Monitoring report form for CDM project activity

(Version 06.0)

MONITORING REPORT		
Title of the project activity	Wind Energy Project in Maharashtra by M/s Shah Promoters & Developers	
UNFCCC reference number of the project activity	4489	
Version number of the PDD applicable to this monitoring report	03	
Version number of this monitoring report	01	
Completion date of this monitoring report	21/08/2018	
Monitoring period number	04th	
Duration of this monitoring period	01/04/2016 to 31/07/2018 (Inclusive of both days)	
Monitoring report number for this monitoring report	NA	
Project participants	M/s Shah Promoters & Developers	
Host Party	India (host)	
Sectoral scopes	Sectoral Scope : 01 Energy industries (renewable - / non-renewable sources)	
Applied methodologies and standardized baselines	AMS-I.D. – Grid connected renewable electricity generation (Version 16)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	-	20,436 tCO2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	26,648 tCO2e	

SECTION A. Description of project activity

A.1. General description of project activity

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
Total	**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.

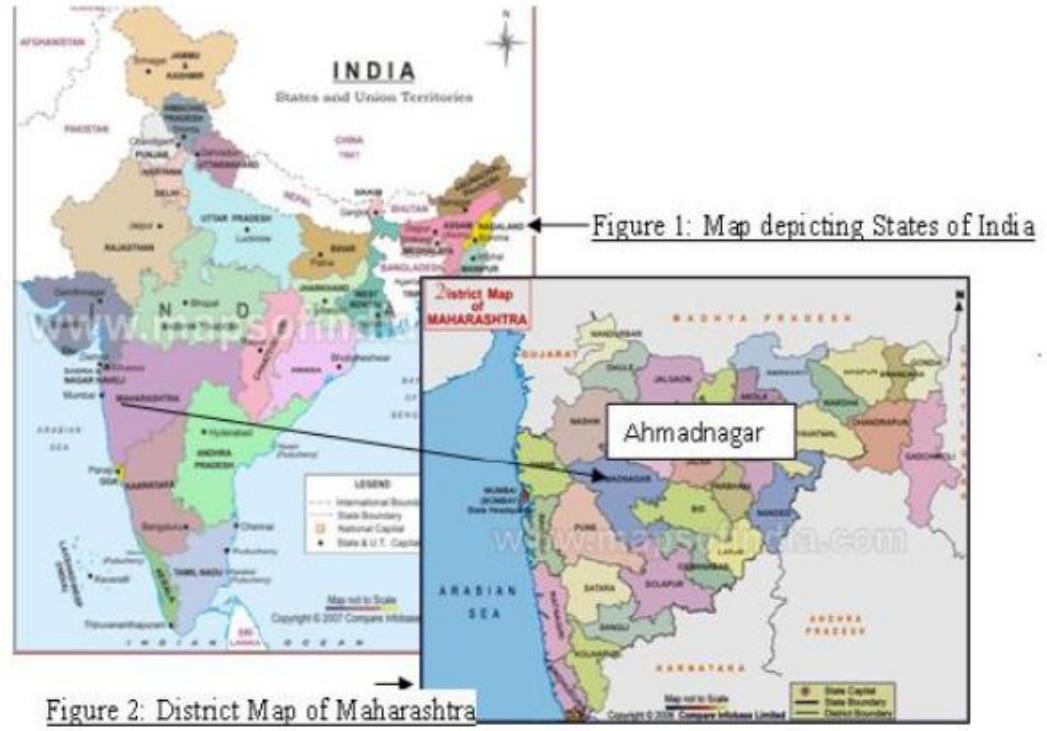
Total emission reductions achieved in this monitoring period

During the reported monitoring period 01/04/2016 to 31/07/2018 (Inclusive of both days) the project activity has supplied 22,583 MWh of electricity, and thus contributing to GHG reductions of 20,436 tCO_2e (Rounded Down).

