MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/09/2010

CONTENTS

* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
Version 01 and date: 03/02/2012

14 MW Wind Power Project in Maharashtra
Reference number: 2342
Second Monitoring Period
01/11/2010 to 31/12/2011 (Inclusive both days)

SECTION A. General description of the project activity

A.1. Brief description of the 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[1] 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[2] 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 A.4 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[3]	J - 17[3]	1.25[3]	SUZLON, S-70	Jamade, Dhule[3]	Jamde[3]	10/08/2006[3]
	J - 21[3]	1.25[3]	SUZLON, S-70	Jamade, Dhule[3]	Jamde[3]	10/08/2006[3]
	J - 22[3]	1.25[3]	SUZLON, S-70	Jamade, Dhule[3]	Jamde[3]	10/08/2006[3]
	J - 23[3]	1.25[3]	SUZLON, S-70	Jamade, Dhule[3]	Jamde[3]	10/08/2006[3]
Site II[4]	N - 4[4]	1.50[4]	SUZLON, S-82	Nagaj, Sangli[4]	Ghatnadre[4]	30/09/2007[4]
	N - 5[4]	1.50[4]	SUZLON, S-82	Nagaj, Sangli[4]	Ghatnadre[4]	30/09/2007[4]
	N - 6[4]	1.50[4]	SUZLON, S-82	Nagaj, Sangli[4]	Ghatnadre[4]	30/09/2007[4]

[1] As per the new delineation of electricity system in India, western region grid is a part of integrated NEWNE grid.
[2] Refer columns WEG Location No. and Village, District of table A.1.1
[3] 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
[4] 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

	N - 7[4]	1.50[4]	SUZLON, S-82	Nagaj, Sangli[4]	Ghatnadre[4]	30/09/2007[4]
	N - 8[4]	1.50[4]	SUZLON, S-82	Nagaj, Sangli[4]	Ghatnadre[4]	30/09/2007[4]
	N - 9[4]	1.50[4]	SUZLON, S-82	Nagaj, Sangli[4]	Ghatnadre[4]	30/09/2007[4]
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.

Total emission reductions achieved in this monitoring period

During the reported monitoring period 01/11/2010 to 31/12/2011 (Inclusive Both Days) the project activity has supplied 25,120 MWh (Rounded Down) of electricity, and thus contributing to GHG reductions of 20,599 tCO_2e (Rounded Down).

A.2. Project Participants

As per Annex-I of registered PDD[5]

Organization:	M/s Shah Promoters & Developers
Street/P.O.Box:	Apte Road, Deccan Gymkhana
Building:	AST-1, Success Chambers
City:	Pune
State/Region:	Maharashtra
Postfix/ZIP:	411 004
Country:	India
Telephone:	91-20-25531777
FAX:	91-20-24275998
E-Mail:	vastushree@vsnl.net
URL:	
Represented by:	
Title:	Partner
Salutation:	Mr.
Last Name:	Shah
Middle Name:	Chandrakant
First Name:	Rajesh
Department:	Management
Mobile:	91-9822095858
Direct FAX:	91-20-24275998
Direct tel:	91-20-242275996
Personal E-Mail:	Rajeshshah28@yahoo.co.in

Annex-1 party is not yet identified.

A.3. Location of the project activity:

All the WEGs of this project activity are situated in Dhule and Sangli districts of Maharashtra, India. Complete information of the location of all the WEGs of the project activity: Village, Taluka, District and GPS coordinates is provided under the below table A.3.1

Site	Windmill Location No.[6]	Addresses[7]	Latitude and Longitude[8]

[5] http://cdm.unfccc.int/UserManagement/FileStorage/MZPHR7W2B3DGF6X4OJYQSCI0UN1AT9

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

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

A.4. Technical description of the project

Description of the technology applied in the project activity and detailed technical process, including diagrams[9]:

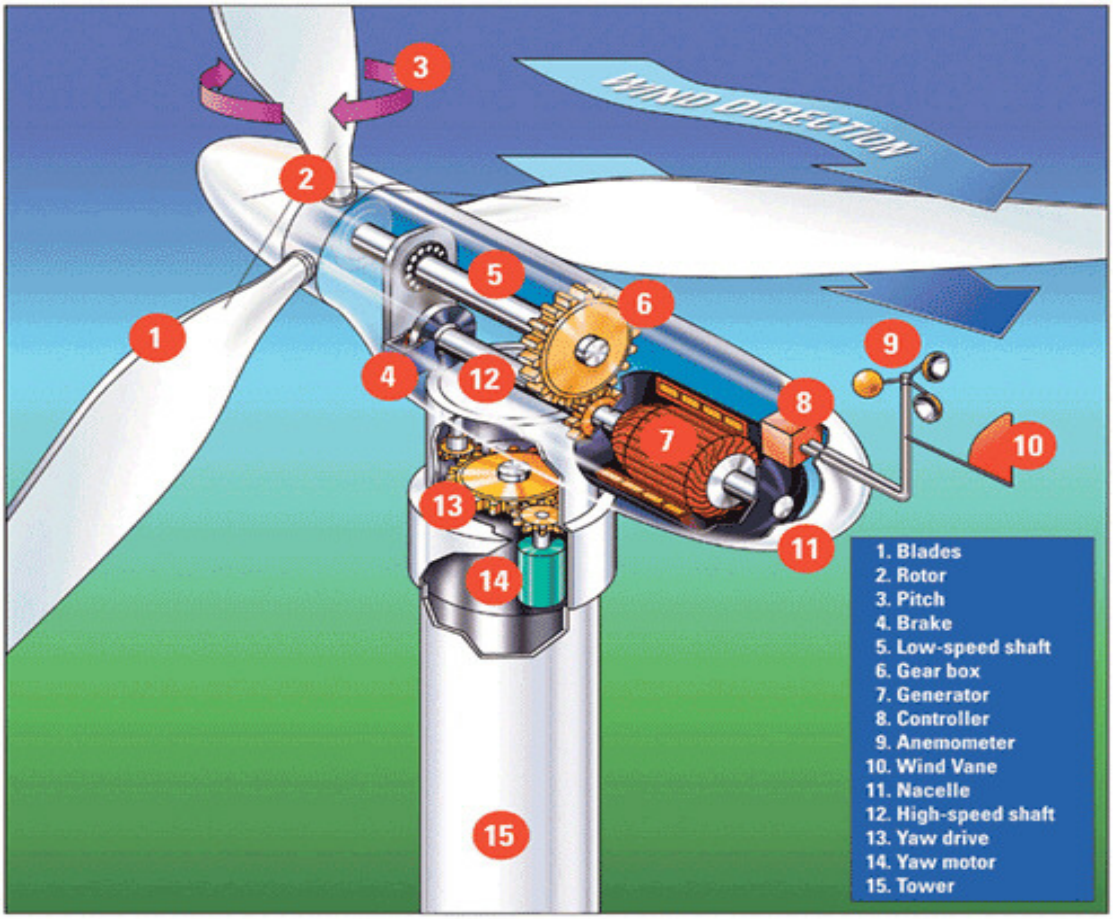
In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind has considerable amount of kinetic energy when blowing at high speeds. This kinetic energy when passes through the blades of the WEG is converted into mechanical energy 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.

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

[9] Registered PDD, section A.4.2 and the technical specifications provided by SUZLON



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

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

As defined under Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project activity falls under following project types and categories:

Project Type: **I –** Renewable Energy Projects
Project Category: **I.D. –** Grid connected renewable electricity generation (Version 13)[10]
Reference: Appendix B of the simplified M&P for small scale CDM project activities

Sectoral Scope Energy Industries: (Renewable/non-renewable)

A.6. Registration date of the project activity:

Registration Date: 08/06/2009[11]

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

Crediting period from 08/06/2009 to 07/06/2019 (Fixed)[12]
Choice of crediting period: Fixed for 10 years 0 Month

A.8. Name of responsible person(s)/entity(ies):

Contact information of the person/entity responsible for completing the monitoring report from (CDM-MR): M/s Shah Promoters & Developers (Please refer section A.2.).

SECTION B. Implementation of the project activity

B.1. Implementation status of the 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.

There has been no change in the project activity i.e. all the Wind Energy generators (WEG) are operational since installation. The net electricity export from the project activity was 25,120 MWh over the Monitoring Period of 01/11/2010 to 31/12/2011 (Inclusive both days). The CUF of 17.55[13] % which is less than the estimated CUF in the PDD i.e. 20%.

