by $EG_{JMR,export}$ - $EG_{JMR,import}$ at the substation

	feeder. This apportioning procedure is under control of state electricity board and PP do not have any control on it. PP is getting direct value of net electricity supplied to grid and same parameter value is used for emission reduction calculations as per methodology requirement.
Comments	-

Gujarat sub-bundle[7]

Data / Parameter	EG(Net export by project activity)
Data unit	MWh
Description	Net generation from all the WTGs of the promoter at a particular site connected to same feeder.
Source of data	State electricity bills (certificate of share of electricity)
Description of measurement methods and procedures to be applied	The net generation in MWh by the project activity is determined as a sum of net generations of individual WTGs. The logic of determination of the parameter is explained in detail under section B.7.2 of revised monitoring plan dated 27-June-2012.
Frequency of monitoring/recording	Recorded monthly
Value monitored	7,111.92
Monitoring equipment	Trivector Energy meter Please refer appendix 01 for meter details
QA/QC procedures to be applied	This parameter is calculated by applying apportioning logic on the values that are monitored with the help of metering system involving common bulk meter and inbuilt control panel meter/ Yard meter of the WTGs. This apportioning procedure is under control of state electricity board and PP do not have any control on it. The calibration of the meters will be done by state utility normally on annual basis or as specified by the state utility in PPA signed between PP and state utilities for all the sub bundles, however, it will be ensured that it does not go beyond the calibration interval in line with the latest version of General Guidance to SSC CDM Methodologies. The parameter can be also cross checked with the electricity sales invoices issued by PP to state utility. Accuracy class: 0.5s Calibration frequency: Annually
Purpose of the data	Used for the calculation of Emission reduction
Calculation method	Directly taken from State electricity bills (certificate of share of electricity)

[7] Deviation to demonstrate only the net electricity generation for the Gujarat sub bundle has been taken and the details of the same is provided in section 3.2.2 of this report.

Comments	-

Tamilnadu sub-bundle

Data / Parameter	$EG_{JMR,export}$
Data unit	MWh
Description	*Total export from the WTG at (HTSC) TNEB meter*
Source of data	Monitored through meters and referred from Statement Showing the energy generated through wind mill
Description of measurement methods and procedures to be applied	The value of total export is taken from the TNEB meter adjacent to the WTG. Energy meter measures both electricity import and electricity export by the project activity to the grid. The electricity exported to and imported from the grid is recorded every month jointly by Project Proponents representative & TANGEDCO personal. The net electricity supplied to the grid is calculated by deducting imports from gross exports. The same figures will be used for billing purposes as well.
Frequency of monitoring/recording	Measured monthly
Value monitored	1,026.17
Monitoring equipment	TNEB meter. Please refer appendix 01 for meter details
QA/QC procedures to be applied	The calibration of the meters will be done annually by state utility. Other than periodic calibration of the meters will be matched with WTG controller reading every month.
Purpose of the data	*Used for the calculation of EG(Net export by project activity) (Baseline calculation)*
Calculation method	The value of total export will be taken from the TNEB meter adjacent to the WTG.
Comments	*Data will be archived during the whole crediting period + 2 years*

Data / Parameter	$EG_{JMR,Import}$
Data unit	MWh
Description	Total import from the WTG at (HTSC) TNEB meter.
Source of data	Monitored through meters and referred from Statement Showing the energy generated through wind mill

Description of measurement methods and procedures to be applied	The value of total import will be taken from the TNEB meter adjacent to the WTG
Frequency of monitoring/recording	Measured monthly
Value monitored	18.82
Monitoring equipment	TNEB meter
QA/QC procedures to be applied	The calibration of the meters is done annually by state utility. Other than periodic calibration of the meters will be matched with WTG controller reading every month.
Purpose of the data	*Used for the calculation of EG(Net export by project activity)(Baseline Calculation)*
Calculation method	The value of total import will be taken from the TNEB meter adjacent to the WTG.
Comments	Data will be archived during the whole crediting period + 2 years

Data / Parameter	EG (Net export by project activity)
Data unit	MWh
Description	Net generation from the individual WTG.
Source of data	Joint meter reading and TNERC electricity bills.
Description of measurement methods and procedures to be applied	The value of total import will be taken from the TNEB meter adjacent to the WTG
Frequency of monitoring/recording	Measured Monthly
Value monitored	1,007.35
Monitoring equipment	TNEB meter
QA/QC procedures to be applied	The calibration of the meters is done annually by state utility. Other than periodic calibration of the meters will be matched with WTG controller reading every month.
Purpose of the data	To calculate Emission Reduction
Calculation method	Calculated as total Export – total import
Comments	*Data will be archived during the whole crediting period + 2 years*

For Maharashtra, Gujarat and Tamil Nadu sub-bundle

Since the NEWNE and Southern grids are integrated into Indian Grid, there is no any separate grid emission factors for NEWNE and Southern grids, hence Indian grid emission factor is considered for all three states WTGs.

