Monitoring report form (Version 03.2)

Monitoring report

Title of the project activity	14 MW Wind Power Project in Maharashtra
Reference number of the project activity	2342[1]
Version number of the monitoring report	01
Completion date of the monitoring report	13/01/2014
Registration date of the project activity	08/06/2009[2]
Monitoring period number and duration of this monitoring period	Monitoring Period : 03 Duration of Monitoring Period : 01/01/2012 to 31/12/2013 (first and last days included)
Project participant(s)	M/s Shah Promoters & Developers
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope(s) : 01 Applied Methodology(ies) : AMS I.D. Version 13
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	((731/365)*21904) = 43,868 tCO_2
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	41,494 tCO_2
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	20,951 tCO_2
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	20,543 tCO_2

[1] http://cdm.unfccc.int/Projects/projsearch.html
[2] http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>> Purpose of the project activity and the measures taken to reduce greenhouse gas emissions:

The implemented project activity by M/s Shah Promoters & Developers is a small-scale project involving installation of 10 wind electric generators (WEGs) of individual capacities 1.25 MW (4 machines) and1.5 MW (6 machines).

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 state electricity utility namely Maharashtra State Electricity Distribution Company Limited (MSEDCL) which falls under Western region grid[3] of India (now part of integrated NEWNE grid) and thus leads to CO_2 emission reduction due to the displacement of equivalent amount of electricity.

>> Brief description of the installed technology and equipments:

The project activity consists of 10 wind electric generators (WEGs) installed in three phases at various locations[4] within Maharashtra. The project activity does not involve any technology transfer. The details of the windmill e.g. employed technology, model, rated capacity is provided in table A.1.1: Commissioning dates, capacity, location number, supplier and model number, location for the project activity. The details description of technology is provided in section C.1 of Monitoring Report.

>> Relevant dates for the project activity

The details of the WEG e.g. Commissioning dates, capacity, location number, location for the project activity is provided in table A.1.1

Table A.1.1: Commissioning dates, capacity, location number, supplier and model number, location for the project activity

Site	WEG Location No.	Installed Capacity (MW)	Technology	Village, District	Substation	Date of Commissioning
Site I[5]	J - 17[5]	1.25[5]	SUZLON, S-70	Jamade, Dhule[5]	Jamade[5]	10/08/2006[5]
	J - 21[5]	1.25[5]	SUZLON, S-70	Jamade, Dhule[5]	Jamade[5]	10/08/2006[5]
	J - 22[5]	1.25[5]	SUZLON, S-70	Jamade, Dhule[5]	Jamade[5]	10/08/2006[5]
	J - 23[5]	1.25[5]	SUZLON, S-70	Jamade, Dhule[5]	Jamade[5]	10/08/2006[5]
Site II[6]	N - 4[6]	1.50[6]	SUZLON, S-82	Nagaj, Sangli[6]	Ghatnandre[6]	30/09/2007[6]
	N - 5[6]	1.50[6]	SUZLON, S-82	Nagaj, Sangli[6]	Ghatnandre[6]	30/09/2007[6]
	N - 6[6]	1.50[6]	SUZLON, S-82	Nagaj, Sangli[6]	Ghatnandre[6]	30/09/2007[6]
	N - 7[6]	1.50[6]	SUZLON, S-82	Nagaj, Sangli[6]	Ghatnandre[6]	30/09/2007[6]
	N - 8[6]	1.50[6]	SUZLON, S-82	Nagaj, Sangli[6]	Ghatnandre[6]	30/09/2007[6]
	N - 9[6]	1.50[6]	SUZLON, S-82	Nagaj, Sangli[6]	Ghatnandre[6]	30/09/2007[6]
Total	**10**	**14 MW**				

All the WEGs of the project activity are in operation from the commissioning and operating satisfactorily during the reported monitoring period.

>> Relevant dates for the project activity

During the reported monitoring period 01/01/2012 to 31/12/2013 (first and last days included) the project activity has supplied 53,198 MWh (Rounded Down) of electricity, and thus contributing to GHG reductions of 41,494 tCO2e (Rounded Down).

[3] As per the new delineation of electricity system in India, western region grid is a part of integrated NEWNE grid.
[4] Refer columns WEG Location No. and Village, District of table A.1.1
[5] Commissioning certificate issued by MSEDCL, Certificate reference: SE/DHL/Tech/Wind/ No 6580 for WEG location J-17, J-21, J-22, J-23 providing commissioning date as 10/08/2006
[6] Commissioning certificate issued by MSEDCL, Certificate reference: SE/SC/T/AE[C]/ No.8016 for WEG location N-4, N-5, N-6, N-7, N-8, N-9 providing commissioning date as 30/09/2007

A.2. Location of project activity

>> Host Party(ies) : India

>> Region/State/Province etc : Maharashtra

>> **City/Town/Community etc** : Site I – Village - Jamade, District - Dhule
Site II – Village - Nagaj, District - Sangli

>> Physical/ Geographical location :

GPS coordinates are provided in below table A.2.1

Site	Windmill Location No.[7]	Addresses[8]	Latitude and Longitude[9]	
Site I	J-17	R. S. No. - 19, Village – Jamade, Taluka - Sakari, Dist - Dhule	21°10'50.8" N	74°21'32.3" E
	J-21	R. S. No. - 19, Village – Jamade, Taluka - Sakari, Dist - Dhule	21°10'45.8" N	74°22'14.1" E
	J-22	R. S. No. - 19, Village – Jamade, Taluka - Sakari, Dist - Dhule	21°10'57.2" N	74°22'13.4" E
	J-23	R. S. No. - 19, Village – Jamade, Taluka - Sakari, Dist - Dhule	21°11'11.9" N	74°22'14.2" E
Site II	N-4	Survey no.-585, Village – Nagaj, Taluka - Kawathe Mahakal, Dist - Sangli	17°09'49.3" N	74°56'58.1" E
	N-5	Survey no.-604, Village – Nagaj, Taluka - Kawathe Mahakal, Dist - Sangli	17°10'00.8" N	74°57'04.3" E
	N-6	Survey no.-604, Village – Nagaj, Taluka - Kawathe Mahakal, Dist - Sangli	17°10'13.4" N	74°57'06.1" E
	N-7	Survey no.-604, Village – Nagaj, Taluka - Kawathe Mahakal, Dist - Sangli	17°10'25.5" N	74°57'04.4" E
	N-8	Survey no.-604, Village – Nagaj, Taluka - Kawathe Mahakal, Dist - Sangli	17°10'37.1" N	74°57'06.9" E
	N-9	Survey no.-604, Village – Nagaj, Taluka - Kawathe Mahakal, Dist - Sangli	17°10'48.8" N	74°57'07.8" E