A.2. Location of project activity

a. Host Party: India
b. State: Maharashtra
c. City/ Town/ Community: Ahmednagar
d. Physical/ Geographical location: GPS coordinates is provided under the below table

Wind Mill Location No.	Address	Latitude	Longitude
E-53/12	Gut No.195, Village – Baradari, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 20.9"N	74°50' 01.1"E
E-53/13	Gut No.206/A, Village – Baradari, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 28.8"N	74°50' 01.6"E
E-53/14	Gut No. 206/A , Village – Baradari, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 35.3"N	74°50' 00.6"E
E-53/118	Gut No.282, 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, Village – Jamb, Taluka - Ahmednagar , Dist - Ahmednagar	19°06' 07.3"N	74°53' 34.8"E
E-53/129	Gut No.217, Village – Jamb, Taluka - Ahmednagar, Dist - Ahmednagar	19°06' 00.5"N	74°53' 37.2"E
E-53/70	Gut No.208, Village – Agadgaon, Taluka - Ahmednagar, Dist - Ahmednagar	19°10' 32.0"N	74°52' 55.2"E
E-53/97	Gut No.365, Village – Agadgaon, Taluka - Ahmednagar, Dist - Ahmednagar	19°09' 29.6"N	74°52' 51.4"E
E-53/100	Gut No.365, Village – Agadgaon, Taluka - Ahmednagar, Dist - Ahmednagar	19°09' 32.6"N	74°52' 25.4"E



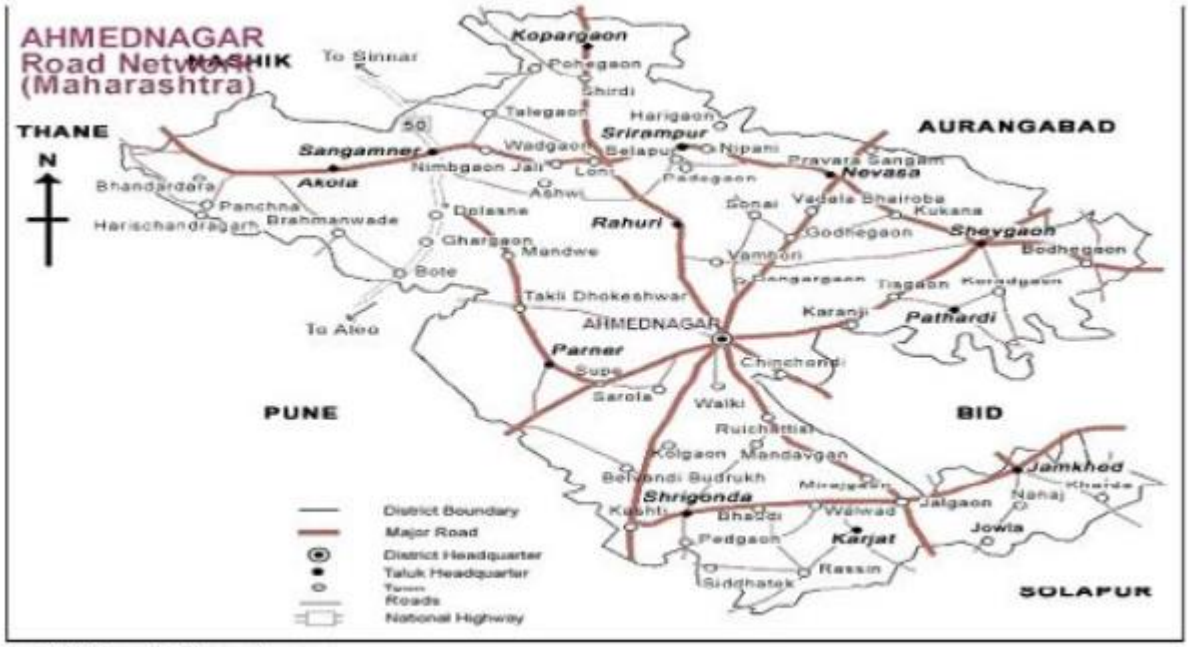


Figure 3: Map of Ahmadnagar

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 participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host Party)	M/s Shah Promoters & Developers	No
Netherlands	Klinkenberg Traders B.V	No
United Kingdom of Great Britain and Northern Ireland	MBA Trading Limited	No

A.4. Reference to applied methodologies and standardized baselines

The below methodology is applicable for the project activity
Methodology : AMS I. D Grid Connected Renewable Electricity Generation (Version 16)[1]
Type I : Renewable Energy Project (Small Scale)
Category : I. "D", Grid Connected Renewable Electricity Generation

Methodology also refers the tool - "Tool to calculate the emission factor for an electricity system"[2] (Version 02)

A.5. Crediting period type and duration

Type : Fixed
Duration : 01/03/2011 to 28/02/2021
Current Monitoring Period : 01/04/2016 to 31/07/2018 (Inclusive of both days)

[1] https://cdm.unfccc.int/methodologies/DB/Q3VOK1HPBFTLSP7ZXFMY8R8Y4BEVJX

[2] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf

SECTION B. Implementation of project activity

B.1. Description of implemented 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 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.

