



**Monitoring report form for CDM project activity
(Version 06.0)**

MONITORING REPORT

Title of the project activity	Roaring 40's Wind Farms (Khandke) Private Limited	
UNFCCC reference number of the project activity	3142	
Version number of the PDD applicable to this monitoring report	06	
Version number of this monitoring report	05	
Completion date of this monitoring report	10/03/2018	
Monitoring period number	02	
Duration of this monitoring period	From 01/01/2012 to 31/12/2012 (Both days inclusive)	
Monitoring report number for this monitoring report	Not applicable	
Project participants	CLP Wind Farms (Khandke) Private Limited	
Host Party	India	
Sectoral scopes	Sectoral scope 1: Energy Industries (Renewable - /non-renewable sources).	
Applied methodologies and standardized baselines	"Consolidated baseline and monitoring methodology for "Grid-connected electricity generation from renewable sources" Reference: Approved Consolidated baseline methodology ACM0002 (Version 10)	
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
	32,006 tCO ₂	0 tCO ₂
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	29,233 tCO ₂	

SECTION A. Description of project activity

A.1. General description of project activity

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CLP Wind Farms (Khandke) Pvt. Ltd. (CLPWFK), formerly known as Roaring 40s wind Farms (Khandke) Pvt. Limited, has developed a 50.4 MW wind farm in the state of Maharashtra, India in three phases (Phase-I, II & III). The project activity under consideration is Phase-I of the project consisting of 21 machines of 800 kW each, amounting to 16.8 MW.

The purpose of the project activity is to development, design, engineering, procurement, finance, construction, operation and maintenance of the project activity, 16.8 MW phase-I wind power project ("Project") in the Indian state of Maharashtra to provide reliable, renewable power to the Maharashtra state electricity grid. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid. In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the grid, which are predominantly based on fossil fuels.

The Project harnesses renewable resource (wind) in the region, and thereby displacing electricity generation by non-renewable natural resources and hence ultimately leading to sustainable economic and environmental development. Wind World (India) Limited (WWIL) (formerly known as Enercon (India) Limited) is the equipment supplier and the operations and maintenance contractor for the Project. The Project is owned by CLP Wind Farms (Khandke) Private Limited and WWIL is responsible for operation and maintenance of the wind farm.

The generated electricity is being supplied to Maharashtra State Electricity Distribution Company Limited ("MSEDCL") under a long-term power purchase agreement (PPA) and thereby marginally contributing towards reduction in the energy demand supply gap in the state of Maharashtra, diversification of grid supply and reduction of greenhouse gas emissions. The first machine under phase-I was commissioned on 27/06/2007 and the last machine was commissioned on 19/12/2007. The expected operational lifetime of the project is for 20 years.

The total emission reductions achieved under this monitoring period from 01/01/2012 to 31/12/2012 (including first and last day) are 32,006 tCO₂.

A.2. Location of project activity

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The Project is spread across Ranjani, Ratadgaon, Agadgaon and Bardari villages in Khandke Taluk of Ahmednagar District of Maharashtra state in India.

The Project area extends between latitude 19⁰, 3.5' to 19⁰, 11' North and longitude 74⁰, 49' to 74⁰, 56' East. The Project is connected to the WWIL substation (to be owned by MSETCL) at Village Mehekari (near 33 kV Mehekari S/S), Ahmednagar district. The Project activity is located at a distance of 120 km from Pune by road. The nearest major railway station is at Pune.

The details of the physical location of the project activity are presented below:

WEC Location No.	Unique Identification of WECs	Name of Village	Feeder No	Date of Commissioning	Latitude	Longitude
83	R 40s K-01	Ranjani	02	27-Jun-07	N19 10 19.7	E74 54 21.2
84	R 40s K-02			27-Jun-07	N19 10 14.8	E74 54 28.9
85	R 40s K-03			27-Jun-07	N19 10 09.1	E74 54 36.2
86	R 40s K-04			27-Jun-07	N19 10 02.9	E74 54 43.8
87	R 40s K-05			27-Jun-07	N19 09 52.3	E74 54 36.8
88	R 40s K-06			27-Jun-07	N19 09 44.0	E74 54 37.6
89	R 40s K-07			27-Jun-07	N19 10 08.5	E74 55 00.0
90	R 40s K-08			27-Jun-07	N19 10 15.4	E74 54 56.5
91	R 40s K-09			27-Jun-07	N19 10 23.1	E74 54 51.7
17	R 40s K-10	Ratadgoan	03	30-Jun-07	N19 07 09.4	E74 49 56.1
18	R 40s K-11			30-Jun-07	N19 07 19.6	E74 49 52.4
19	R 40s K-12			30-Jun-07	N19 07 32.6	E74 49 52.5
20	R 40s K-13			22-Aug-07	N19 07 42.1	E74 49 55.6
112	R 40s K-14	Agadgoan	02	22-Aug-07	N19 08 08.2	E74 52 19.8
113	R 40s K-15			22-Aug-07	N19 08 00.1	E74 52 24.8
115	R 40s K-16			19-Dec-07	N19 07 56.6	E74 52 08.5
92	R 40s K-17			27-Sep-07	N19 09 55.0	E74 52 56.1
93	R 40s K-18			27-Sep-07	N19 09 48.6	E74 52 58.7
99	R 40s K-19			1-Oct-07	N19 09 45.7	E74 52 43.1
15	R 40s K-20	Bardari	03	12-Oct-07	N19 06 52.7	E74 49 57.7
16	R 40s K-21			12-Oct-07	N19 06 58.9	E74 49 54.0

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)	CLP Wind Farms (Khandke) Pvt. Ltd. (Private entity)	No

A.4. Reference to applied methodologies and standardized baselines

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Title: “Consolidated baseline and monitoring methodology for “Grid-connected electricity generation from renewable sources”

Reference: Approved consolidated baseline methodology ACM0002 (Version 10)

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 01
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology/ tools can be obtained at <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

A.5. Crediting period type and duration

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The length of the Crediting period of the project activity as per registered PDD is 10 years (fixed). The crediting period start date is 14/10/2010 and length of crediting period is 10 year (from 14/10/2010 to 13/10/2020).

SECTION B. Implementation of project activity**B.1. Description of implemented project activity**

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Wind turbines produce electricity by using the natural power of wind to drive a generator. Wind has a considerable amount of kinetic energy when blowing at high speeds. When this kinetic energy passes over the blades of the wind turbines, it is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity. The electricity thus produced using wind leads to displacement of electricity produced by the grid which is primarily coal based and thus results in significant reduction of carbon dioxide emissions which is the main emission source being displaced by the implementation of the proposed project activity.

The Project involves 21-wind energy converters (WECs) of WWIL make (800 kW E-48) with internal electrical lines connecting the Project with local evacuation facility. The WECs generate 3-phase power at 400V, which is stepped up to 33 kV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V \pm 12.5%. The average life time of the WEC is around 20 years as per the industry standards. The salient features of the state-of-art-technology are:

- Gearless Construction - Rotor & Generator Mounted on same shaft eliminating the Gearbox.
- Variable speed function – has the speed range of 18 to 33 RPM thereby ensuring optimum efficiency at all times.
- Variable Pitch functions ensuring maximum energy capture.
- Near Unity Power Factor at all times.
- Minimum drawl (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEC with voltage fluctuation of -20 to +20%.

- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator, which runs at maximum speed of 33 rpm and uses Air Brakes.
- Three Independent Braking Systems.
- Generator achieving rated output at only 33 rpm.
- Incorporates lightning protection system, which includes blades.
- Starts Generation of power at wind speed of 3 m/s.

These turbines are supplied by WWIL and are designed for Indian wind conditions. The technology for the same is environmentally safe and sound. Further, there is no technology transfer involved in the project activity. The WECs under the project activity were commissioned phase wise. Commissioning dates of the WEGs are mentioned below:

The first machine in this project activity was commissioned on 27/06/2007 and the last machine was commissioned on 19/12/2007. The project activity consists of 21 machines of 800kW each amounting to a total of 16.8 MW. The commissioning schedule is provided below:

