Monitoring report form (Version 03.2)

Monitoring report

Title of the project activity	Wind Energy Project in Maharashtra by M/s Shah Promoters & Developers
Reference number of the project activity	4489
Version number of the monitoring report	01
Completion date of the monitoring report	07/04/2014
Registration date of the project activity	14/02/2011[1]
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 02 Monitoring Period: 01/07/2012 to 31/12/2013 (First and last date included)
Project participant(s)	M/s Shah Promoters & Developers
Host Party(ies)	India (host)
Sectoral scope(s) and applied methodology(ies)	Sectoral scope(s): 01, Applied methodology : AMS –I.D: Grid connected renewable electricity generation (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	17170.915[2] tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	21301 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	7295 tCO2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	14006 tCO2e

[1] http://cdm.unfccc.int/Projects/DB/RWTUV1297334687.42/view
[2] Calculated as (11416*549) / 365= 17170.915 tCO_2e

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 09 ENERCON make wind electric generators (WEGs) of individual capacities 0.8 MW.

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 NEWNE grid of India 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 09 WEGs of ENERCON make (E-53) having a capacity of 0.8 MW. The WEG of project activity are situated in Ahmednagar district of 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 B.2 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

WEG Location No.	Installed Capacity (MW)	Technology	Village, District	Date of Commissioning
E-53/12	0.8	ENERCON, E-53	Baradari, Ahmednagar	31/03/2009
E-53/13	0.8	ENERCON, E-53	Baradari, Ahmednagar	30/03/2009
E-53/14	0.8	ENERCON, E-53	Baradari, Ahmednagar	30/03/2009
E-53/118	0.8	ENERCON, E-53	Khandke, Ahmednagar	31/03/2009
E-53/128	0.8	ENERCON, E-53	Jamb, Ahmednagar	31/03/2009
E-53/129	0.8	ENERCON, E-53	Jamb, Ahmednagar	31/03/2009
E-53/70	0.8	ENERCON, E-53	Agadgaon, Ahmednagar	30/03/2009
E-53/97	0.8	ENERCON, E-53	Agadgaon, Ahmednagar	01/07/2009
E-53/100	0.8	ENERCON, E-53	Agadgaon, Ahmednagar	01/07/2009
	7.2 MW			

All the WEGs of the project activity are in operation from the commissioning and operating satisfactorily during the reported monitoring period. Information on continued operation period is provided under section B.1 of MR.

Total emission reductions achieved in this monitoring period

During the reported monitoring period 01/07/2012 to 31/12/2013 (First And Last Date Included) the project activity has supplied 23,537 MWh (Rounded Down) of electricity, and thus contributing to GHG reductions of 21301 tCO_2 (Rounded Down).

A.2 Location of project activity

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(a) Host Party: India

(b) State: Maharashtra

(c) City/ Town/ Community: Ahmednagar

(d) Physical/ Geographical location: GPS coordinates is provided under the below table

Table A.2.1: The location of the individual wind turbines of the project activity.

Wind Mill Location No.	Address	Latitude[3]	Longitude
E-53/12	Gut No.195 [4], Village – Baradari, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 20.9"N	74°50' 01.1"E
E-53/13	Gut No.206/A [5], Village – Baradari, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 28.8"N	74°50' 01.6"E
E-53/14	Gut No. 206/A [6], Village – Baradari, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 35.3"N	74°50' 00.6"E
E-53/118	Gut No.282 [7], Compt. No.- 315 PT, Village - Khandke, Taluka - Ahmednagar, Dist - Ahmednagar	19°07' 36.6"N	74°52' 57.2"E
E-53/128	Gut No.217 [8], Village – Jamb, Taluka - Ahmednagar , Dist - Ahmednagar	19°06' 07.3"N	74°53' 34.8"E
E-53/129	Gut No.217 [9], Village – Jamb, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 00.5"N	74°53' 37.2"E
E-53/70	Gut No.208 [10], Village – Agadgaon, Taluka - Ahmednagar, Dist - Ahmednagar	19°10' 32.0"N	74°52' 55.2"E
E-53/97	Gut No.365 [11], Village – Agadgaon, Taluka - Ahmednagar, Dist - Ahmednagar	19°09' 29.6"N	74°52' 51.4"E
E-53/100	Gut No.365 [12], Village – Agadgaon, Taluka - Ahmednagar, Dist - Ahmednagar	19°09' 32.6"N	74°52' 25.4"E