<table>
<tr><td>Data / Parameter</td><td>EF_{Grid}</td></tr>
<tr><td>Data unit</td><td>tCO_2/MWh</td></tr>
<tr><td>Description</td><td>Tons of CO_2 per MWh of electricity produced in Indian grid (Ex-post)</td></tr>
<tr><td>Source of data</td><td>Latest available version of CO2 Baseline Database for the Indian Power Sector, User Guide, CEA i.e. Weighted average emission factor of the current generation mix is considered.</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>The value has been provided by Central Electricity Authority for the year 2011-12, 2012-13, 2013-14, 2014-15, 2015-16, and 2016-17.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Annual</td></tr>
<tr><td>Value monitored</td><td>
<table>
<tr><td colspan="2">Monitoring period</td><td>Year</td><td>Emission Factor</td><td>CEA Database</td></tr>
<tr><td>From</td><td>To</td><td></td><td></td><td></td></tr>
<tr><td>01-January-2012</td><td>31-March-2012</td><td>2011-12</td><td>0.78</td><td>Version 13[8]</td></tr>
<tr><td>01-April-2012</td><td>31-March-2013</td><td>2012-13</td><td>0.83</td><td>Version 13</td></tr>
<tr><td>01-April-2013</td><td>31-March-2014</td><td>2013-14</td><td>0.82</td><td>Version 15[9]</td></tr>
<tr><td>01-April-2014</td><td>31-March-2015</td><td>2014-15</td><td>0.82</td><td>Version 16[10]</td></tr>
<tr><td>01-April-2015</td><td>31-March-2016</td><td>2015-16</td><td>0.82</td><td>Version 17[11]</td></tr>
<tr><td>01-April-2016</td><td>31-March-2017</td><td>2016-17</td><td>0.82</td><td>Version 17</td></tr>
<tr><td>01-April-2017</td><td>20-October-2017</td><td>-</td><td>0.82</td><td></td></tr>
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[8] https://cea.nic.in/wp-content/uploads/baseline/2020/07/database_13.zip

[9] https://cea.nic.in/wp-content/uploads/baseline/2020/07/database_15.zip

[10] https://cea.nic.in/wp-content/uploads/baseline/2021/06/2019_20_CO2_database.zip

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

	Emission Factor from 01-January-2012 to 31-March-2012: 0.78 Emission Factor from 01-April-2012 to 20-October-2017: 0.82 (Conservative Value is considered for this period as value varies from 0.83 to 0.82)
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Used for the Baseline emission Calculation
Calculation method	-
Comments	Applicable for Maharashtra, Gujarat and Tamil Nadu Sub-bundles. Weighted average emission factor of the current generation mix is taken as per registered monitoring plan and this parameter value is directly taken from CEA database and this is in line with the previous verifications in VCS and CDM.

4.3 Monitoring Plan

The project activity essentially involves generation of electricity from wind, the WTG can only convert wind energy into electrical energy and cannot use any other input fuel for electricity generation. Thus, no special ways and means are required to monitor leakage from the project activity.

a. The project activity requires evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state power utility.
b. The electricity generation measurements are required by the respective state utility and the investors to assess electricity sales revenue and / or wheeling charges.
c. The project activity has therefore envisaged two independent measurements of generated electricity from the wind turbines.
d. The primary recording of the electricity fed to the Maharashtra state utility grid is carried out jointly at the incoming feeder of the state power utility. The primary recording of the electricity fed to the Gujarat and Tamil Nadu state electricity utility grid will be carried out at the meter of the state electricity utility adjacent to the WTG. Machines for sale to utility are connected to the feeder.
e. The joint measurement was carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties has signed the recorded reading.

- Metering equipment – Metering is carried out through electronic tri-vector meters of accuracy class varies from 0.2 to 0.5% depending upon the availability of meters with SEB for Maharashtra, Gujarat and Tamil Nadu State required for the project. The main meter and/or check meter (if any) shall be installed and owned by State utility of respective state

of the different sub bundles. The metering equipments will be maintained in accordance with electricity standards applicable in the region from time to time.