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, location for the project activity and Table A.3.1: The location of the individual wind turbines of the project activity

[10] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD
[11] http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view
[12] http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view
[13] Here the CUF is calculated based upon the parameter "Net Electricity export to the grid by the project activity" as during the project conceptualization as the transmission losses were considered as Zero (0%) for conservative calculation of the Project IRR. This is done only to compare the project implementation/performance with respect to assumption during conceptualization. The CUF based on generation readings of WTGs is 18.28%.

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

WTGs Location No.	Unit	Downtime		Total hrs
		01/11/2010 to 31/12/2010	01/01/2011 to 31/12/2011	
J-17	hrs	11.70	959.30	7,074.18
J-21	hrs	28.10	928.80	
J-22	hrs	7.90	1038.90	
J-23	hrs	17.90	936.70	
N-4	hrs	13.90	669.09	
N-5	hrs	19.50	444.30	
N-6	hrs	2.00	443.99	
N-7	hrs	7.80	562.00	
N-8	hrs	5.00	519.60	
N-9	hrs	27.90	429.80	

The project activity is legally compliance with the Power Purchase Agreement and other one time clearances like Infrastructure clearances issued by Maharashtra Energy Development Agency, Land sale deeds and also the calibration of the meters has been done by SEB as per the schedule of the MSEDCL. Furthermore, there are no special events encountered in the project activity like meter failure, huge downtimes etc.

The project activity is implemented in line with the registered PDD (please refer Table A.1.1). There is no change in the installed capacity of the installed WTGs and the electricity generated from the WTG is exported to grid. Hence the project activity is in compliance as envisaged in the PDD.

B.2. Revision of the monitoring plan

Yes, revision of the monitoring plan has been approved on date 22/09/2010[14].

B.3. Request for deviation applied to this monitoring period

Section is left blank on purpose as no request for deviation is applied.

B.4. Notification or request of approval of changes

Not applicable

The project was commissioned before the registration and thereafter there are no changes in the installed components of the project activity i.e. WEGs. Therefore the project activity corresponds with the description provided under registered PDD[15] (Version: 04, dated: 02/06/2009), Validation report[16] (Report No: 53701508 – 08/120, dated: 02/06/2009) and revised monitoring plan and validation opinion[17].

SECTION C. Description of the 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.

[14] http://cdm.unfccc.int/UserManagement/FileStorage/W7PSMEH3YR4BZCGD8A2TO9J5IVQF0N
[15] http://cdm.unfccc.int/UserManagement/FileStorage/MZPHR7W2B3DGF6X4OJYQSCI0UN1AT9
[16] http://cdm.unfccc.int/UserManagement/FileStorage/PRBF4QT3JIX8WZ92UNO1ECGDL65SYK
[17] http://cdm.unfccc.int/UserManagement/FileStorage/W7PSMEH3YR4BZCGD8A2TO9J5IVQF0N, http://cdm.unfccc.int/UserManagement/FileStorage/TYU2XFO3Z1NQMLE9J6WHGAPKRC0SIB and http://cdm.unfccc.int/UserManagement/FileStorage/Q07FRADM38NUTCS9WV2J5IY4PKH6ZL

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

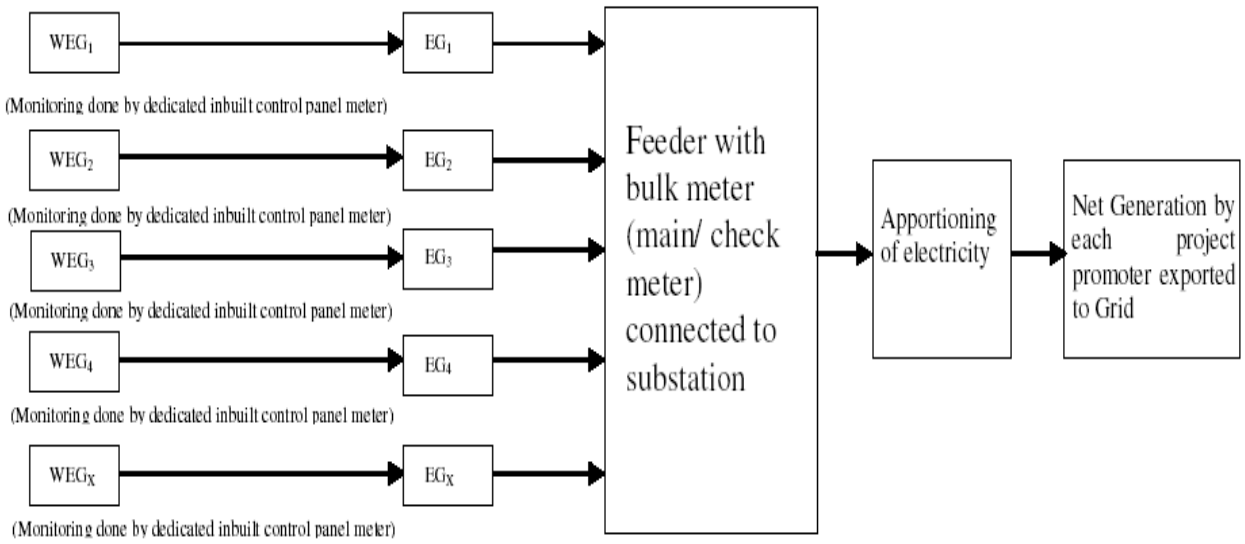
Description of calibration of WEG Controller