Location No.	Unique Identification No	Date of Commissioning
83	R 40s K-01	27/06/2007
84	R 40s K-02	27/06/2007
85	R 40s K-03	27/06/2007
86	R 40s K-04	27/06/2007
87	R 40s K-05	27/06/2007
88	R 40s K-06	27/06/2007
89	R 40s K-07	27/06/2007
90	R 40s K-08	27/06/2007
91	R 40s K-09	27/06/2007
17	R 40s K-10	30/06/2007
18	R 40s K-11	30/06/2007
19	R 40s K-12	30/06/2007
20	R 40s K-13	22/08/2007
112	R 40s K-14	22/08/2007
113	R 40s K-15	22/08/2007
115	R 40s K-16	19/12/2007
92	R 40s K-17	27/09/2007
93	R 40s K-18	27/09/2207
99	R 40s K-19	01/10/2007
15	R 40s K-20	12/10/2007
16	R 40s K-21	12/10/2007

The project activity has been implemented as per the description in the registered CDM PDD. The Project is owned by CLP Wind Farms (Khandke) Private Limited and WWIL is responsible for operation and maintenance of the wind farm. All the events are recorded in the log book available at the project site. During the monitoring period considered in this report, there was no major / special event for any of the machines that are included in the project activity. No event or situation has occurred during this monitoring period, which impacts the applicability of the methodology.

B.2. Post-registration changes**B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines**

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Not applicable

B.2.2. Corrections

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Not applicable

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

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Not applicable

B.2.4. Inclusion of monitoring plan

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Not applicable

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

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Not applicable

B.2.6. Changes to project design

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Not applicable

SECTION C. Description of monitoring system

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The monitoring plan is being devised as per approved consolidated monitoring methodology ACM0002 Version 10 - Consolidated baseline and monitoring methodology for "Grid-connected electricity generation from renewable sources". Followings are the monitoring parameters of the project activity:

This approved monitoring methodology requires monitoring of the following:

- Electricity exported by all the Turbines connected to feeder 2 and feeder 3 (Turbines included in the project activity and Turbines that are not part of the project activity)

- Electricity imported by all the Turbines (Turbines included in the project activity and Turbines that are not part of the project activity) connected to feeder 2 & feeder 3
- Net Electricity supplied to the grid by the WTGs of the project activity connected to feeder 2 & feeder 3

Net Electricity supplied to the grid by the project activity is summation of net electricity supplied to the grid by the WECs of the project activity connected to feeder 2 ($EG_{f2,y}$) and feeder 3 ($EG_{f3,y}$) which are obtained from Energy Breakup Report certified by MSEDCL.

The Project is operated and managed by CLPWFK. The operational and maintenance contract for the project is with WWIL. WWIL follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project has adhered to all the mandatory regulatory and statutory requirements at the state as well as national level. WWIL is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report. The data will be maintained in hard and soft format for the crediting period + 2 years.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project has adhere to all the mandatory regulatory and statutory requirements at the state as well as national level. WWIL is Operation and Maintenance contractor for the project activity and provides the daily generation report to CLPWFK. CLPWFK also maintains the records of daily generation report and joint meter report.

Calibration Details

The metering equipment were inspected & calibrated by state utility. Meter calibration details are given in the table below:-

Sl. No.	Transformer No	Meter Identification No ¹	Accuracy Class	Calibration Date	Calibration Validity Date
1	FEEDER -2	04880814 (Old Main Meter)	0.2s	02/09/2011	01/09/2012
		14796488 (New Main Meter)	0.2s	10/08/2012 ²	09/08/2013

¹ State utility has replaced the TOD (Time of Day) energy meter to ABT (Availability Based Tariff) meter on 31/07/2012 to satisfy regulation issued by Govt. India pertaining to meter installation which is beyond the control of CLP. Thus, same changes occurred at site has been considered as project deviation.

² Energy meters for feeder-2 and feeder-3 have been replaced by state utility on 31/07/2012

Sl. No.	Transformer No	Meter Identification No ¹	Accuracy Class	Calibration Date	Calibration Validity Date
2		04880815 (Old Check Meter)	0.2s	02/09/2011	01/09/2012
		14796490 (New Check Meter)	0.2s	10/08/2012	09/08/2013
	FEEDER -3	04880816 (Old Main Meter)	0.2s	02/09/2011	01/09/2012
		14796497 (New Main Meter)	0.2s	10/08/2012	09/08/2013
		04880817 (Old Check Meter)	0.2s	02/09/2011	01/09/2012
		14796478 (New Check Meter)	0.2s	10/08/2012	09/08/2013