3As per letter provided by technology supplier

4 Infrastructure clearance for 3.20MW Ref:PGN-I/IC/Shah P & D/3.20MW/08-09/1515_Issued by MEDA_Dated 25/03/09

5 Infrastructure clearance for 2.40MW_Ref:PGN-I/IC/Shah P & D/2.40MW/08-09/1529_Issued by MEDA_Dated26/03/09

6 Infrastructure clearance for 2.40MW_Ref:PGN-I/IC/Shah P & D/2.40MW/08-09/1529_Issued by MEDA_Dated26/03/09

7 Infrastructure clearance for 3.20MW Ref:PGN-I/IC/Shah P & D/3.20MW/08-09/1515_Issued by MEDA_Dated 25/03/09

8 Infrastructure clearance for 3.20MW Ref:PGN-I/IC/Shah P & D/3.20MW/08-09/1515_Issued by MEDA_Dated 25/03/09

9 Infrastructure clearance for 3.20MW Ref:PGN-I/IC/Shah P & D/3.20MW/08-09/1515_Issued by MEDA_Dated 25/03/09

10 Infrastructure clearance for 2.40MW_Ref:PGN-I/IC/Shah P & D/2.40MW/08-09/1529_Issued by MEDA_Dated26/03/09

11 Infrastructure clearance for 1.60MW_Ref:PGN-I/IC/Shah P & D/1.60MW/09-10/3874_Issused by MEDA_Dated26/06/09

12 Infrastructure clearance for 1.60MW_Ref:PGN-I/IC/Shah P & D/1.60MW/09-10/3874_Issused by MEDA_Dated26/06/09

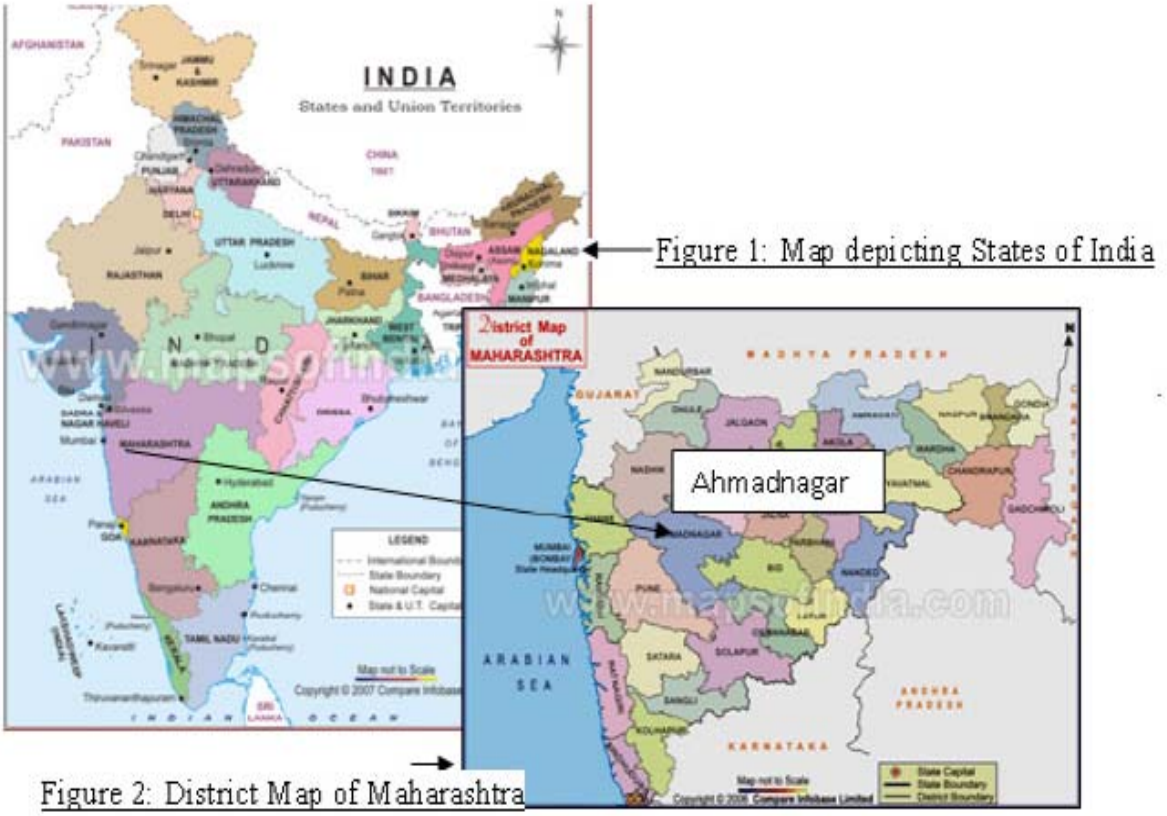

Figure 1: Map depicting States of India

Figure 2: District Map of Maharashtra

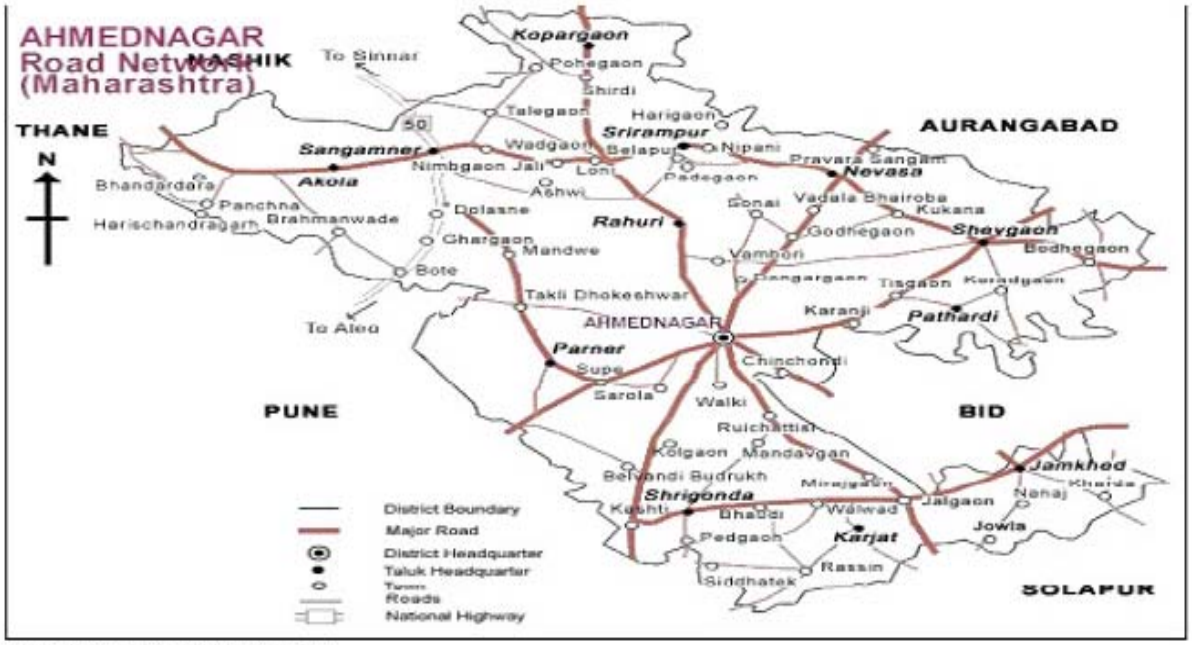

Figure 3: Map of Ahmadnagar

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.

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 (host)	M/s Shah Promoters & Developers	No

A.4. Reference of applied methodology

>>
Title: Grid connected renewable electricity generation
Reference: AMS –I.D.
Version: 16

Methodology also refers the tool -
"Tool to calculate the emission factor for an electricity system"[13] (Version 02)

A.5. Crediting period of project activity

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Crediting period from 01/03/2011 to 28/02/2021 (Fixed)[14]
(Changed from: 01/04/2011 to 31/03/2021)
Choice of crediting period: Fixed for 10 years 0 Month

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

>>