[7] Commissioning certificate issued by MSEDCL, Certificate reference: SE/DHL/Tech/Wind/ No 6580 and Certificate reference: SE/SC/T/AE[C]/ No.8016

[8] Commissioning certificate issued by MSEDCL , Certificate reference: SE/DHL/Tech/Wind/ No 6580 and Certificate reference: SE/SC/T/AE[C]/ No.8016

[9] As per letter submitted by Suzlon also refer MR of first monitoring period.

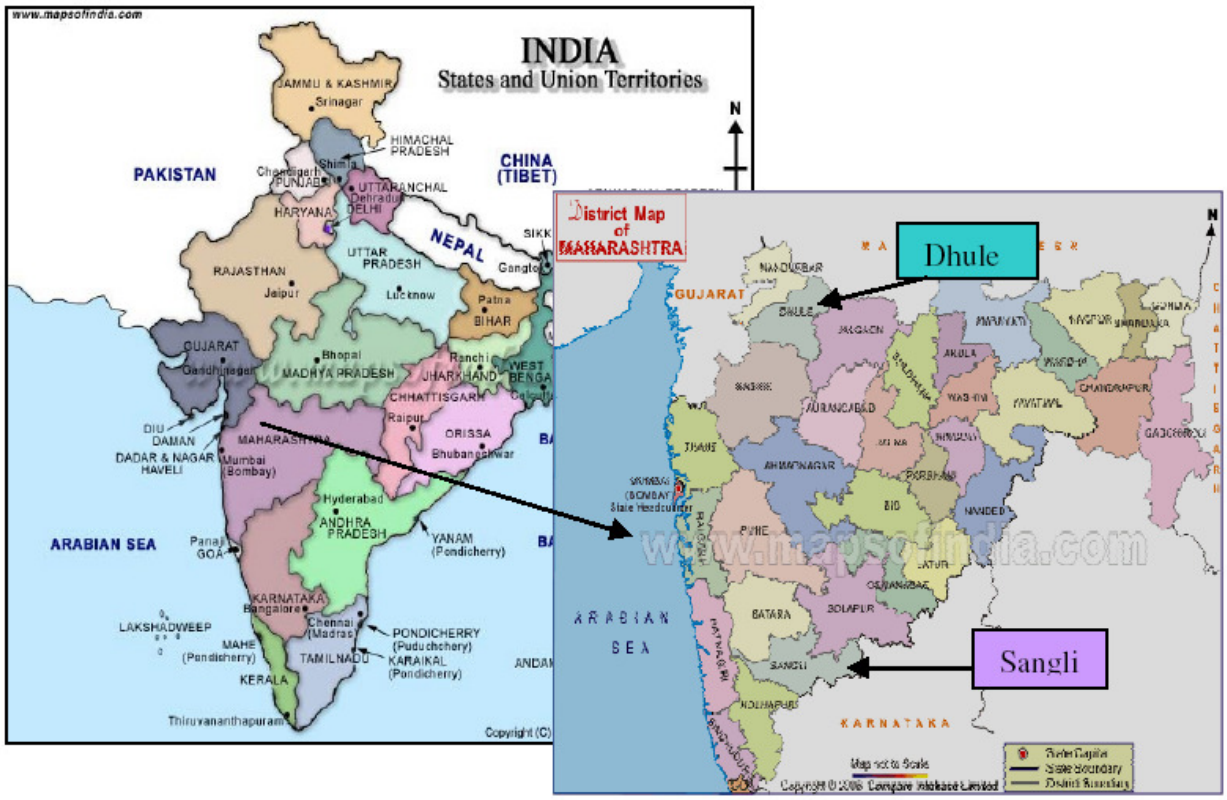


Figure 1 : Map of India & Maharashtra.