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

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
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

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 onetime 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 the registered monitoring plan, applied methodologies or standardized baselines

Not Applicable.

B.2.2. Corrections

Not Applicable.

B.2.3. Changes to the start date of the crediting period

Crediting period is from 01/03/2011 to 28/02/2021 (Fixed) (Changed from: 01/04/2011 to 31/03/2021). The same has been already approved by Board and it does not affect start date of this current monitoring period.

Please refer UN project web page for same
http://cdm.unfccc.int/Projects/DB/RWTUV1297334687.42/view
This change comes under category of (a) Changes that have been approved by the Board or notified to the secretariat and that do not affect the start of this monitoring period (i.e. any of the changed start dates are prior to the start of this monitoring period);

B.2.4. Inclusion of monitoring plan

There has not been any change in the monitoring plan during the current monitoring period.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

Not Applicable.

B.2.6. Changes to project design

The project has not been any changes to the project design document.

SECTION C. Description of monitoring system

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 ABT 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 by third party i.e. MSEDCL, the accuracy of measurement is assured at all times. Necessary records of calibration has maintained by both MSEDCL and project proponents. Delay in calibration was observed but necessary correction in calculations is undertaken.

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 are 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 are 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 are 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 ABT 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.

ABT Meter - is a device that measures the amount of electrical energy supplied to the utility.

Availability Based Tariff (ABT) is a frequency based pricing mechanism applicable in India for unscheduled electric power transactions. The ABT falls under electricity market mechanisms to charge and regulate power to achieve short term and long term network stability as well as incentives and dis-incentives to grid participants against deviations in committed supplies as the case may be.

Description of calibration of WEG Controller

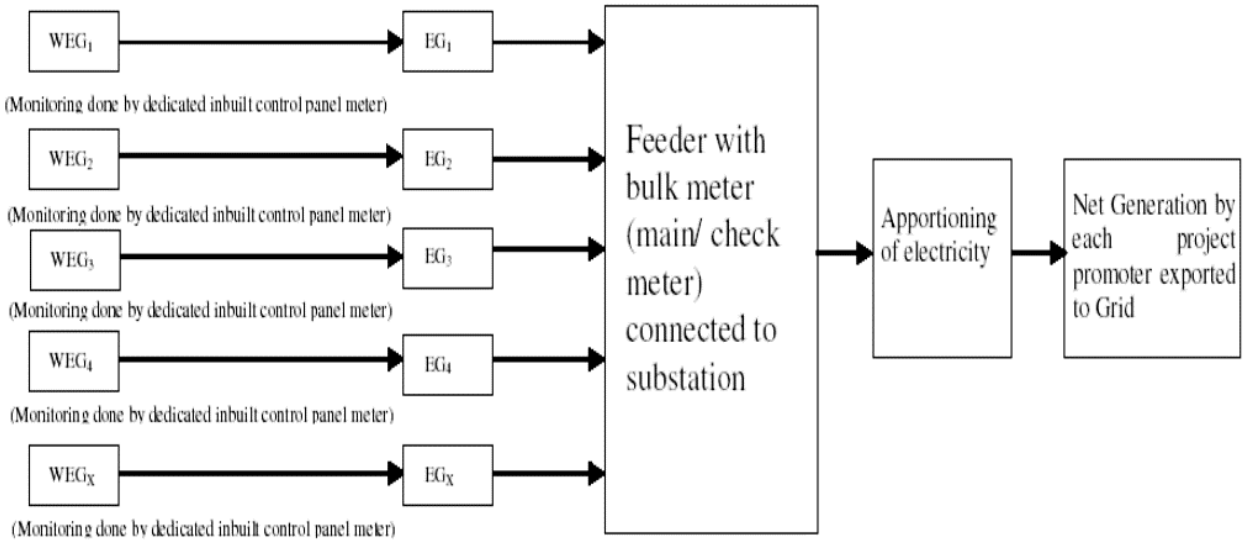
MPU (Main Processing Unit) is used for control of Wind Turbine Generator (WTG), this microprocessor based intelligent controller specially designed for WTG. Monitoring of Electricity is on continuous basis by MPU. WTG cannot operate without MPU as it continuously monitors for any fault or deviation in 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.