Information on the implementation and actual operation of the project activity

The present project activity was already commissioned before the registration at UNFCCC (please refer section A.1 of the monitoring report) with total installed capacity 7.2 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 25,527 MWh over the Monitoring Period of 01/07/2012 to 31/12/2013 (First and Last Date Included)

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.2.1: The location of the individual wind turbines of the project activity.

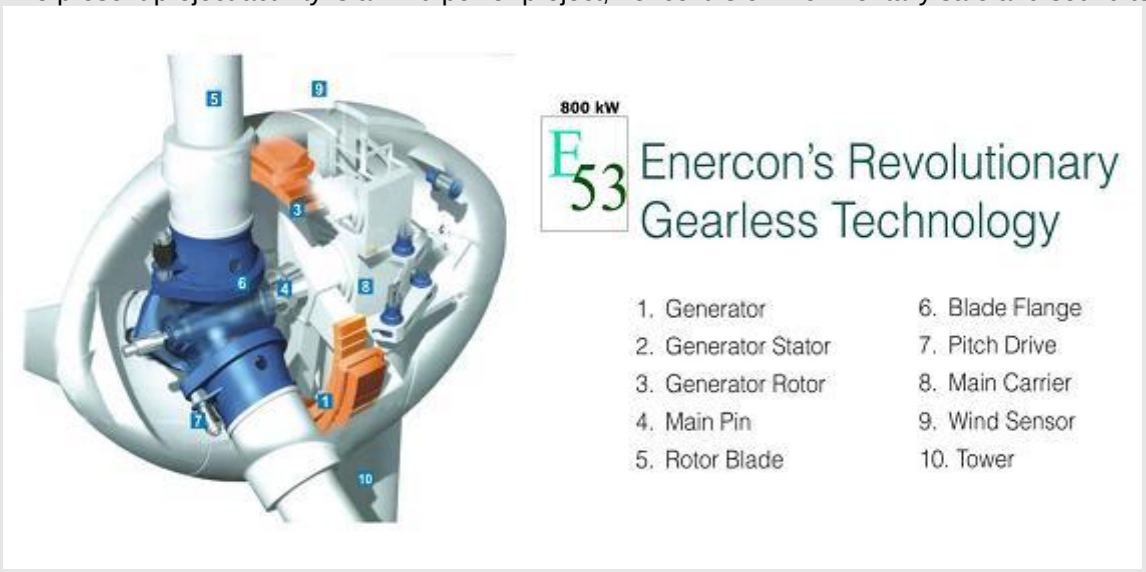
The downtime for the project activity for the current monitoring period is mentioned in the following table:

WTGs Location No.	Unit	Downtime		Total
		01/07/2012 to 31/12/2012	01/01/2013 to 31/12/2013	Hrs:Min:Sec
E-53/12	hrs	98:18:00	75:09:00	1667:06:00
E-53/13	hrs	95:11:00	61:50:00	
E-53/14	hrs	94:25:00	119:52:00	
E-53/118	hrs	130:02:00	64:20:00	
E-53/128	hrs	94:12:00	80:52:00	
E-53/129	hrs	146:31:00	54:41:00	
E-53/70	hrs	161:20:00	63:45:00	
E-53/97	hrs	115:01:00	50:23:00	
E-53/100	hrs	103:51:00	57:23:00	

[13] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf
[14] http://cdm.unfccc.int/Projects/DB/RWTUV1297334687.42/view

Description of the technology applied in the project activity and detailed technical process, including diagrams[15]:

The present project activity is a wind power project; hence it is environmentally safe and sound technology.



Technology

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 which is converted into mechanical energy and rotates the wind blades. When the wind turbine blades rotate, the connected generator also rotates, thereby producing electricity. A wind turbine generator consists of following parts.

Tower – Either steel lattice or tubular pole. The tubular towers are more popular among modern turbines because of their lower airflow interference and downstream turbulence creation. Also, they seem to be more aesthetically acceptable.