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.

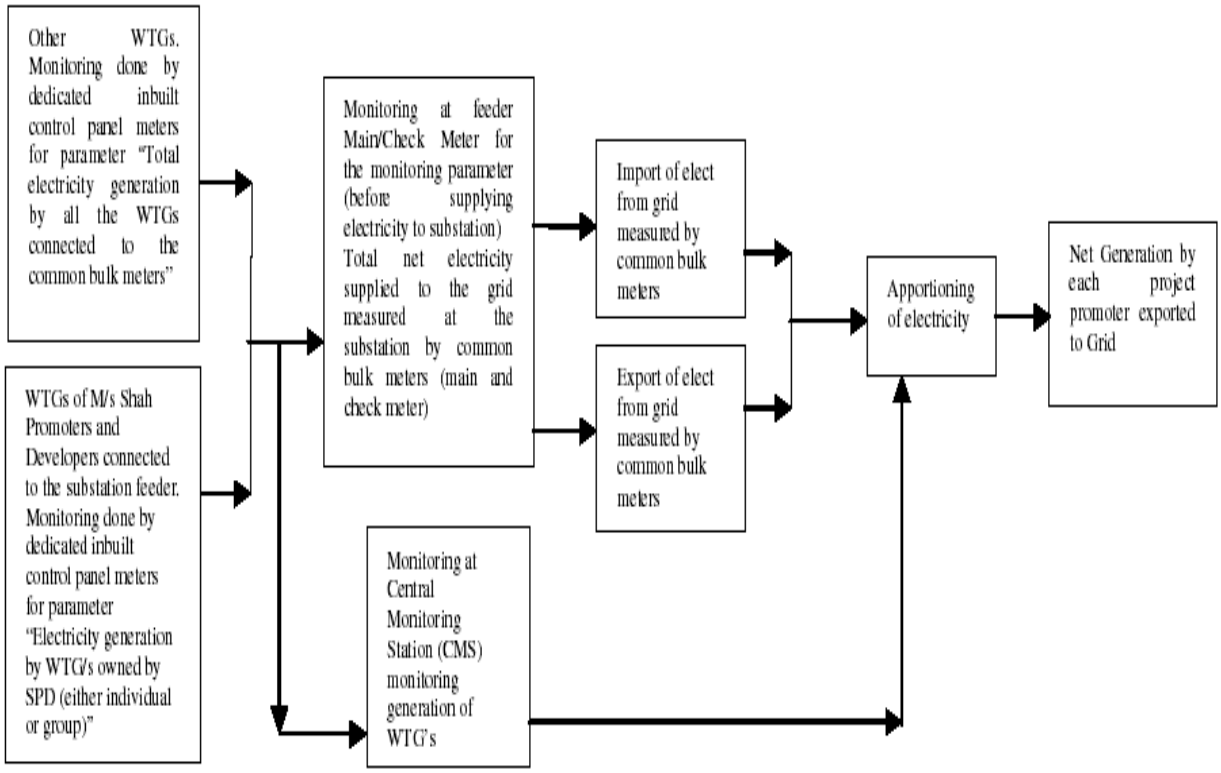
Description of billing calculation from net meter to individual meters