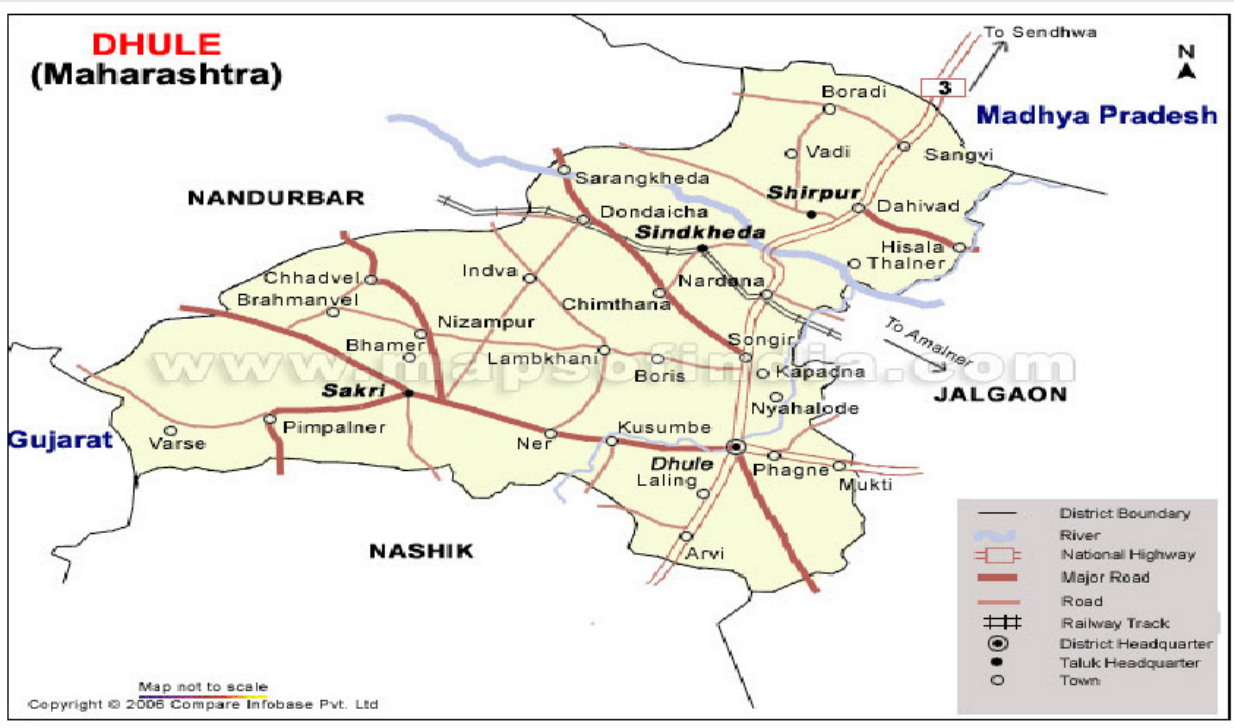


Figure 2 : Map of Dhule

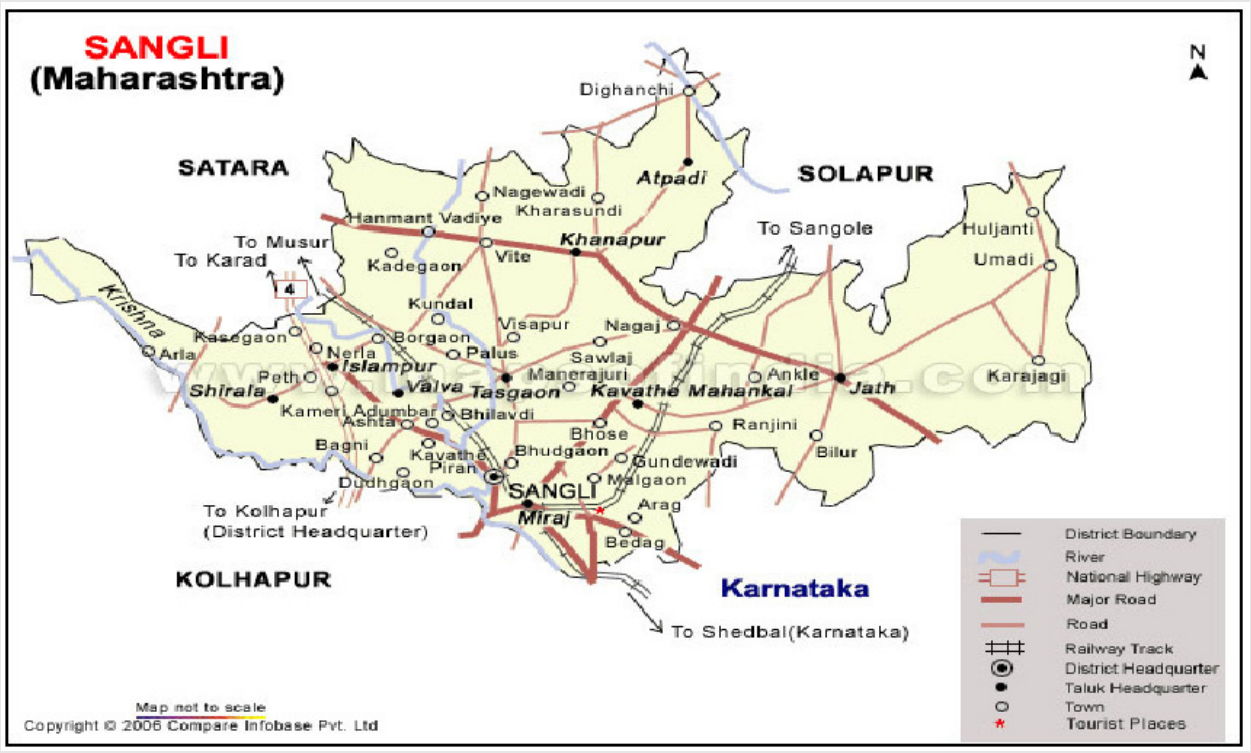


Figure 3 : Map of Sangli

The project activity was commissioned before the completion of validation of the project activity and continue to operate at the same location since their commissioning and hence there is no change in the location of WEGs since commissioning and hence since the validation. The latitude and longitude mentioned in the registered CDM PDD was restricted up-to Taluka only i.e. Sakri and Kawathe Mahakal, which does not refers to the specific project activity location. However the Latitude and Longitude included in the monitoring report corresponds to the WEGs of the project activity.

Furthermore, M/s Suzlon Infrastructure Services Limited has provided Certificate for WEG location number, make/ model of WEG, latitude and longitude of WEG which is more transparent and traceable.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	M/s Shah Promoters & Developers	No

A.4. Reference of applied methodology

>> **Type : I**- Renewable energy projects

Category : I.D. – Grid connected renewable electricity generation

Version number : (13)[10]

Sectoral Scope : 01

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

Tool : Tool to calculate the emission factor for an electricity system" (Version 01, EB 35)[11]

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

A.5. Crediting period of project activity

>> Crediting period from 08/06/2009 to 07/06/2019 (Fixed)[12]

Choice of crediting period: Fixed for 10 years 0 Month

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

>> The present project activity was already commissioned before the registration at UNFCCC (Site I - 1.25 X 4 machines in Dhule in the year 2006 and Site II - 1.50 X 6 machines in Sangli in 2007) with total installed capacity 14 MW.

The detailed status of implementation i.e. start date as well as capacity for each site of the project activity is provided under Table A.1.1: Commissioning dates, capacity, location number, supplier and model number.

Detail location of individual wind turbine are given under Table A.2.1

The downtime for the project activity for the current monitoring period is mentioned in the following table:

WEGs Location No.	Unit	Downtime		Total hrs
J-17	hrs	321.60	175.90	4765.10
J-21	hrs	436.40	213.50	
J-22	hrs	270.90	418.60	
J-23	hrs	352.20	269.50	
N-4	hrs	273.20	147.30	
N-5	hrs	159.20	123.90	
N-6	hrs	225.30	557.90	
N-7	hrs	160.30	101.80	
N-8	hrs	164.40	95.00	
N-9	hrs	170.50	127.70	

In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind has considerable amount of kinetic energy when blowing at high speeds. This kinetic energy when passes through the blades of the WEG is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity.