Rotor Blades - Current design uses either two- or three-bladed wind turbines, but the latter are becoming more popular and have a number of technical advantages. Two-bladed designs have the advantage that the hub is lighter and so the entire structure can be lighter. This is traded off by the fact that three bladed designs are much better understood aerodynamically and also have a lower noise level than the two-bladed turbines. These blades are made of glass reinforced plastic (GRP).

The Nacelle – This sits atop the tower and holds the rotor blades in place while housing the generator. In large turbines, the nacelle with rotor is electrically yawed into or out of the wind.

Salient features of ENERCON (E-53) 800 KW WEG

1.	Turbine model	ENERCON E-53
2.	Rated power	800 kW
3.	Hub-height	75 m
4.	Rotor (Diameter)	53 m
5.	Turbine type	Direct driven, upwind, horizontal axis wind turbine with variable rotor speed.
6.	Power regulation	Independent pitch system for each blade.
7.	Design life time	20 years
8.	Cut-in wind speed	2.5 m/s
9.	Rated wind speed	12 m/s
10.	Cut-out wind speed	28-34 m/s

[15]Registered PDD, section A.4.2 and the technical specifications provided by ENERCON

11.	Extreme wind speed	59.5 m/s
12.	Rated rotational speed	32 rpm
13.	Operating range rotational speed	12 - 29 rpm
14.	Orientation	Upwind
15.	No. of blades	3
16.	Blade material	Glass Fibre Epoxy Reinforced
17.	Gear box type	Gearless
19.	Braking	Aerodynamic
20.	Output voltage	400 V
21.	Yaw system	Active yawing with 4 electric yaw drives with brake motor.

Description of Generator[16]

Type	Sync. - Wound rotor
Number	1
Max speed	29 rounds/minute
Output voltage	400
Manufacturer	Enercon

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. 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. Post registration changes

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

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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

>>

Crediting period from 01/03/2011 to 28/02/2021 (Fixed) (Changed from: 01/04/2011 to 31/03/2021)

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

>>

Not Applicable.

[16]Please refer section A.4.2 of PDD

SECTION C. Description of monitoring system

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As emission reductions from the project are 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 a having monitoring system is to have a constant watch on the emission reductions.

The delivered energy is meter by ENERCON and MSEDCL at the high voltage side of the step up transformers. Metering has been done either for two /three / more wind turbines depending on the location of wind turbines and service connection number. Metering equipments are 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 will be 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 is assured at all times. Necessary records of calibration has maintained by both MSEDCL and project proponents.

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

- The 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 will be carried out jointly at the incoming feeder of the state power utility (MSEDCL). Machines for sale to utility are connected to the feeder.
- 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 will be connected to the Central Monitoring Station (CMS) of the entire wind farm. The generation data of individual machine can be monitored as a real-time entity at CMS.
- The joint measurement will be carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties will sign the recorded reading.
- Metering equipment - Metering is carried out through electronic trivector meters, installed at the substation. The main meter has installed and owned by MSEDCL, whereas the project participant owns the check meters. The metering equipments are maintained in accordance with electricity standards.

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

MPU (Main Processing Unit) is used for control of Wind Turbine Generator (WTG), this micro-processor based intelligent controller specially designed for WTG. Monitoring of Electricity is on continuous basis by MPU. WTG cannot operate without MPU as it continuously monitors for any fault or deviation in the reading thus provide on line tracking of metering arrangement.

The electrical function is as below:

The three-phase current transformer operated electricity meter in the control cabinet measures the kilowatt-hours fed by the converter. The meter supplies 3000 pulses for every kilowatt-hour metered. Since, due to the electricity meters which in the pulse inverter have a ratio of 1000 A/5 A (c=200) per metered kilowatt

hour, the converter has therefore fed 200 kilowatt hours, 3000/200= 15 pulses per kilowatt hour fed in obtained.

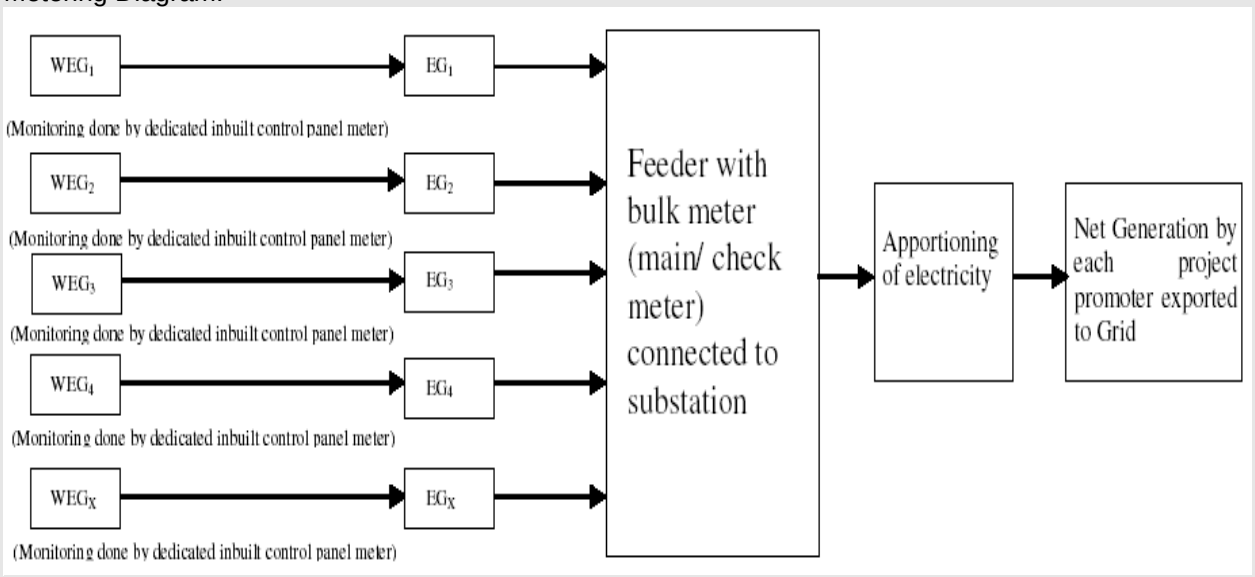
Since some meters or converters from some operators are used along with other factors, as is the case with the thyristor inverter, the pulse rate of the meter and the conversion factor must be set on the I/O card under "basic settings" (3000 pulses/KWh and 1000 A/5 A for pulse inverters). After every 15th pulse, the I/O card relays a signal to the MPU which meters these kilowatt hours to compare with the measured output and pass on to the display, the customer interface data transfer system