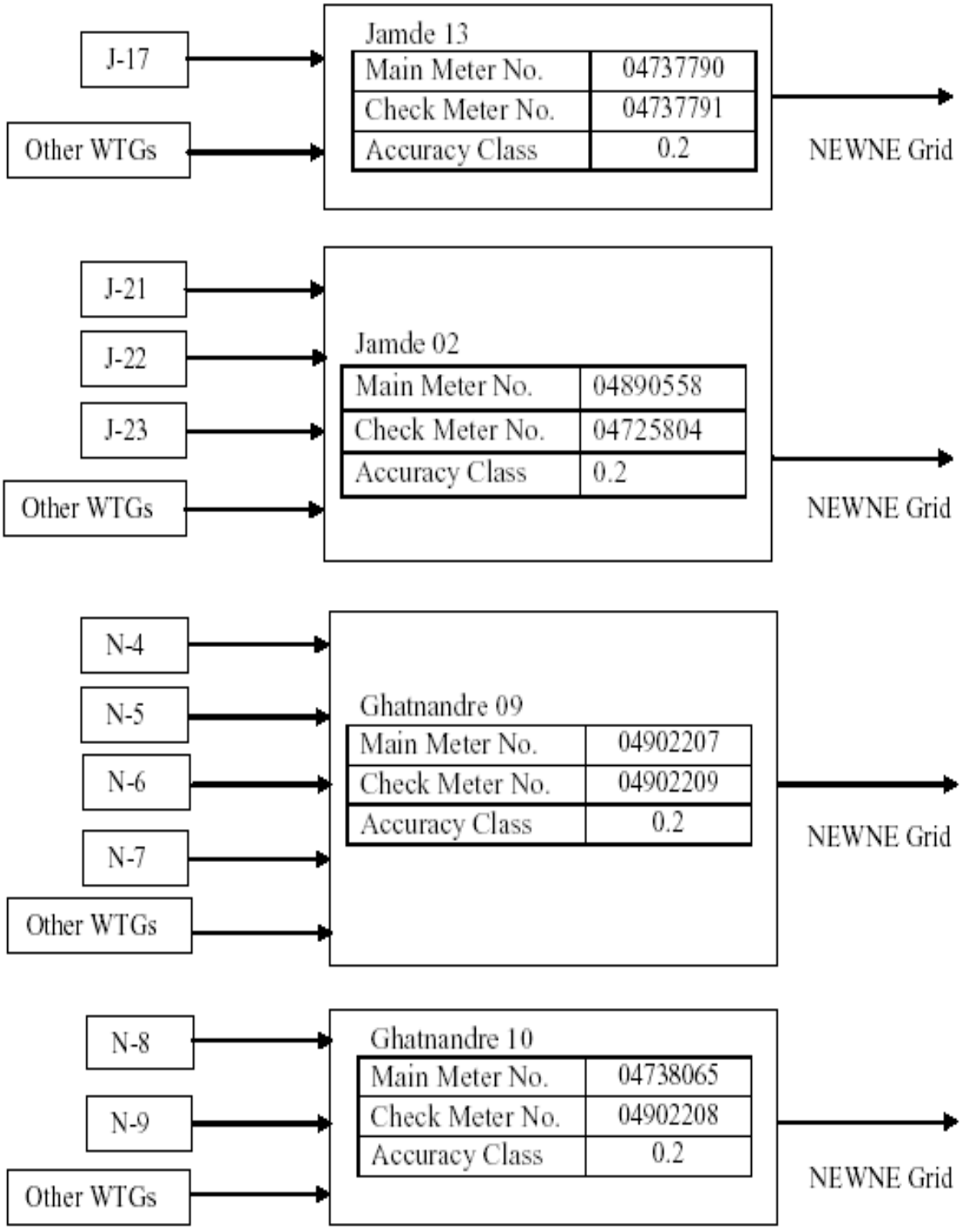
Each substation is connected to a number of wind turbines. The generation reading is collectively displayed by the substation meter. The net generation of each of the wind turbines is then calculated in the following manner:

Metering Diagram:



Monitoring Arrangement:





Schematic Diagram including Meter Location

The generated electricity is measured through inbuilt control panel meter of the WTGs. 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 WTGs 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 (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 (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" ($EG_{JMR,export}$) and "import" ($EG_{JMR,import}$) 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.