The technology is a clean technology since there are no GHG emissions associated with the electricity generation.

[11] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.pdf
[12] http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view

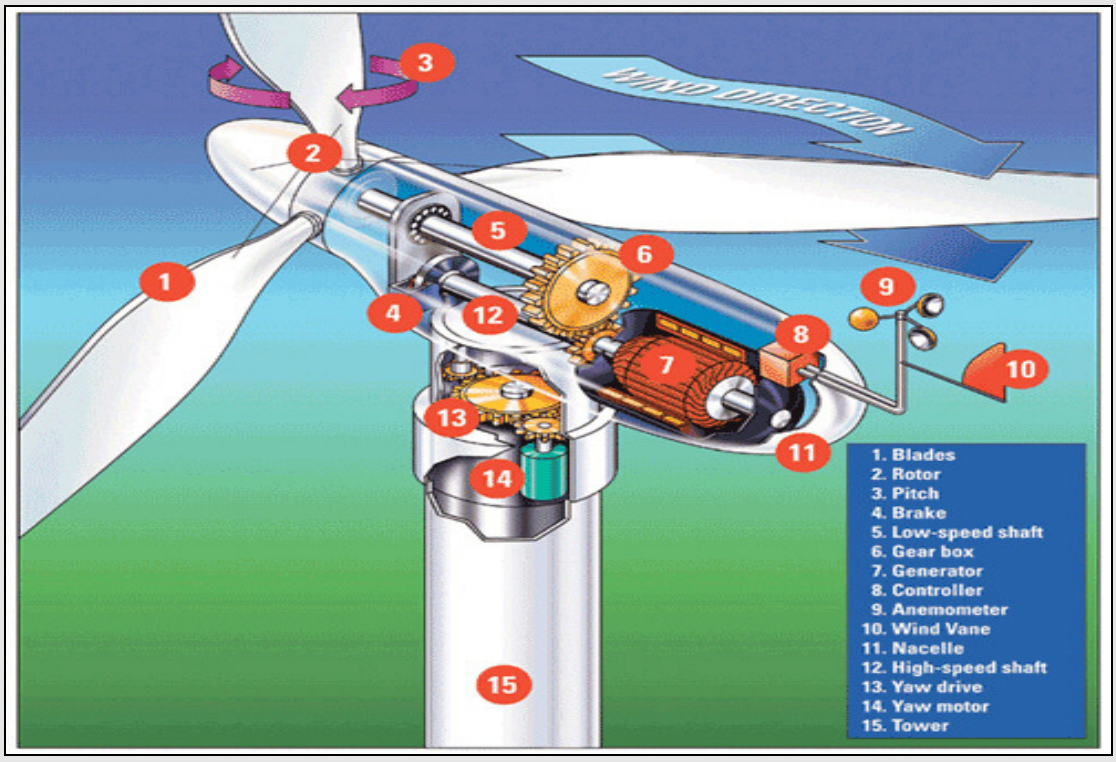


Figure 4 : Windmill

The important parts of windmill are:

i. Main tower
ii. Blades
iii. Nacelle
iv. Hub
v. Main shaft
vi. Gearbox, bearing and housing
vii. Brake
viii. Generator

Salient Features of Suzlon (S-70) 1250 kW WEG

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 m^2
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 Suzlon (S-82) 1500 kW WEG

Rotor diameter	82.0 m
Installed electrical output	1500 kW
Cut –in wind speed	4 m/s
Rated wind speed	14 m/s
Cut-out wind speed	20 m/s
Rotor swept area	5281 m^2
Rational speed	16.30 RPM
Rotor material	GRP
Regulation	Pitch
Generator	Asynchronous generator,4 poles
Rated output	1500 kW
Rotational speed	1511 rpm
Operating voltage	690 v
Frequency	50 Hz
Protection	IP 54
Insulation class	H
Cooling system	Air –cooled
Gear box	3 stage gear box,1 planetary and 2 helical
Manufacturer	Winergy
Gear Ratio	95.09
Nominal load	1650 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 backup system
Design standards	GL/IEC

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

>> Not Applicable.

B.2.2. Corrections

>> Not Applicable.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

>> Not Applicable.

B.2.4. Changes to project design of registered project activity

>> Not Applicable.

B.2.5. Changes to start date of crediting period

>> Not Applicable.

B.2.6. Types of changes specific to afforestation or reforestation project activity

>> Not Applicable.

SECTION C. Description of monitoring system

>> As emission reductions from the project is determined by the number of units exported to the grid. It is mandatory to have a monitoring system in place and ensure that the project activity produces and exports the rated power at the stipulated norms. The sole objective of having monitoring system is to have a constant watch on the emission reductions.

The delivered energy is metered by Suzlon and MSEDCL at the high voltage side of the step up transformers. Metering is done either for two /three / more wind turbines depending on the location of wind turbines and service connection number. Metering equipments has electronic trivector meters*. The metering equipments are maintained in accordance with electricity standards and have the capability of recording daily and monthly readings. Records of joint meter reading are maintained at site and a copy is maintained at the head office. All the meters are tested for accuracy every calendar year with reference to a portable standard meter. As the instruments are calibrated and marked at regular intervals, the accuracy of measurement can be assured at all times. Necessary records of calibration are maintained by both MSEDCL and project proponents.

The project activity essentially involves generation of electricity from wind, the employed WEG 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.

- The proposed project activity requires evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state power utility (MSEDCL).
- The electricity generation measurements are required by the utility and the investors to assess electricity sales revenue and / or wheeling charges.
- The project activity has therefore envisaged two independent measurements of generated electricity from the wind turbines.
- The primary recording of the electricity fed to the state utility grid is carried out jointly at the incoming feeder of the state power utility (MSEDCL). Machines for sale to utility are connected to the feeder.
- The joint measurement is carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties sign the recorded reading.
- Metering equipment - Metering is carried out through electronic trivector meters*of accuracy class 0.2% required for the project. The main meter was installed and owned by MSEDCL, whereas the project participant owns the check meters. The metering equipments are maintained in accordance with electricity standards.
- The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WEGs. Each WEG 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 machine can be monitored as a real-time entity at CMS. The snapshot of generation on the last day of every calendar month will be kept as a record both in electronic as well as printed (paper) form.