The above arrangement is of auto tracking type and hence calibration is not required separately for WTG electricity meter

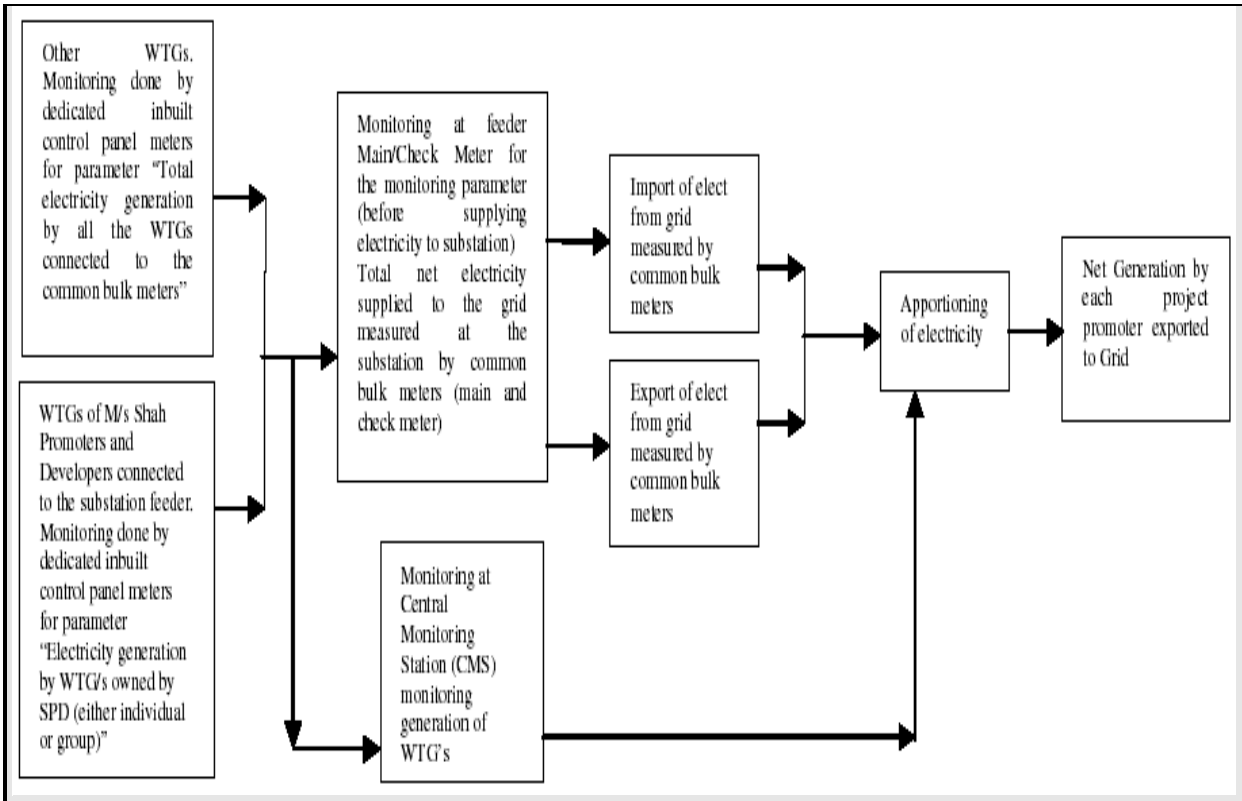
Description of billing calculation from net meter to individual meters

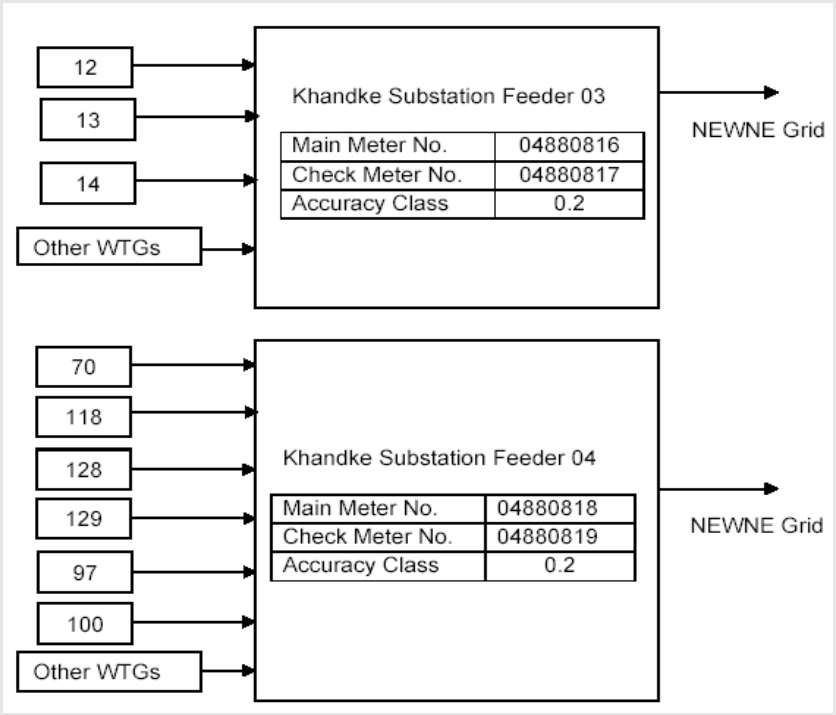
Each substation is connected to approximately a number of wind turbines. The generation reading is collectively displayed by the substation meter. The net generation of each of the wind turbines is then calculated in the following manner:

Metering Diagram:



Monitoring Arrangement:





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. EGn,y is the electricity generated from an individual wind turbine measured through its controller meter. The individual Electricity Generated from the wind turbines 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 connected to the particular feeder in MWh as measured at the individual controllers 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 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" ($EG_{JMR,export}$) and "import" ($EG_{JMR,import}$) of the electricity to/ from the NEWNE grid. There is a single meter which gives both the export and import values, this metered reading includes the net value of line losses and auxiliary consumption. Further, as there is a common MSEDCL joint meter for multiple project proponents, the joint meter reading (JMR) taken every month by MSEDCL personnel, reflects the cumulative monthly generation for all wind turbines connected to this MSEDCL meter. The apportioning of electricity generated from the various wind turbines is done by MSEDCL based on the values of generation from the installed WTG's (connected to common bulk meter) provided by the EPC contractor (Enercon in this case). Once the JMR is issued by MSEDCL, project proponent will raise invoice on MSEDCL.

EGy - Net Electricity exported to the grid by the Project Activity is calculated as follows:

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

Where

EG_y	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 (monitored).
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 is responsible for 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 of 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 electricity generation. The project performance is communicated to the higher management by the accounts department.

For this project, the feeder connections are as follows:

Site : Village –Khandake**, Ahmadnagar.**

WEG Location No.	Substation	Feeder Number
E53/12	Khandake	03
E53/13	Khandake	03
E53/14	Khandake	03
E53/118	Khandake	04
E53/128	Khandake	04
E53/129	Khandake	04
E53/70	Khandake	04
E53/97	Khandake	04