The apportioning of electricity generated from the various wind turbines is done by MSEDCL based on the Values of generation for WTG's provided by the O & M contractor and Total net electricity supplied to the grid measured at the substation by common bulk meter (main and check meter) as below enumeration: .

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

Where

EGy	Net Electricity exported to the grid by the Project Activity,
$\sum_{0}^{n} EG_{n,y}$	Electricity generation by WTG/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 WTGs 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

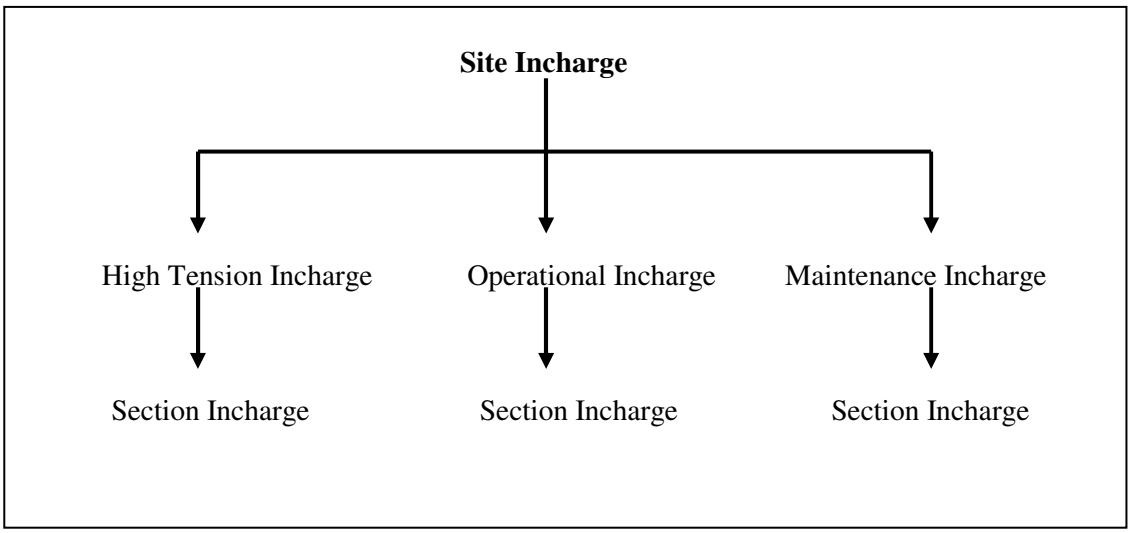
WTG Location No.	Substation	Feeder Number
N-4	Ghatnandre	9
N-5	Ghatnandre	9
N-6	Ghatnandre	9
N-7	Ghatnandre	9
N-8	Ghatnandre	10
N-9	Ghatnandre	10

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 WTGs is carried out by the WTG manufacturer and supplier (Suzlon). Special emphasis is 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.

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 determined at registration and not monitored during the monitoring period, including default values and factors	
(Copy this table for each data and parameter. To report multiple values, a table may be used)	
Data / Parameter:	**Section is left blank on purpose (as there is no ex-ante value validated during validation)**
Data unit:	
Description:	
Source of data used:	
Value(s) :	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	
Additional comment:	

D.2. Data and parameters monitored	
(Copy this table for each data and parameter. To report multiple values, a table may be used)	
Data / Parameter:	**EGy**
Data 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:	25,120.00
Indicate what the data are	Used for the Baseline Calculation

used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	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 $\sum_{0}^{m} EG_{m,y}$. $$EGy = \left[\frac{\sum_{0}^{n} EG_{n,y}}{\sum_{0}^{m} EG_{m,y}} \right] \times EG_{MSEDCL}$$
QA/QC procedures applied:	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 WTGs. 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.

Data / Parameter:	$\sum_{0}^{n} EG_{n,y}$
Data unit:	MWh
Description:	Electricity generation by WTG/s owned by SPD (either individual or group)
Measured /Calculated /Default:	Measured
Source of data:	Monitored through inbuilt control panel meters of the WTGs. The O & M contractor further aggregates (calculates) the monitored readings to arrive at "Total electricity generation by WTGs owned by SPD".
Value(s) of monitored parameter:	26,122.80
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Used for the Calculation of EGy / Baseline Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Monitored through inbuilt WTG Controller meter. Please refer Annex I of Monitoring Report "Controller Calibration related Information"
Measuring/ Reading/ Recording frequency:	The electricity generated by the WTGs of SPD is monitored with the help of inbuilt control panel meters installed on all the WTGs. The data is continuously measured at each WTG by inbuilt control panel meter and recorded at CMS maintained by O & M contractor.