*Trivector Meter - is a device that measures the amount of electrical energy supplied to the utility. It is called as tri-vector meter because it measures energy consumption of the three phase lines R, Y, B which are 120 phase difference from each other. It measures the consumption in terms of the active energy, reactive energy, apparent energy, power factor

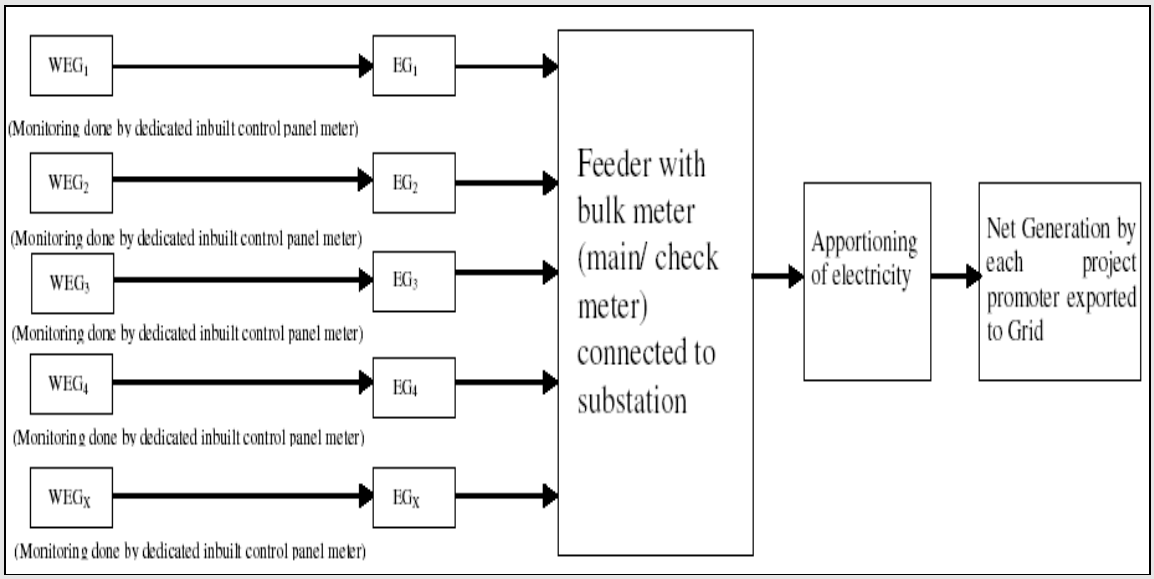
Description of calibration of WEG Controller

SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi-function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current/voltage are converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed/stored. Woodward relay does not have a display and needs special protocol to view energy readings as this relay communicates digital signal through special communication protocol hence, it is not possible to calibrate. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration during operation.

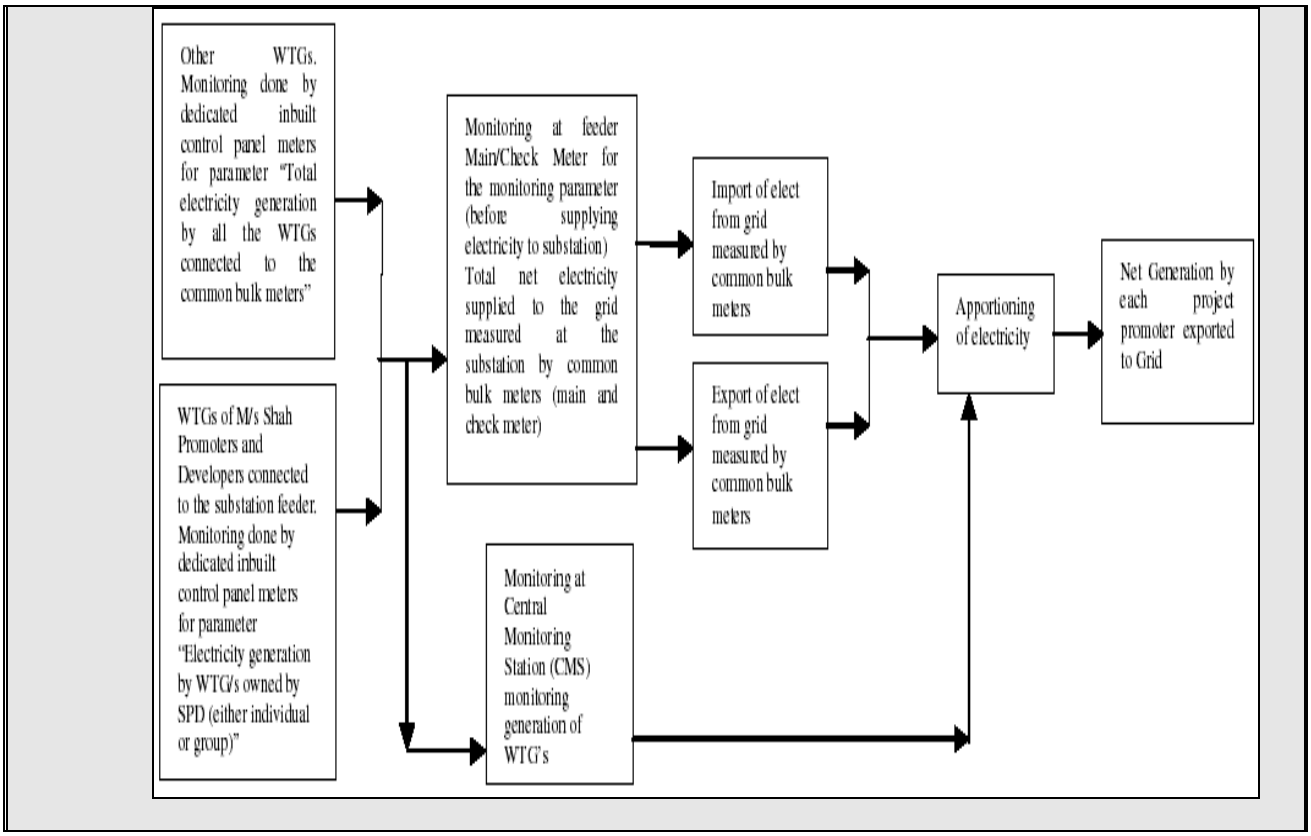
Description of billing calculation from net meter to individual meters