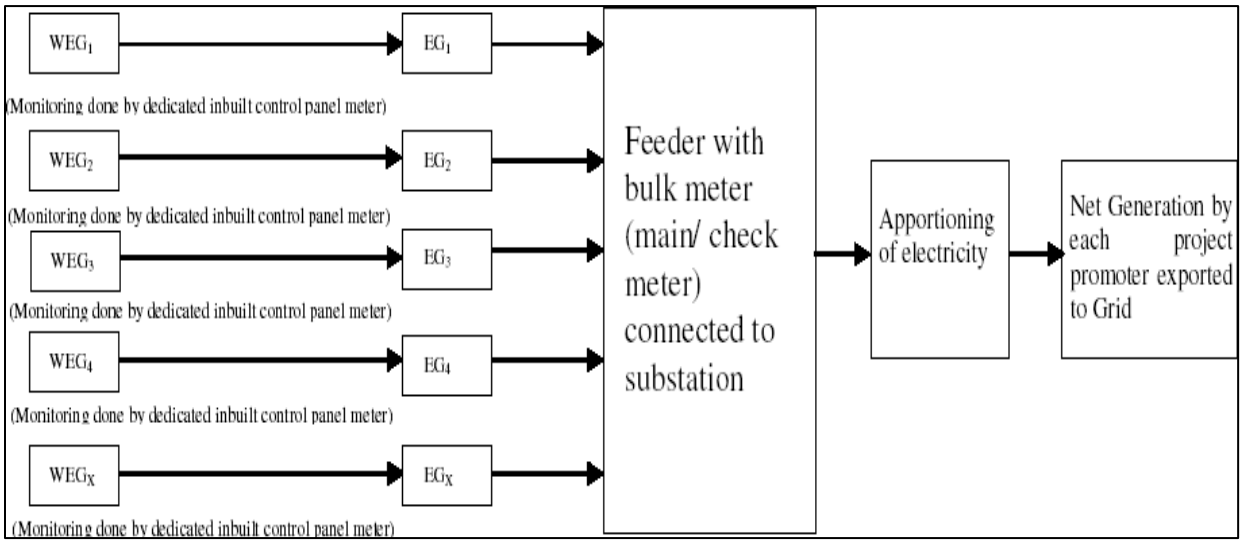
- Meter readings - The monthly meter readings at the project site and the receiving station are taken simultaneously and jointly by the parties on a pre-determined day of the following month. At the conclusion of each meter reading, an appointed representative of the state utility and the company signs a document indicating the number of kWh exported to the grid.

f. The secondary monitoring, which would be done at the individual WTGs. Each WTG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through a wireless Radio Frequency (RF) network (PLC). The generation data of individual turbine can be monitored as a real-time entity at CMS.

g. PP has no control over the monitoring system, selection and calibration of meter, data management procedure and the same has been manage by the state utility together with O & M supplier.

Description of billing calculation from main meter to individual meters in Maharashtra Sub- bundle

Each substation is connected to a number wind turbine. The generation reading is collectively displayed by the substation meter. The net generation of each of the wind turbine is then calculated in the following manner:



The generated electricity is measured through a two step procedure wherein the first metering is carried out at the controller of the machine with on-board meter. The monitoring of all these wind turbines is done from a common monitoring station as a part of central monitoring system. The system consists of a state- of- the- art controlling and monitoring and well trained staff personnel of O&M contractor are always present on site to monitor various parameters of power generation and deal with any problems related to generation, transmission or maintenance.

$EG_{n,y}$ is the electricity generated from an individual wind turbine measured through its controller meter. The summation of total Electricity Generated (MWh) from all the wind turbines of the project proponent at a particular site is presented as

$$\sum_{0}^{n} EG_{n,y}$$

And the summation of total Electricity Generated (MWh) from all the wind turbines connected to the particular feeder (Including project WTGs) as measured at the individual controllers is presented as