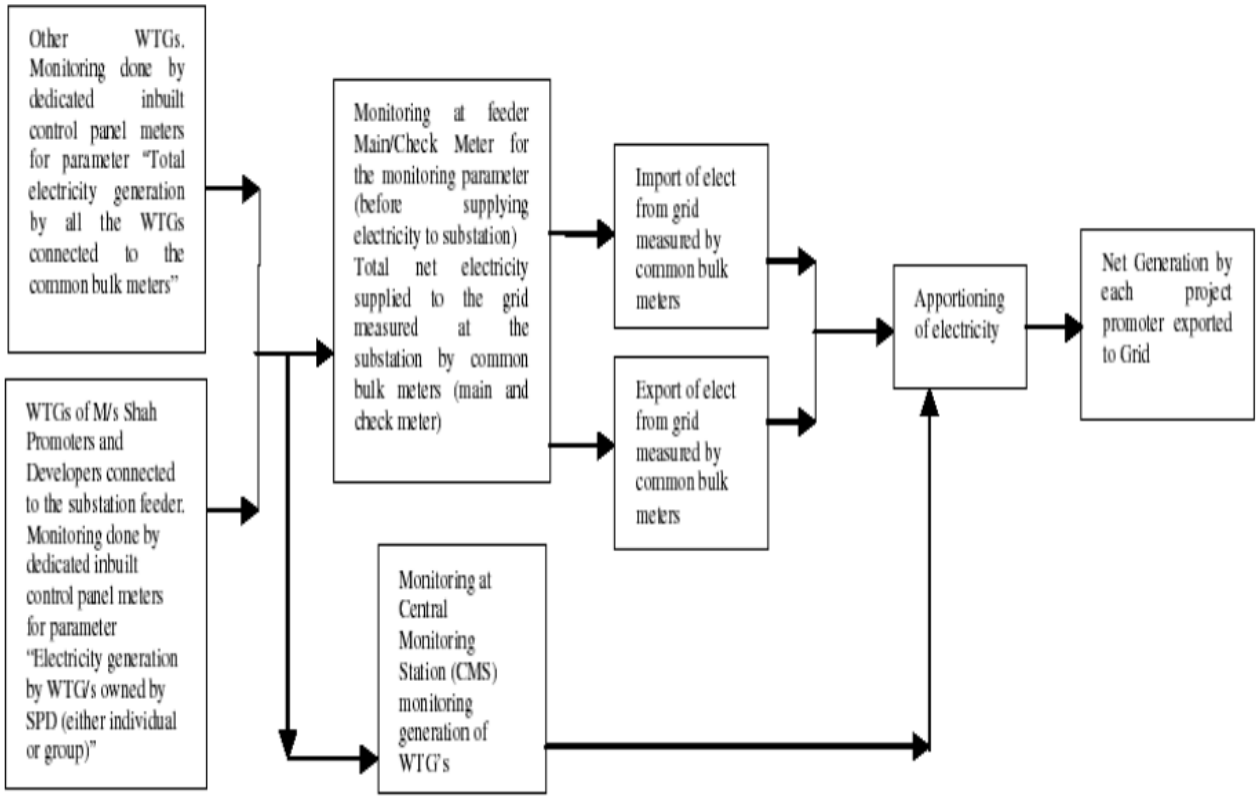
Since some meters or converters from some operators are used along with other factors, as is the case with the thyristor inverter, the pulse rate of the meter and the conversion factor must be set on the I/O card under "basic settings" (3000 pulses/KWh and 1000 A/5 A for pulse inverters). After every 15^{th} 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.