Calculation method (if applicable):	The electricity generated by the WTGs of SPD is monitored with the help of inbuilt control panel meters installed on all the WTGs. The data is continuously measured at each WTG by inbuilt control panel meter and recorded at CMS maintained by O & M contractor. The aggregated or individual monthly readings of "Total electricity generation by WTGs owned by SPD" is provided by O & M contractor to MSEDCL for apportioning and calculating the net electricity exported by the individual WTG in Joint Meter Reading Report issued by MSEDCL.
QA/QC procedures applied:	As per letter provided by the technology supplier the inbuilt control panel meters cannot be calibrated. The meter are of accuracy class 0.2. Please also refer to detailed description under "Description of calibration of WEG Controller" in section B.7.2 of PDD.

Data / Parameter:	$\sum_{0}^{m} EG_{m,y}$
Data unit:	MWh
Description:	Total electricity generation by all the WTGs connected to the common bulk meters
Measured /Calculated /Default:	Measured
Source of data:	Monitored through inbuilt control panel meters of the WTGs. The O & M contractor further aggregates (calculates) the monitored readings to arrive at "Total electricity generation by all the WTGs connected to the common bulk meter".
Value(s) of monitored parameter:	199,771.65
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Used for the Calculation of EGy / Baseline Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Monitored through inbuilt WTG Controller meter. Please refer Annex I of Monitoring Report "Controller Calibration related Information"
Measuring/ Reading/ Recording frequency:	The electricity generated by all the WTGs (including WTGs of SPD) is monitored with the help of inbuilt control panel meters installed on all WTGs (which are connected to common bulk meters i.e. main meter & check meter). The data is continuously measured at each WTG by inbuilt control panel meter and recorded at CMS. However access to this reading for WTGs 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 WTGs (including WTGs of SPD) is monitored with the help of inbuilt control panel meters installed on all WTGs (which are connected to common bulk meters i.e. main meter & check meter). The data is continuously measured at each WTG 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 WTG's. The reading of "Total electricity generation by all the WTGs connected to the common bulk meters" is monitored by O & M contractor at CMS.
QA/QC procedures applied:	As per letter provided by the technology supplier the inbuilt control panel meters can not be calibrated. Please also refer to detailed description under "Description of calibration of WEG Controller" in

	section B.7.2 of PDD.

Data / Parameter:	EG_{MSEDCL}
Data 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:	191,968.00
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Used for the Baseline Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please refer Annex I of Monitoring Report.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Net export from all the WTGs 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 applied:	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.

Data / Parameter:	**$EF_{Grid, y}$**
Data unit:	tonnes of CO_2 eq /MWh
Description:	Weighted average grid emission factor
Measured /Calculated /Default:	**---**
Source of data:	The value has been provided by Central Electricity Authority [18] (Version 06)
Value(s) of monitored parameter:	0.82
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Used for the Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration	Not Applicable

[18] http://www.cea.nic.in/reports/planning/cdm_co2/Database_publishing_ver6.zip

frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Latest CEA database for reported Monitoring Period
Calculation method (if applicable):	The used data is from an official source.
QA/QC procedures applied:	The value has been taken from official statistics published by Central Electricity Authority, which is a official data available in public domain.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

Baseline Emission Calculation

Baseline emissions $_{(Project)}$ (tons of CO_2) = Grid Emission factor (tons of CO_2/MWh) * Net export to the grid (MWh/year)

Total Baseline Emission for the Monitoring Period of 01/11/2010 to 31/12/2011 (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
01/11/2010 to 31/12/2010	2,128.43	0.82	1,745.32
01/01/2011 to 31/12/2011	22,992.41	0.82	18,853.78
Total (after round down)	**25,120.00**		**20,599.00**

Note: The Parameter "Net Electricity export to the grid by the project activity" $\mathbf{EG_y}$ (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 EB 52 Annex 60 guidance (Please refers worksheet "Apprortioning SPD 14 MW").