$$\sum_{0}^{m} EG_{m,y}$$

A ratio based on these two sets of measured values is used for apportioning the net electricity supplied to the western regional grid (now integrated in to NEWNE regional grid) by the project activity. The second metering is carried out at grid interconnection point (sub-station) wherein the Joint Meter Reading (JMR) is carried out, usually in the first week of every month, in presence of the representatives of the project proponent & the state electricity utility. This JMR (windmill's break up energy report) is used for calculation of the amount of electricity supplied to the grid against which the utility makes the payment to the project proponent. The JMR gives both the "export" ($EG_{JMR,export}$) and "import" ($EG_{JMR,import}$) of the electricity to/ from the grid. From these two values, $EG_{(Main\ Meter\ reading)}$ is calculated by deducting $EG_{JMR,import}$ from $EG_{JMR,export}$. This $EG_{(Main\ Meter\ reading)}$ value is then used for calculating net export from individual windmills. There is a single meter which gives both the export and import values, this metered reading gives the net value of line losses and auxiliary consumption. Further, as there is a common joint meter for multiple project proponents, the joint meter reading (JMR) taken every month, by state utility personnel, reflects the cumulative monthly generation for all wind turbines connected to this main meter. The apportioning of electricity generated from the various wind turbines is done by the EPC contractor and state utility based on the power generation from the individual wind turbines connected to the main meter. A monthly report on generation and consumption is prepared by the O&M contractor. This report contains details of power exported/imported to/from the grid by each of the wind turbines connected. This apportioned value is then used by the project proponent to raise invoice from state utility.

$EG_{(Net\ export\ by\ project\ activity)}$, the electricity supplied to the grid by the project activity is calculated as follows:

$$EG_{(Net\ export\ by\ project\ activity)} = \frac{\sum_{0}^{n} EG_{n,y} * EG_{(Main\ Meter\ reading)}}{\sum_{0}^{m} EG_{m,y}}$$

Where

$EG_{(Net\ export\ by\ project\ activity)}$	Net generation from all the WTGs of the promoter at a particular site
$\sum_{0}^{n} EG_{n,y}$	Total electricity generated by the WTGs of the promoter as measured at the controller

EG (Main Meter reading)	Total net generation from all wind turbines at the common metering point as calculated by $EG_{JMR,export}$ - $EG_{JMR,import}$ at the substation feeder.
$\sum_{0}^{m} EG_{m,y}$	Total generation of all the WTGs connected to the feeder as measured at controller.

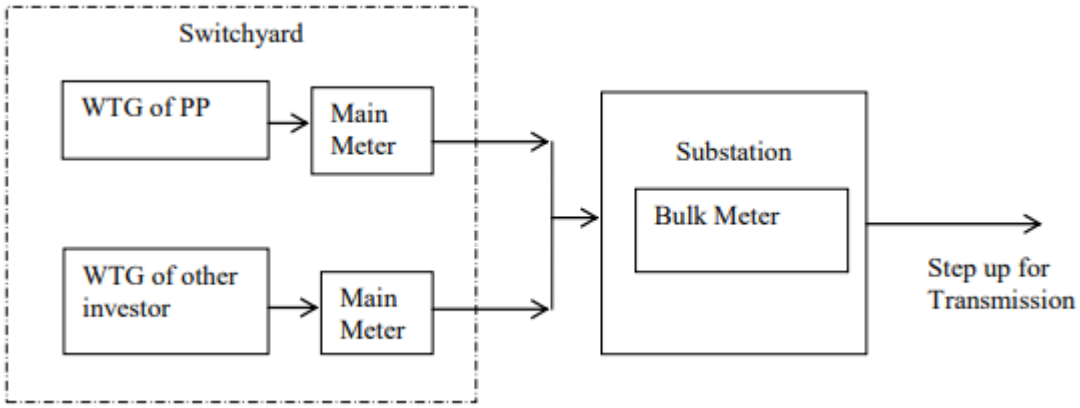
The responsibility of calibration, periodical testing, sealing and maintenance of meters is with the respective state utilities. This is done in the presence of representatives of the promoter. The frequency of meter testing is given in section D.2 of this monitoring report. All meters are tested only at the Metering Point. Additionally, each wind turbine is equipped with an integrated electronic meter. The electricity generated is recorded by the O & M staff of the EPC contractor on 24-hour basis.

The Accounts department of WMI receives the data from both the sources and keeps track of project activity which reduces the carbon emission reductions. The project performance is communicated to the higher management by the accounts department.

The feeder connections are as follows:

WTG Location No.	Site
K 233	Dhule
K231	Dhule

The Metering system of project activity for the state of Gujarat is illustrated in below figure



The system consists of a state- of- the- art controlling and monitoring and well trained staff personnel of O & M contractor. O & M staff is always present on the site to monitor various parameters of power generation and deal with any problems related to generation, transmission or maintenance.