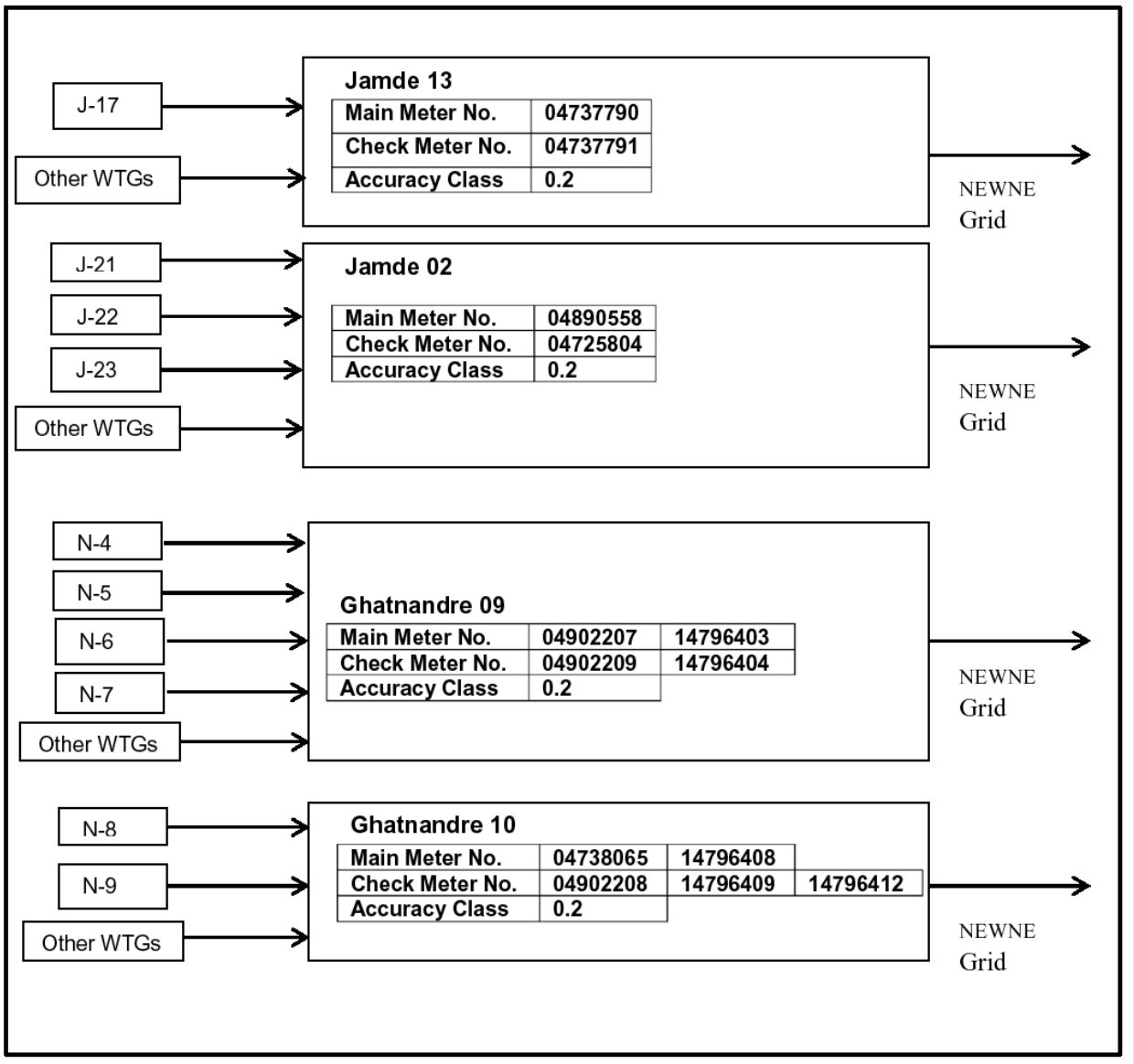
Each substation is connected to a number of wind turbines. The generation reading is collectively displayed by the substation meter. The net generation of each of the wind turbines is then calculated in the following manner:

Metering Diagram:



Monitoring Arrangement:


Other WTGs. Monitoring done by dedicated inbuilt control panel meters for parameter "Total electricity generation by all the WTGs connected to the common bulk meters"
WTGs of M/s Shah Promoters and Developers connected to the substation feeder. Monitoring done by dedicated inbuilt control panel meters for parameter "Electricity generation by WTG/s owned by SPD (either individual or group)"
Monitoring at feeder Main/Check Meter for the monitoring parameter (before supplying electricity to substation) Total net electricity supplied to the grid measured at the substation by common bulk meters (main and check meter)
Import of elect from grid measured by common bulk meters
Export of elect from grid measured by common bulk meters
Monitoring at Central Monitoring Station (CMS) monitoring generation of WTG's
Apportioning of electricity
Net Generation by each project promoter exported to Grid



The generated electricity is measured through inbuilt control panel meter of the WEGs. The monitoring of electricity generation from all these wind turbines is done at 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, Suzlon Energy Limited, are always present on site to monitor various parameters of power generation and deal with any problems related to generation, transmission or maintenance. The Electricity Generated from the wind turbine/s (either individual or group) of the project proponent in MWh is presented as

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

And the summation of total Electricity Generated from all the wind turbines at the given site and connected to common bulk meter in MWh as measured at inbuilt control panel meters of the WEGs is presented as;

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

A ratio based on these two set of measured values is used for apportioning the net electricity supplied to the western regional grid (Now integrated in to NEWNE Grid) by the project activity. The second metering is carried out at grid interconnection point (substation) 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 (MSEDCL). This JMR 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" (EGJMR,export) and "import" (EGJMR, import) of the electricity to/ from the western grid (Now integrated in to NEWNE Grid). There are common bulk meter which monitors both the export and import of electricity to the grid.