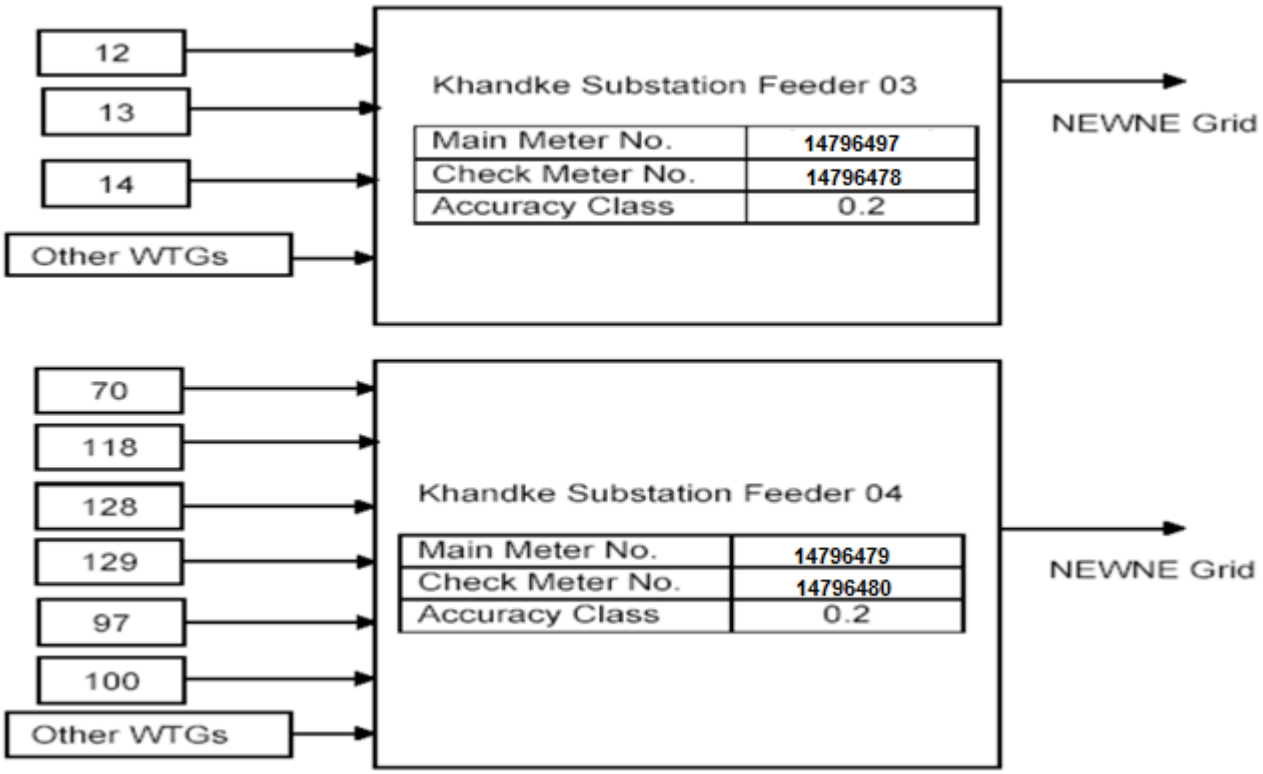
Description of billing calculation from net meter to individual meters
Each substation is connected to approximately a number of wind turbines. The generation reading is collectively displayed by the substation meter. The net generation of each of the wind turbines is then calculated in the following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

Metering Diagram:



Metring 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” (EGJMR, export) and “import” (EGJMR, 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 to MSEDCL.

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

$$EG_y = \frac{\sum_0^n EG_{n,y}}{\sum_0^m EG_{m,y}} x\ EG_{MSEDCL}$$

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.