The project activity essentially involves generation of electricity utilizing wind energy. The WTG converts wind energy into electrical energy and does not utilize any other input fuel for electricity generation. The evacuation facility is essentially maintained by the state power utility. The monitoring of the generated electricity would be carried out in two-fold.

a) Electricity generation measured continuously by main meter located adjacent to the WTG in the switchyard and recorded monthly by state utility in presence of representative of client

b) There is transmission loss between the individual WTG and substation. This loss is proportionally divided among the WTGs connected to the meter on the basis of the prorata reading taken at the individual WTG meter. The final share certificate issued to the project proponent is based on the electricity generated minus losses. This is issued by state utility.

c) The billing will be on monthly basis project proponent raise invoice and submit to GUVNL for payment based on Joint meter reading (certificate of share of electricity) certified by state utility at the end of each month for the energy supplied.

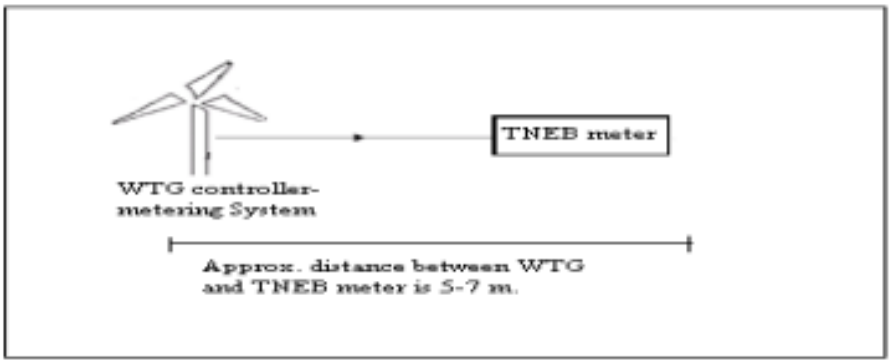
The feeder connections are as follows

WTG Location No.	Site
VRRB-600/07-08 733	Chandrodi
VRRB-600/07-08 734	Chandrodi
VRRB-600/07-08 735	Chandrodi

Description of billing calculation for Tamil Nadu Sub-bundle

The monitoring system consists of monitoring of two parameters:-

- Reading of electricity import & export at the WTG controller.
- Reading of electricity imports & export at the metering point of TNEB., located approximately 5 - 7 m. from the WTG. Each WTG has its individual EB meter, installed by the State utility.



Hence there is no need to apportion electricity generation in case of Tamil Nadu.

The import & export figure at WTG controller will be recorded in the logbooks of the O &M contractor on a daily basis. This data will be preserved in paper or electronic form. The summary of the generation will be submitted by them to the PP on a daily & monthly basis.

The TNEB meter will be the main source for monitoring net export to the grid. Monthly reading from

the TNEB meter will be recorded by the engineers of the state utility in presence of the O & M contractor who represents PP. Subsequently the statement will be prepared.

Hence, $EG_{(Net\ export\ by\ project\ activity)} = EG_{JMR,export} - EG_{JMR,import}$, at TNEB (HTSC) metering point.

The TNEB meters are scheduled to be calibrated as provided in the parameter wise tables in section B.7.1 above. The entire responsibility of this task lies with the state utility. The meter accuracy class varies from 0.2 to 0.5 %depending upon the availability of meters with TNEB.TNEB has an on-site testing & calibration arrangement; hence there is no need to dismantle the meter for calibration. In case the meters are found faulty and hard to calibrate against the prescribed accuracy class, the meter will be replaced by the state utility.

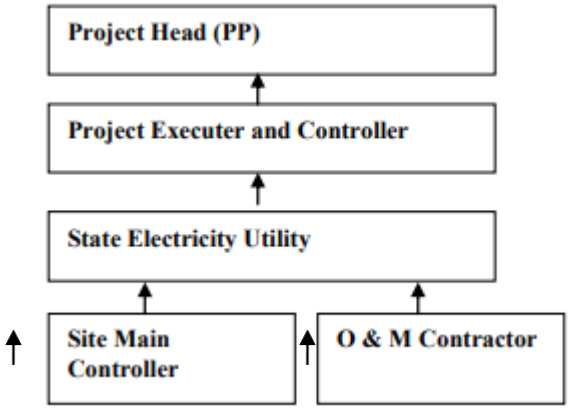
Reading at WTG controller will be recorded as a secondary & fail safe measure in case of malfunctioning of the TNEB meter. The site engineer will cross check & review the generation at controller & TNEB meter on a daily basis, in case of any deviation, he will report to the O & M in-charge & the state utility.

The data will be archived in paper or in electronic form.