$$EGy = \left[\frac{\sum_{0}^{n} EG_{n,y}}{\sum_{0}^{m} EG_{m,y}} \right] X \; EG_{MSEDCL}$$

Where

EGy	Net Electricity exported to the grid by the Project Activity,
$\sum_{0}^{n} EG_{n,y}$	Electricity generation by WEG/s owned by SPD (either individual or group) included in this project activity at the controller.
EG_{MSEDCL}	Total net electricity supplied to the grid measured at the substation by common bulk meter (main and check meter).
$\sum_{0}^{m} EG_{m,y}$	Total electricity generation by all the WEGs connected to the common bulk meters

MSEDCL carries out the calibration, periodical testing, sealing and maintenance of meters in the presence of SPD representative. The frequency of meter testing is annual. All meters are tested only at the Metering Point. The meters are tested and maintained as per the Metering Code for Maharashtra. 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 SPD 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.

For this project, the feeder connections are as follows:

Site I : Village – Jamade, Dhule

WEG Location No.	Substation	Feeder Number
J-17	Jamade	13
J-21	Jamade	02
J-22	Jamade	02
J-23	Jamade	02

Site II : Village –Nagaj, Sangli

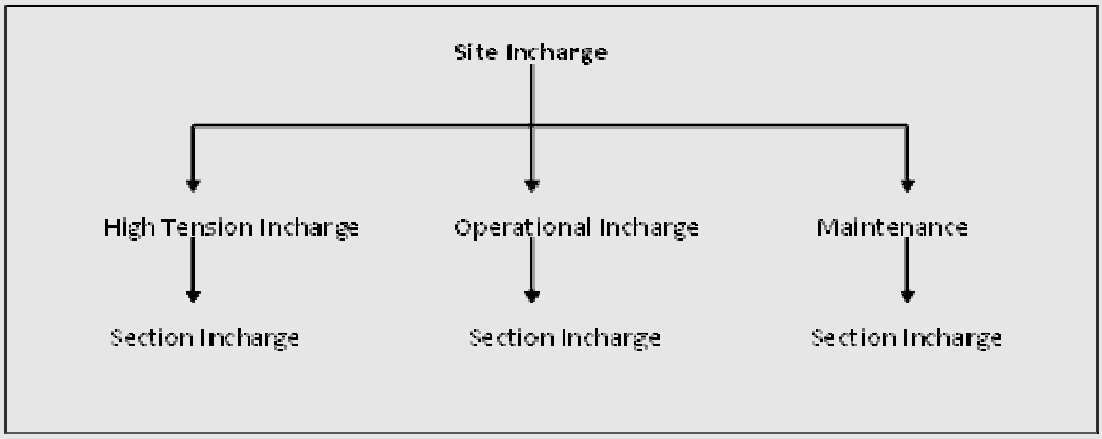
WEG Location No.	Substation	Feeder Number
N-4	Ghatnandre	9
N-5	Ghatnandre	9
N-6	Ghatnandre	9
N-7	Ghatnandre	9
N-8	Ghatnandre	10
N-9	Ghatnandre	10

Recording of generation at the joint meter (JMR) will be usually from 1st of one month to 1st or 2nd of next month.

The project participant has signed an operation and maintenance agreement with the supplier of the wind turbines i.e. Suzlon. The agreement is for a period of 10 years. The performance of the turbines, safety in operation and scheduled /breakdown maintenances is responsibility of Suzlon and is organized and monitored by them. So the authority and responsibility of project management lies with the O & M contractor.

ISO 9001:2000 standard has been adopted by Suzlon, who is responsible for monitoring, calibration and O & M of the project. Training is an essential part of the ISO system. To comply with the ISO standard, training has to be provided to personnel according to their responsibility with in organization.

The organizational hierarchy of Suzlon for O& M management is as follows



Routine Maintenance Services:

The project proponents have signed an "Operation and maintenance" agreement with the supplier of the wind turbines for the operation of the wind farm. 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 and 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 WEGs 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.

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 staff operating and maintaining the WEGs is carried out by the WEG manufacturer and supplier (Suzlon). Special emphasis is given to the training of the employees to enable them to develop their skills to meet changing WEG 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.

Besides the usual training programs for their staff Suzlon conducts specific familiarization capsules for customers, such that they are fully aware of the capabilities of the highly sophisticated WEGs of Suzlon.

The training programme focuses mainly on the management, monitoring and maintenance, and safety and reliability aspects of wind power. 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.

The project activity essentially involves generation of electricity from wind. The employed WEGs can only convert wind energy into electrical energy and cannot use any other input fuel for electricity generation. As the operation of WEGs is emission free and no emissions will be produced during the lifetime of the WEGs.

Although it is being anticipated that there would be no unintended emissions/leakages from this project, however, if any such condition arises, and leakage effect is found due to the project, such leakage will be accounted accordingly as mentioned in the chosen applied baseline methodology.

SPD has appointed a full time project in-charge to manage the overall project activity. The project in-charge supervises the functioning of the wind farm in close coordination with the officials & technical personnel of Suzlon.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data / Parameter:	**Section is left blank on purpose (as there is no ex-ante value validated during validation)**
Unit:	

Description:	
Source of data:	
Value(s) applied):	
Purpose of data:	
Additional comment:	

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	**EGy**
Unit:	MWh
Description:	Net Electricity export to the grid by the project activity.
Measured/ Calculated / Default:	Measured/Calculated
Source of data:	Joint meter reading issued by MSEDCL for promoter with the help of O & M contractor by applying logic of apportioning described in section B.7.2 of PDD.
Value(s) of monitored parameter:	53,198.00
Monitoring equipment:	Please refer Annex I of Monitoring Report.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Net Electricity exported to the grid by the Project Activity is calculated based on the monitoring parameter- $\sum_{0}^{n} EG_{n,y}$, EG_{MSEDCL} and $\sum_{0}^{m} EG_{m,y}$. $$EGy = \left[\frac{\sum_{0}^{n} EG_{n,y}}{\sum_{0}^{m} EG_{m,y}} \right] X \; EG_{MSEDCL}$$
QA/QC procedures:	The project revenue is based on the net units displaced as 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 WEGs. The common bulk meters constitute main meter and check meter. The accuracy of the main meter and check meter can be verified by comparing with each other. 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 MSEDCL.
Purpose of data:	Used for the Baseline Calculation
Additional comment:	---