E.2. Project emissions calculation

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, $PE_y = 0$

E.3. Leakage calculation

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. Emission reductions calculation / table

Emission Reduction Due to Project Activity

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), project emissions (PE_y) and Leakage emission (LE_y)

$ER_y = BE_y - PE_y - LE_y$

Where:

ER_y = Emission reductions in year *y* (t CO_2/y)
BE_y = Baseline Emissions in year *y* (t CO_2/y)
PE_y = Project emissions in year *y* (t CO_2/y)
LE_y = Leakage emissions in year *y* (t CO_2/y)

Period	Total Baseline Emissions (tCO_2e)	Total Project Emission	Total Leakage (tCO_2e)	Total Emission Reduction (tCO_2e)
01/11/2010 to 31/12/2010	1,745.32	0	0	1,745.32
01/01/2011 to 31/12/2011	18,853.78	0	0	18,853.78
Total (after rounding down)				**20,599.00**

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

Comparison of the actual emission reduction with estimate in the CDM-PDD for the said monitoring period (considering emission reduction for period 01/11/2010 to 31/12/2011 inclusive both days for which JMR are available) has been carried out in the following table

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	24,619.30 =(426/365*21,094)	20,599.00

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

This section is not applicable as value applied in the ex-ante calculation of the registered CDM-PDD is more than the actual values reached during the monitoring period

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History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Guideline, Form **Business Function**: Issuance		

Annex I: Calibration Details

Feeder	Meter (Main Meter / check Meter)	Meter Details	Calibration Frequency	Date of last Calibration	Validity
Jamde 13	Main Meter	Serial No. : 04737790 Type: Tri Vector Accuracy Class: 0.2	Yearly	20/08/2010, 17/09/2011	One Year
	Check Meter	Serial No.: 04737791 Type: Tri Vector Accuracy Class: 0.2	Yearly	20/08/2010, 17/09/2011	One Year
Jamde 02	Main Meter	Serial No.: 04890558 Type: Tri Vector Accuracy Class: 0.2	Yearly	20/08/2010, 17/09/2011	One Year
	Check Meter	Serial No.: 04725804 Type: Tri Vector Accuracy Class: 0.2	Yearly	20/08/2010, 17/09/2011	One Year
Ghatnandre 09	Main Meter	Serial No.: 04902207 Type: Tri Vector Accuracy Class: 0.2	Yearly	19/06/2010, 15/03/2011, 13/06/2011	One Year
	Check Meter	Serial No.: 04902209 Type: Tri Vector Accuracy Class: 0.2	Yearly	19/06/2010, 15/03/2011, 13/06/2011	One Year
Ghatnandre 10	Main Meter	Serial No.: 04738065 Type: Tri Vector Accuracy Class: 0.2	Yearly	19/06/2010, 15/03/2011, 13/06/2011	One Year
	Check Meter	Serial No.: 04902208 Type: Tri Vector Accuracy Class: 0.2	Yearly	19/06/2010, 15/03/2011, 13/06/2011	One Year

Controller Calibration related Information

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02/08/2008

To,
M/s Shah Promoters and Developers.
"Hyde Park " , S.No.587,
Near Market Yard,
Pune - 411 037.

Sub : Calibration of WTG Controller for Dhule and Sangli Site.

Dear Sir ,

This is with reference to your quiery regarding Calibration of Controller of your WTG at Dhule and Sangli Site . In this regards, we would like to clarify as follows: -

* **Mita Controller WP 3000** is a micro-processor based intelligent controller which has been specially designed for control of wind turbines, where control functions, data collection and storage, real time grid monitoring and storage and such other functions are integrated. In order to measure Electrical Energy and Grid Parameters, the controller uses an interface card WP3090. The controller has three current inputs from CT and three voltage inputs from PT. The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous values of parameters such as voltage, current, frequency, power factor, kVA, kVAr and kW. These instantaneous values are then time integrated to display kVAh, kVArh and kWh and displayed / stored. **WP3000 being main controller for controlling entire turbine operation and is calculating energy generation with the basic signal of CT and PT connected to through I/O hence, not possible to calibrate.**

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* **SCS Controller** is also 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 is 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 is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol hence, it is not possible to calibrate. Moreover, turbine can not run without this relay hence it can not be removed for calibration during operation.**

As far as Accuracy class is concern it is +/- 0.2 % tolerance for our controller systems.

Warm Regards

For Suzlon Infrastructure Services Ltd.

Authorized Signatory.