The feeder connections are as follows:

WTG Location No.	Site
SF No. 155/3(P), 4, 156/1A(P)	Tenkasi
SF. No 156/1A (P), 156/2	Tenkasi

II. Organizational structure*:*



Routine Maintenance Services:

The project proponents have signed an "Operation and Maintenance" agreement with the suppliers i.e. Suzlon & Vestas RRB. The O & M management structure is as follows:

Routine Maintenance Labour Work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and

upkeep of the equipment including –

a) Tower Torquing
b) Blade Cleaning
c) Nacelle Torquing and Cleaning
d) Transformer Oil Filtration
e) Control Panel & LT Panel Maintenance
f) Site and Transformer Yard Maintenance

Security Services: This service includes watch, ward and security of the wind farm and the equipment.

Management Services:

a. Data logging in for power generation, grid availability, machine availability.
b. Preparation and submission of monthly performance report in agreed format.
c. Taking monthly meter reading jointly with utility of power generated at wind farm and supplied to grid from the meter(s) maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

a) Visual inspection of the WTG and all parts thereof.
b) Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.
c) Annual training schedules are organized by the manufacturers and suppliers of the wind turbines.

The responsibilities of CDM project team is presented below -

Designation	Responsibilities
Project Head	• Overall performance monitoring • Project Execution
Project Executer and Controller	• Operation • Verification of data • Site visit to check authenticity of data and take corrective action, wherever necessary • Storage of data
Site Main Controller	• Operation, Monitoring and Verification of data • Data recording • Storage of data

Training

Training of O&M staff for operating and maintaining the WTGs will be carried out by the WTG

manufacturer and supplier. Special emphasis will be given to the training of the employees to enable them to develop their skills to meet changing WTG technology and to provide efficient and effective O&M services. There is an initial learning programme as well as continuous learning programmes for all employees. All newly-hired employees are required to attend an intensive two- to four-week, full- time training programme to familiarize them with business and operations.

The training program focuses mainly on the management, monitoring, maintenance, safety and reliability aspects of wind power project. The objectives include:

1. Understanding the various stages and aspects in the management of wind power systems.
2. Understanding the importance of monitoring and maintenance of wind power systems and hence the various tasks involved in this.
3. Understanding the importance of safety and reliability aspects involved with wind power and the measures taken.
4. Managing generation and other data for future reference.

Procedures for handling internal auditing and non-conformities.

An internal audit of the project activity was done on a half yearly basis by a special audit team. The audit team is comprising competitive persons. The team has already audited the project for the following aspects among other things:

- Are the monitoring of CDM parameters done in line with the CDM-SSC-PDD Is the documentation of monitored CDM parameters done properly
- Are equipments calibrated and maintained as scheduled
- Is the quantity of CERs generated in line with that projected in the CDM-SSC-PDD, if not, what are the reasons for deviation?
- Are necessary corrective actions being taken to address deviations?
- Check the authenticity of data monitored and recorded by random cross-checking with other sources.

The audit team has already submitted their observations to Head- Wind Power Projects for his review and necessary action.

Procedures for maintenance of monitoring equipments:

- Site Engineer would conduct physical inspection of all the energy meters once a month
- Any maintenance requirements would be immediately attended
- The energy meters will undergo preventive maintenance once in a year

- The responsibility of maintenance will be with the Site Engineer
- Maintenance history card would be maintained for all energy meters

Data uncertainties and adjustments

For this parameter, data uncertainties are likely during the following scenarios:

- During error in meter
- When meter is dismantled for O&M or calibration
- When records are lost

Error in main meter will be usually identified during cross-checking with check meter. If an error is found in the state utility main-meter, the PP will request to state utility or recalibrating the main meter. Data recorded by check meter & the PP's meter minus average transmission losses would be used for emission reduction determination for the error period.

When main-meter is dismantled for O&M or calibration, the same procedure as listed above will be used for emission reduction calculation. In case of Tamil Nadu, there is no need to dismantle the meter, as it is being calibrated by the state utility on site.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

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.

$BE_y = EG_y X\ EF_{grid}$

Where,

BE_y = Baseline Emissions (tCO_2/year)

EG_y = Electricity generated by the project activity in the year y

EF_{grid} = CO_2 emission factor

The baseline emission calculation for the reported monitoring period is demonstrated below.