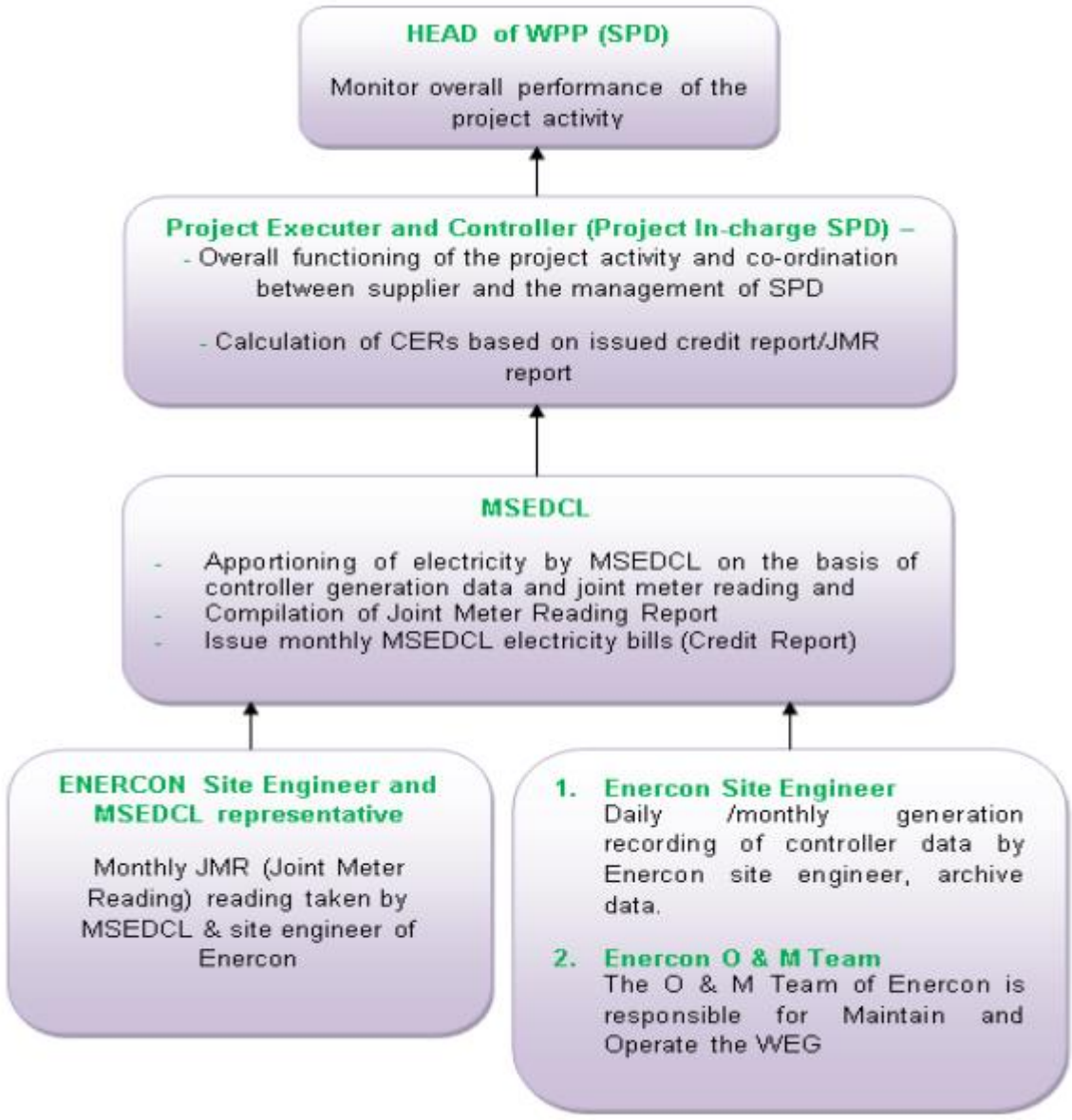
For this project, the feeder connections are as follows:
Site: Village –Khandake**, Ahmadnagar.**

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. Therefore, the authority and responsibility of project management lies with the O & M contractor.

Enercon, who is responsible for monitoring calibration and O & M of the project, has adopted ISO standard. 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 Torqueing
b) Blade Cleaning
c) Nacelle Torqueing and Cleaning
d) Transformer Oil Filtration
e) Control Panel & LT Panel Maintenance
f) Site and Transformer Yard Maintenance

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

Management Services:

a) Data logging in for power generation, grid availability, machine availability.
b) Preparation and submission of monthly performance report in agreed format.

c) Taking monthly meter reading jointly with utility of power generated at Wind Farm and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

a) Visual inspection of the 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 is 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

Data/Parameter	EF_{OM}
Unit	tCO_2/ MWh
Description	Simple Operating Margin Emission Factor
Source of data	Baseline CO2 Emission Database[3] (Version 4.0)
Value(s) applied	1.008
Choice of data or measurement methods and procedures	The data is prepared by Central Electricity Authority, GOI.
Purpose of data/parameter	To Calculate the baseline emission
Additional comments	Weighted Average of 3 years data has been considered.

Data/Parameter	EF_{BM}
Unit	tCO_2/ MWh
Description	Simple Operating Margin Emission Factor
Source of data	Baseline CO2 Emission Database[4] (Version 4.0)
Value(s) applied	2007-08 : 0.60
Choice of data or measurement methods and procedures	The data is prepared by Central Electricity Authority, GOI.
Purpose of data/parameter	To Calculate the baseline emission
Additional comments	Value for the year 2007-08.

Data/Parameter	EF_{CM}
Unit	tCO_2/ MWh
Description	Simple Operating Margin Emission Factor
Source of data	Baseline CO2 Emission Database[Error! Bookmark not defined.] (Version 4.0)
Value(s) applied	0.905
Choice of data or measurement methods and procedures	The data is prepared by Central Electricity Authority, GOI.
Purpose of data/parameter	To Calculate the baseline emission
Additional comments	Emission factor has been calculated ex-ante for the entire crediting period.