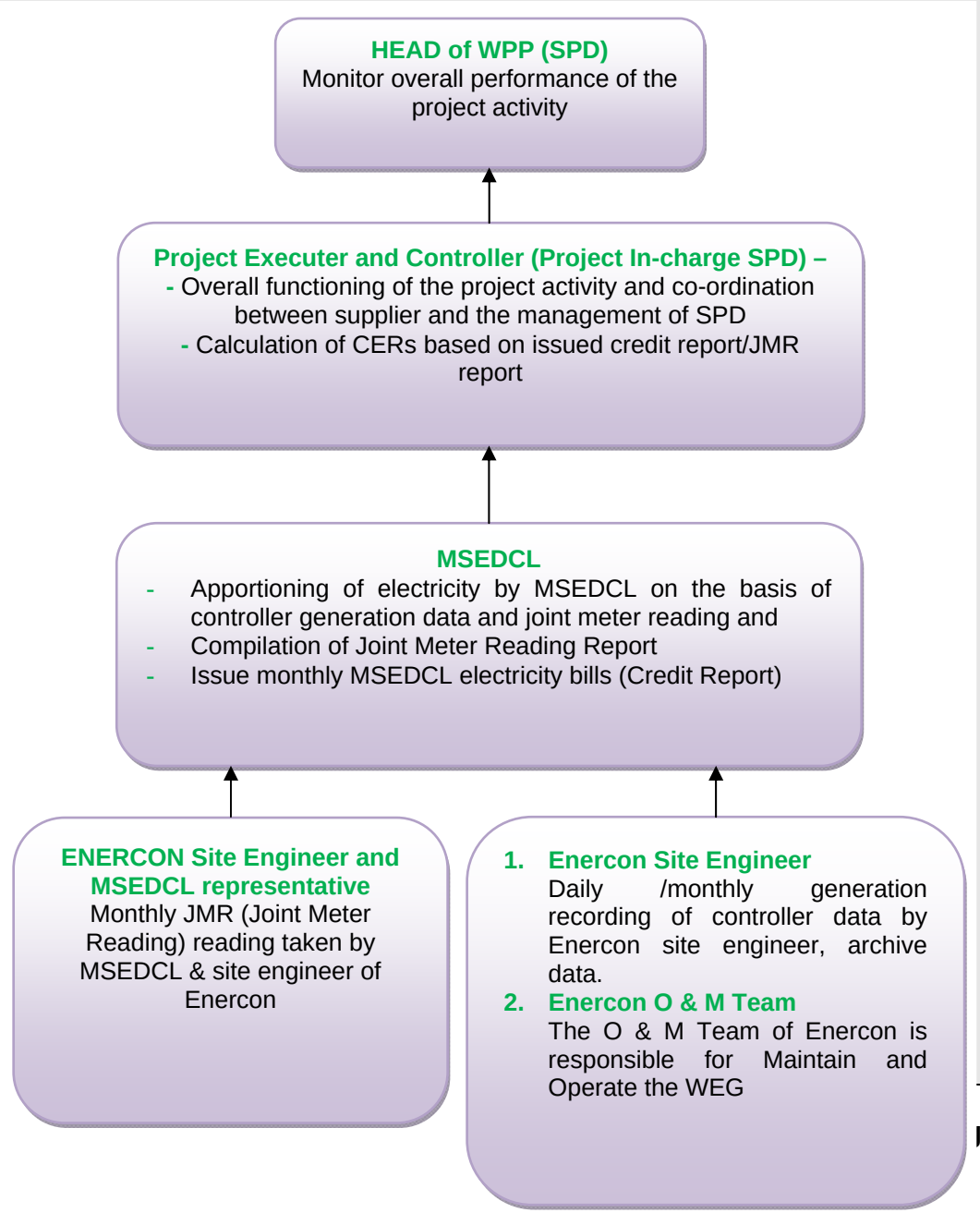
E53/100	Khandake	04

Recording of generation at the joint meter is usually from 1st of one month to 1st or 2nd of next month.

The project participant signed an operation and maintenance agreement with the supplier of the wind turbines i.e. ENERCON. The agreement is for a period of 10 years. The performance of the turbines, safety in operation and scheduled /breakdown maintenances is responsibility of ENERCON 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 Enercon, 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 for Monitoring is as follows



Routine Maintenance Services:

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 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.

Organizational structure, responsibilities and competencies:

The responsibilities of CDM project team is presented below

Designation	Responsibilities
Project Head (Head of WPP)	▪ Overall performance monitoring ▪ Project Execution
Project Executer and Controller (Project In-charge SPD)	▪ Operation ▪ Verification of data ▪ Site visit to check authenticity of data and take corrective action, wherever necessary ▪ Storage of data
Site Main Controller (ENERCON Site Engineer), (ENERCON O & M Team)	▪ 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 (Enercon). 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 program as well as continuous learning programmes for all employees. All newly-hired employees

are required to attend an intensive six month full-time training programme to familiarize them with business and operations.

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

The training program 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.

SPD has appointed a full time Project Executer and Controller (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 Enercon.

SECTION D. Data and parameters

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

Data / Parameter:	**EF_{OM}**
Unit:	tCO2/MWh
Description:	Simple Operating Margin Emission Factor
Source of data:	Baseline CO_2 Emission Database[17] (Version 4.0)
Value(s) applied):	1.008
Purpose of data:	To Calculate the combine margin emission factor
Additional comment:	Weighted Average of 3 years data has been considered.

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Data / Parameter:	**EF_{BM}**
Unit:	t CO_2/MWh
Description:	Build Margin Emission Factor
Source of data:	Baseline CO_2 Emission Database (Version 4.0)
Value(s) applied):	2007-08 : 0.60
Purpose of data:	To Calculate the combine margin emission factor
Additional comment:	Value for the year 2007-08

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Data / Parameter:	**EF_{CM}**
Unit:	t CO_2/MWh
Description:	Combined Margin Emission Factor
Source of data:	Baseline CO_2 Emission Database[18] (Version 4.0)
Value(s) applied):	0.905
Purpose of data:	To Calculate the baseline emission of the project activity

[17] http://www.cea.nic.in/reports/planning/cdm_co2/database_publishing_ver4.zip
[18] http://www.cea.nic.in/reports/planning/cdm_co2/database_publishing_ver4.zip

Additional comment:	Emission factor has been calculated ex-ante for the entire crediting period.

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D.2. Data and parameters monitored

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:	23,527
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 WTGs. The common bulk meters constitute main meter and check meter. 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. Check meter is placed to verify main meter readings. It can be used as a source of reading in case of main meter failure. The calibration of main & check meter will be done as per the guidelines set by CERC
Purpose of data:	Used for Baseline Calculation
Additional comment:	--

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Data / Parameter:	$\sum_{0}^{n} EG_{n,y}$
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 (either individual or group)".
Value(s) of monitored parameter:	25,834.99
Monitoring equipment:	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:	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.
Purpose of data:	Used for Baseline Calculation
Additional comment:	--

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Data / Parameter:	$\sum_{0}^{m} EG_{m,y}$
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:	277,968.46
Monitoring equipment:	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 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:	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 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:	271,694.60
Monitoring equipment:	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:	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 Baseline Calculation
Additional comment:	--

D.3. Implementation of sampling plan

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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

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Estimated amount of baseline emissions for this monitoring period as per the registered PDD

For the applied monitoring period, estimated amount of Baseline emissions = =(11416 tCO_2e/year *549 days) / 365 days per year = 17170.915 tCO_2e

Actual amount of baseline emissions for this monitoring period

$BE_y = EF_{CM} * EG_y$

Where

EG_y is the "Net Electricity export to the grid by the project activity" in year y, and
EF_{CM} Combined margin CO_2 emission factor for grid connected power generation in year y.