For Maharashtra State:

Monitoring Period	EG_y (MWh)	EF_{Grid} (tco_2/MWh)	BE_y (tco_2)
01-January-2012 to 31-March-2012	0	0.78	0

01-April-2012 to 31-December-2012	3,108.03	0.82	2,548
01-January-2013 to 31-December-2013	3,491.04	0.82	2,862
01-January-2014 to 31-December-2014	2,713.80	0.82	2,225
01-January-2015 to 31-December-2015	2,997.31	0.82	2,457
01-January-2016 to 31-December-2016	3,706.43	0.82	3,039
01-January-2017 to 20-October-2017	3,095.42	0.82	2,538
Total	**19,112.03**		**15,669**

For Gujarat State:

Monitoring Period	**EG_y (MWh)**	**EF_{Grid} (tco_2/MWh)**	**BE_y (tco_2)**
01-January-2012 to 31-March-2012	265.96	0.78	851
01-April-2012 to 31-December-2012	785.47	0.82	
01-January-2013 to 31-December-2013	1,493.64	0.82	1,224
01-January-2014 to 31-December-2014	1,284.12	0.82	1,052
01-January-2015 to 31-December-2015	1,261.19	0.82	1,034
01-January-2016 to 31-December-2016	960.25	0.82	787
01-January-2017 to 20-October-2017	1,061.30	0.82	870
Total	**7,111.92**		**5,818**

For Tamil Nadu State:

Monitoring Period	**EG_y (MWh)**	**EF_{Grid} (tco_2/MWh)**	**BE_y (tco_2)**
01-January-2012 to 31-March-2012	0	0.78	0
01-April-2012 to 31-December-2012	0	0.82	0
01-January-2013 to 31-December-2013	0	0.82	0
01-January-2014 to 31-December-2014	152.65	0.82	125
01-January-2015 to 31-December-2015	843.54	0.82	691
01-January-2016 to 31-December-2016	11.16	0.82	9
01-January-2017 to 20-October-2017	0	0.82	0
Total	**1,007.35**		**825**

Total net electricity supplied by the project activity =27,231.31 MWh

Total baseline emission = 22,312 tCO_2 (Vintage wise roundown value)

5.2 Project Emissions

The emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions through substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y)

Hence, PE_y= 0

5.3 Leakage

As wind energy projects fall under clean energy sources for electricity generation, the emission from the project is taken as zero.

Hence, 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	3,399	0	0	3,399
2013	4,086	0	0	4,086
2014	3,402	0	0	3,402
2015	4,182	0	0	4,182
2016	3,835	0	0	3,835
2017	3,408	0	0	3,408
Total	22,312	0	0	22,312

The actual VCUs is about 45.79 % lower than the estimated tCO_2e.

This variation is majorly due to the variation in wind flow pattern (PLF), 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 are conservative.

This variation is also due to the fact that for the Tamil Nadu site, PP does not have generation records for years as mentioned in the ER sheet thus zero value has been taken as a conservative approach.

APPENDIX 1: < CALIBRATION DETAILS

Sr. No.	WTG Location No.	Feeder /SS Name	Main Meter No.	Check Meter No.	Accuracy class	Date of calibration	Due date of calibration
Bundle -I Maharashtra state	K 233	Walve feeder-III	04862765	04862469	0.2	17- Sept- 2011 26- Sept-2012[12] 12-Aug -2013 07-June-2014 30-June-2015 16-March-2017[13]	16- Sept-2012 25-Sept-2013 11- Aug-2014 06- June -2015 29-June-2016 15-March -2018
	K 231	Walve feeder-III	04862765	04862469	0.2	17- Sept- 2011 26- Sept-2012[14] 12-Aug -2013 07-June-2014 30-June-2015 16-March-2017[15]	16- Sept-2012 25-Sept-2013 11- Aug-2014 06- June -2015 29-June-2016 15-March -2018
Bundle -II – Gujarat State	VRRB-600/07-08 733	Surajbari S/S	GJB02055	GJB02056	0.5	19- May-2011 17-May-2012 14-May-2013 11-May-2014 08-May-2015 05-May-2016 02-May-2017	18-May-2012 16-May -2013 13-May-2014 10-May-2015 07- May-2016 04- May -2017 01-May- 2018
	VRRB-600/07-08 734	Surajbari S/S	GJB01199	GJB01200	0.5	06-April -2011 02- April-2012 29-March -2013 26- March -2014 21- March-2015 18-March-2016 15-March-2017	05-April-2012 01-April- 2013 28-March-2014 25 -March-2015 20-March -2016 17-March-2017 14-March-2018
	VRRB-600/07-08 735	Surajbari S/S	GJB01175	GJB01176	0.5	10-Feb-2011 07-Feb-2012 04-Feb-2013 01- Feb -2014 24-Jan-2015 20-Jan-2016 16-Jan-2017	09- Feb -2012 06- Feb -2013 03- Feb -2014 31-Jan-2015 23- Jan-2016 19- Jan-2017 15-Jan-2018