Data / Parameter:	$\sum_{0}^{m} EG_{m,y}$

Unit:	MWh
Description:	Total electricity generation by all the WEGs connected to the common bulk meters
Measured/ Calculated / Default:	Measured
Source of data:	Monitored through inbuilt control panel meters of the WEGs. The O & M contractor further aggregates (calculates) the monitored readings to arrive at "Total electricity generation by all the WEGs connected to the common bulk meter".
Value(s) of monitored parameter:	301,297.06
Monitoring equipment:	Monitored through inbuilt WEG Controller meter. Please refer Annex I of Monitoring Report "Controller Calibration related Information"
Measuring/ Reading/ Recording frequency:	The electricity generated by all the WEGs (including WEGs of SPD) is monitored with the help of inbuilt control panel meters installed on all WEGs (which are connected to common bulk meters i.e. main meter & check meter). The data is continuously measured at each WEG by inbuilt control panel meter and recorded at CMS. However access to this reading for WEGs other than that of SPD is not available and the reading are directly reflected in the JMR which is issued by MSEDCL on monthly basis.
Calculation method (if applicable):	The electricity generated by all the WEGs (including WEGs of SPD) is monitored with the help of inbuilt control panel meters installed on all WEGs (which are connected to common bulk meters i.e. main meter & check meter). The data is continuously measured at each WEG by inbuilt control panel meter and recorded at CMS. The readings are aggregated by the O & M contractor and provided to the MSEDCL for apportioning and calculating the net electricity exported by WEG's. The reading of "Total electricity generation by all the WEGs connected to the common bulk meters" is monitored by O & M contractor at CMS.
QA/QC procedures:	As per letter provided by the technology supplier the inbuilt control panel meters cannot be calibrated. Please also refer to detailed description under "Description of calibration of WEG Controller" in section B.7.2 of PDD.
Purpose of data:	Used for the Calculation of EGy / Baseline Calculation
Additional comment:	---

Data / Parameter:	**EG_{MSEDCL}**
Unit:	MWh
Description:	Total net electricity supplied to the grid measured at the substation by common bulk meters (main and check meter).
Measured/ Calculated / Default:	Calculated

Source of data:	This parameter is calculated by subtracting imported electricity from the exported electricity to grid and monitored with the help of bulk meters.
Value(s) of monitored parameter:	291,299.68
Monitoring equipment:	Please refer Annex I of Monitoring Report.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Net export from all the WEGs is calculated by subtracting import from the export. Export and import of electricity is measured at the common bulk meters (i.e. main meter & check meter)The readings at the common bulk meter will be taken on a monthly basis, in presence of the representative of MSEDCL & O & M contractor(PP's representative).
QA/QC procedures:	The common bulk meters constitute main meter and check meter. The meters are of accuracy class 0.2. The accuracy of the main meter and check meter can be verified by comparing with each other. The calibration of the common bulk meters (main & check meter) will be done by state utility normally on annul basis or as per the schedule of MSEDCL.
Purpose of data:	Used for the Baseline Calculation
Additional comment:	---

Data / Parameter:	**$EF_{Grid, y}$**
Unit:	tonnes of CO2 eq /MWh
Description:	Weighted average grid emission factor
Measured/ Calculated / Default:	---
Source of data:	The value has been provided by Central Electricity Authority[13] (Version 08)
Value(s) of monitored parameter:	0.78
Monitoring equipment:	Not Applicable
Measuring/ Reading/ Recording frequency:	Latest CEA database for reported Monitoring Period
Calculation method (if applicable):	The used data is from an official source.

[13] http://www.cea.nic.in/reports/planning/cdm_co2/database_8.zip

QA/QC procedures:	The value has been taken from official statistics published by Central Electricity Authority, which is an official data available in public domain.
Purpose of data:	Used for the Baseline emission calculation
Additional comment:	---

D.3. Implementation of sampling plan

>> Not Applicable

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>> **Baseline Emission Calculation**

Baseline emissions (Project) (tons of CO2) = Grid Emission factor (tons of CO2/MWh) * Net export to the grid (MWh/year)

Total Baseline Emission for the Monitoring Period of 01/01/2012 to 31/12/2013 (Inclusive Both Days) as follows:

Period	Total Generation (MWh)	Emission Factor of the grid (tCO_2/ MWh)	Baseline Emission (tCO_2e)
	EG_y	$EF_{Grid, y}$	BE_y
01/01/2012 to 31/12/2012	26,860.78	0.78	20,951.41
01/01/2013 to 31/12/2013	26,337.74	0.78	20,543.44
Total (after round down)			**41,494.00**[14]

Note: The Parameter "Net Electricity export to the grid by the project activity" EGy (MWh) is calculated based on applying apportioning logic by MSEDCL. The PP with the help of its monitoring plan effectively captures and demonstrates the apportioning logic as applied by MSEDCL. There is minor difference between JMR issued by MSEDCL and the value reproduced by the PP (Please refer worksheet "Apprortioning SPD 14 MW". As a conservative measure the PP is applying the most conservative value for the parameter 'Net Electricity export to the grid by the project activity' based on JMR, recalculated value and value derived after application of Para 238 and 239 of VVS (Please refers worksheet "Apprortioning SPD 14 MW" and Annex II of revised monitoring report).

E.2. Calculation of project emissions or actual net GHG removals by sinks

>> **Project Emission**

Being a wind energy project, the project activity does not lead to any form of emission; hence project emission has not been considered in this case.

Hence, PE_v= 0

E.3. Calculation of leakage

>> **Leakage Emission**

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

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

[14] Rounded down value

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	41,494	0	0	41,494

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	((731/365)*21904) = 43,868 tCO2	41,494

E.6. Remarks on difference from estimated value in registered PDD

>> Not Applicable

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	20,951	20,543

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Document information

Version	*Date*	*Description*
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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