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

Total Baseline Emission for the Monitoring Period of 01/07/2012 to 31/12/2013 (First and Last Date Included) as follows:

Period	Net Generation from all the WEGs (MWh)	Emission Factor of the grid (tCO_2/ MWh)	Baseline Emission (tCO_2e)
	$EG_{(Net\ export\ by\ project\ activity)}$	**EF_y**	**BE_y**
01/07/2012 to 31/12/2012	8060.84	0.905	7295.06
01/01/2013 to 31/12/2013	15476.67	0.905	14006.39
Total		**After Rounddown**	**21301**

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

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Emission Reduction:

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 (BEy) and project emissions (PE 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)

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

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Leakage Emission

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

Hence, $LE_v = 0$

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

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	21301	0	0	21301

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)	17170.915[19]	21301

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

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From E.5 above, we can observe that actual CER achieved for the current monitoring period of 549 days (01/07/2012 to 31/12/2013) is 21301. As per the registered PDD, the estimated CER for 549 days is 17170.915[20]. Hence the emission reduction for the current monitoring period is higher than estimated emission reductions by 19.38%. The major reason is the applied monitoring period is for one and half years has captured higher generation months i.e. July 2012, August 2012 and the entire peak generation season of the calendar year 2013.

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)	7295	14006

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Document information

[19] Calculated as (11416*549) / 365= 17170.915 tCO_2e
[20] Calculated as (11416*549) / 365= 17170.915 tCO_2e

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.

Decision Class: Regulatory
Document Type: Form
Business Function: issuance
Keywords: monitoring report, performance monitoring

Annex I

Calibration Details							
Substation / Feeder No.	Meter	Serial No.	Type	Accuracy Class	Calibration Frequency	Calibration Date	Validity
Khandke Substation Feeder No. 03	Main Meter	4880816	Tri Vector	0.2	Yearly	02/09/2011 08/10/2012 08/10/2013	One Year
	Check Meter	4880817	Tri Vector	0.2	Yearly		
Khandke Substation Feeder No. 04	Main Meter	4880818	Tri Vector	0.2	Yearly	01/08/2011 08/10/2012 08/10/2013	One Year
	Check Meter	4880819	Tri Vector	0.2	Yearly		

Controller Calibration related Information

Annex II

Month	Feeder	WTG Location Number	Export of electricity by the WTG as per JMR	Import of electricity by the WTG as per JMR
			kWh	**kWh**
Jul-12	Khandke Substation Feeder 03	12	269875	19
		13,14	530403	37
	Khandke Substation Feeder 04	70	339969	17
		118,128,129	867438	43
		97,100	617224	31
Aug-12	Khandke Substation Feeder 03	12	245541	0
		13,14	484301	0
	Khandke Substation Feeder 04	70	272676	49
		118,128,129	734368	132
		97,100	517218	93
Sep-12	Khandke Substation Feeder 03	12	127149	0
		13,14	253739	0
	Khandke Substation Feeder 04	70	178765	0
		118,128,129	429387	0
		97,100	301003	0
Oct-12	Khandke Substation Feeder 03	12	79006	113
		13,14	161374	231
	Khandke Substation Feeder 04	70	58835	47
		118,128,129	174900	139
		97,100	106641	85
Nov-12	Khandke Substation Feeder 03	12	84802	54
		13,14	175098	111
	Khandke Substation Feeder 04	70	72419	46
		118,128,129	218077	139
		97,100	144270	92
Dec-12	Khandke Substation Feeder 03	12	78363	63
		13,14	159955	129
	Khandke Substation Feeder 04	70	67820	30

		118,128,129	188859	83
		97,100	123197	54
Jan-13	Khandke Substation Feeder 03	12	60407	49
		13,14	123223	100
	Khandke Substation Feeder 04	70	54796	22
		118,128,129	202047	82
		97,100	126437	51
Feb-13	Khandke Substation Feeder 03	12	103247	29
		13,14	207883	58
	Khandke Substation Feeder 04	70	89373	15
		118,128,129	317501	54
		97,100	170656	29
Mar-13	Khandke Substation Feeder 03	12	104123	182
		13,14	214538	375
	Khandke Substation Feeder 04	70	83817	6
		118,128,129	382997	25
		97,100	180454	12
Apr-13	Khandke Substation Feeder 03	12	118861	7
		13,14	261013	17
	Khandke Substation Feeder 04	70	109974	7
		118,128,129	469086	29
		97,100	252360	16
May-13	Khandke Substation Feeder 03	12	151750	2
		13,14	342568	5
	Khandke Substation Feeder 04	70	182378	1
		118,128,129	657493	4
		97,100	404005	2
Jun-13	Khandke Substation Feeder 03	12	203700	38
		13,14	397773	75
	Khandke Substation Feeder 04	70	280950	12
		118,128,129	707525	60
		97,100	493778	41
Jul-13	Khandke Substation Feeder 03	12	287091	1
		13,14	578576	2
	Khandke Substation Feeder 04	70	372160	1
		118,128,129	890289	3
		97,100	673571	2
Aug-13	Khandke Substation Feeder 03	12	215772	0

		13,14	442600	0
	Khandke Substation Feeder 04	70	274314	1
		118,128,129	698427	2
		97,100	486696	1

Sep-13	Khandke Substation Feeder 03	12	121074	126
		13,14	251199	261
	Khandke Substation Feeder 04	70	157835	144
		118,128,129	434971	396
		97,100	278143	253

Oct-13	Khandke Substation Feeder 03	12	69664	130
		13,14	143692	267
	Khandke Substation Feeder 04	70	65382	105
		118,128,129	222782	359
		97,100	117167	189

Nov-13	Khandke Substation Feeder 03	12	100398	16
		13,14	198898	32
	Khandke Substation Feeder 04	70	66396	11
		118,128,129	222203	35
		97,100	130370	21

Dec-13	Khandke Substation Feeder 03	12	70107	80
		13,14	149946	171
	Khandke Substation Feeder 04	70	64278	163
		118,128,129	140767	357
		97,100	101985	259