[12] There was a delay in calibration for Sept 2012 ,thereby error factor has been applied in the ER sheet
[13]There was a delay in calibration for March 2017 ,thereby error factor has been applied in the ER sheet
[14] There was a delay in calibration for Sept 2012 ,thereby error factor has been applied in the ER sheet
[15]There was a delay in calibration for March 2017 ,thereby error factor has been applied in the ER sheet

	VRRB-600/07-08 735	Surajbari S/S	GJU04171		0.5	01-Sept-2011 11-Aug-2012 08- Aug-2013 04-Aug-2014 02-Aug- 2015 25-July-2016 23-July-2017	31-Aug-2012 10-Aug-2013 07-Aug2014 03-Aug-2015 01-Aug-2016 24-July-2017 22- July-2018
Bundle -III - Tamilnadu State	WEG HT SC. No. 2277	Shankarkoil S/S	TN 903073	-	0.5	16- July-2012[16] 30-August-2018	15-July-2013 29-August-2019
	WEG HT SC. No. 2281	Shankarkoil S/S	TNU04733	-	0.5	16-July-2012[17] 30-August -2018	15-July-2013 29-August-2019

For Tamil Nadu Site

Considering the monitoring period as 01-January-2012 to 20-October-2017, there has been delay in calibration of meters and result of delayed calibration is within permissible limit of accuracy class, hence accuracy class of meter of 0.5% has been applied as error factor to the values of both electricity export and electricity import from January 2012 to July 2012 and from July 2013 to October 2017 for each WTGs as a conservative approach.

For Maharashtra Site

Considering the monitoring period as 01-January-2012 to 20-October-2017, there has been delay in calibration of meters and result of delayed calibration is within permissible limit of accuracy class, hence accuracy class of meter of 0.2% has been applied as error factor to the values of both electricity export and electricity import in September 2012, June 2015 and from June 2016 to March 2017 for each WTGs as a conservative approach.

[16] there was a delay in calibration for July 2012, thereby error factor has been applied in the ER sheet .

[17] there was a delay in calibration for July 2012 ,thereby error factor has been applied in the ER sheet .

APPENDIX 2: BREAKDOWN DETAILS

Generation Date	State	Breakdown remark	Breakdown Hours
12- June-012	Tamil Nadu	CLS Generator Lubrication Stop	09:00
27-June-12	Tamil Nadu	Mech Gear Oil Filter Choked Stop	17:00
05-May-13	Tamil Nadu	CLS Generator Lubrication Stop	12:00
12-Oct-13	Tamil Nadu	CLS Pitch Slew Ring Lubrication Stop	14:00
27- Nov-13	Tamil Nadu	Pitch Resolver Encoder Stop	18:00
10- Jan -14	Tamil Nadu	Rep Pitch Frequency Pitch2 Stop	10:00
16- March -14	Gujarat	CLS Generator Lubrication Stop	09:00
09- May-14	Gujarat	Mech Gear Oil Filter Choked Stop	17:00
22-Nov- 14	Gujarat	Rep Pitch Freq Conv Pitch1 Stop	10:00
30- Nov- 14	Gujarat	Forcefull Stoppage	06:00
28-Dec-14	Tamil Nadu	Forcefull Stoppage	12:00
01- Mar- 15	Tamil Nadu	Elec Saftey Chain Stop	10:00
06- June-15	Tamil Nadu	Elec Saftey Chain Stop	12:00
09- July-15	Gujarat	INTL_Line Breakdown due to E/F	10:00
08-Oct- 15	Maharashtra	INTL_Line Breakdown due to E/F	06:00
11- Dec-15	Maharashtra	INTL_Line Breakdown due to E/F	12:00
20-Dec-15	Maharashtra	INTL_Line Breakdown due to E/F	10:00
10- Jan-16	Maharashtra	CLS Generator Lubrication Stop	18:00
15-Feb-16	Maharashtra	Mech Gear Oil Filter Choked Stop	10:00
17-Feb-16	Gujarat	Rep Pitch Freq Conv Pitch1 Stop	09:00
19-Feb -16	Gujarat	Forcefull Stoppage	17:00
25- March-16	Gujarat	Forcefull Stoppage	10:00