D.2. Data and parameters monitored

Data/Parameter	EG_y
Unit	MWh
Description	Net Electricity export to the grid by the project activity

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

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

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 C of this MR.
Value(s) of monitored parameter	22583.64 MWh
Monitoring equipment	For information on i. type, ii. accuracy iii. class, iv. serial number, v. calibration frequency, vi. date of last calibration and validity Please refer Appendix 1 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 $\sum_0^m EG_{m,y}$. $EG_y = \frac{\sum_0^n EG_{n,y}}{\sum_0^m EG_{m,y}} x\ EG_{MSEDCL}$
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) is 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 is done as per the guidelines set by CERC
Purpose of data/parameter	Used for baseline emission Calculation
Additional comments	--

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	27,339.01MWh
Monitoring equipment	Monitored through inbuilt WTG Controller meter.
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. Please also refer to detailed description under "Description of calibration of WEG Controller" in section C of this MR.
Purpose of data/parameter	Used for baseline emission Calculation
Additional comments	--

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	413272.72 MWh
Monitoring equipment	Monitored through inbuilt WTG Controller meter.
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.
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 C of this MR.
Purpose of data/parameter	Used for baseline emission Calculation
Additional comments	--

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	Total net electricity supplied to the grid measured at the substation by common bulk meters (main and check meter).
Value(s) of monitored parameter	340,934.09 MWh
Monitoring equipment	Please refer Appendix 1 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 is 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) is done by state utility normally on annul basis or as per the schedule of MSEDCL.
Purpose of data/parameter	Used for baseline emission Calculation
Additional comments	--

D.3. Implementation of sampling plan

Not Applicable

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

As described in the section above, the total emission reduction achieved in a year would be
$ER_y = BE_y – PE_y – LE_y$

Where,
ER_y is the Emission reductions during the year y
BE_y is the Baseline emissions during the year y
PE_y is the Project emissions during the year y
LE_y is the Leakage emissions during the year y

Baseline emissions:
The baseline emissions are calculated based on the given formula:
$BE_y = EF_{CM} * EG_y$
$EG_y = 22,583$ MWh

$BE_y = 22,583$ MWh x 0.905 tCO_2/MWh
$= 20,436$ tCO_2

E.2. Calculation of project emissions or actual net removals

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.

Therefore,
$PE_y = 0$ tCO_2e

E.3. Calculation of leakage emissions

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

LE_y = 0 tCO_2e

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	20,436	0	0	0	20,436	20,436

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
20,436	26,648

E.6. Remarks on increase in achieved emission reductions

The current monitoring period involves variation in wind flow and this is nature dependent and not in control of PP. It is to be noted that there is no change in design of project activity and all the parameters has been monitored as per the Monitoring Plan mentioned in the Registered SSC-PDD, hence there is no any post registration changes applicable. The actual ER is -23% lower than estimated values for the current monitoring period. This is due to low PLF achieved during current monitoring period.

Appendix 1. Calibration Details

Calibration Details								
Substation/ Feeder No.	**Meter**	**Serial No.**	**Type**	**Accuracy Class**	**Calibration Frequency**	**Calibration Date**	**Validity**	**Delayed calibration as per Para 395 a and 396 a and b of VVS version 09**
Khandke Substation Feeder No. 03	Main Meter	14796497	ABT	0.2	Yearly	06/08/2015 06/10/2016	05/08/2016 05/10/2017	August 2016 to October2016
	Check Meter	14796478	ABT	0.2	Yearly			
Khandke Substation Feeder No. 04	Main Meter	14796479	ABT	0.2	Yearly	07/08/2015 06/10/2016	06/08/2016 05/10/2017	August 2016 to October2016
	Check Meter	14796480	ABT	0.2	Yearly			

Note: There was the delayed calibration for the Feeder- 03 & 04 that has caused reduction in the claimed emission reduction. This reduction was calculated in line with CDM guidelines, the maximum permissible error of 0.2% based on the accuracy of 0.2 class energy meters, hence as a conservative approach maximum permissible error of 0.2% is considered for the delay period i.e. for the month of August 2016 and October 2016 for Feeder-03 & 04.

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Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
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 GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, 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).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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