Monitoring Information

- **Metering:** Electricity supplied to the grid is metered by MSEDCL in the presence of representatives of WWIL (O&M Contractor for the project activity) and MSEDCL.
- **Metering Equipment:** Metering system for the project activity consists of main and check meter. Both the meters are two-way trivector meters capable of recording import and export of electricity and provide output in the form of net electricity supplied to the grid. The metering equipment is maintained in accordance with electricity standards prevalent in Maharashtra.
- **Meter Readings:** Revenue meters are located high voltage side of each feeder which is connected to project WEGs as well as non-project WEGs which are belongs to other project developer. The net electricity supplied to the grid is recorded by taking a Joint Meter Reading (JMR) in the presence of Officials from off-taking Utility and WWIL (on behalf of CLPWFK). The Joint meter reading contains the value of energy imported and exported and the net export to the grid by the project and non-project WEGs connected to same feeder during the recording period. This Joint meter reading is certified by the Executive engineer of the utility and by WWIL Officials. The procedure for calculating net electricity supplied to the grid is described below.
- **Inspection of Energy Meters:** All the main and check energy meters (export and import) installed at the project site are of 0.2% accuracy class. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its accredited representatives.
- **Meter Test Checking:** There is a separate main and check meter for each 33 kV feeder. The main meter is tested for accuracy, with a portable standard meter, by the MSEDCL's testing division. The MSEDCL is responsible to carry out the calibration, periodical testing, sealing and maintenance of meters. All the meters are tested at the metering point. The MSEDCL provides a copy of the test reports. If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit, all the meters will be re-tested and calibrated immediately by MSEDCL.

Apportioning Procedure Implemented by WWIL and Certified by MSEDCL

- STEP 1: Measuring Electricity Generation For Each Turbine**

Electricity generation readings of the LCS meters on each Turbine are recorded on continuous basis and fed to the central monitoring system. Data on generation for each Turbine within the wind farm are accessed and archived electronically in the central monitoring system database.

Electricity generation from the project WEGs are connected to feeder 2 ($EG_{f2,gross,y}$) and feeder 3 ($EG_{f3,gross,y}$) is noted from central monitoring system database by WWIL as:

$$N_{f2} \quad \text{And} \quad N_{f3}$$

$$\sum_{y=0} EG_{f2,gross,y} \quad \sum_{y=0} EG_{f3,gross,y}$$

Where

N_{f2} = Number of Turbines comprising the Project activity connected to the feeder 2

N_{f3} = Number of Turbines comprising the Project activity connected to the feeder 3

$EG_{f2,gross,y}$ = Electricity generation from other Turbines connected to feeder 2

$EG_{f3,gross,y}$ = Electricity generation from other Turbines connected to feeder 3

Same data are noted from central monitoring system database by WWIL as:

$$M_{f2} \quad \text{And} \quad M_{f3}$$

$$\sum_{y=0} EG_{f2,gross,x} \quad \sum_{y=0} EG_{f3,gross,x}$$

Where

M_{f2} = Number of Turbines that are not part of the project activity but are connected to the feeder 2

M_{f3} = Number of Turbines that are not part of the project activity but are connected to the feeder 3

- STEP 2: Determining Electricity Exports From The Turbines**

Measuring Aggregate Electricity Exports From The Feeder

Aggregate electricity exports, to the grid, from the turbines connected to feeder 2 and feeder 3 is measured through the main and check meters installed at the 33 kV side of the Substation. There are one set of main and check meter at each feeder. Joint Meter Reading (JMR) of the main and check meter is carried out on first day of every month in presence of the representatives of the WWIL (the O&M contractor) & the state electricity utility (MSETCL). Electricity export and import for feeder 2 and feeder 3 is denoted as:

Electricity Export from feeder 2: $EG_{f2,JMR,export}$

Electricity Import from feeder 2: $EG_{f2,JMR,import}$

Electricity Export from feeder 3: $EG_{f3,JMR,export}$

Electricity Import from feeder 3: $EG_{f3,JMR,import}$

Determining Electricity Exports From Project Activity

Net electricity exported by individual wind turbines is determined by MSEDCL by apportioning electricity export and electricity import to the project and non-project Turbines in proportion to their generated electricity. As the project WEGs are connected to a common feeder (a common pool where CLP and other project developers feed electricity), state utility (Maharashtra State Electricity Distribution Company Limited, "MSEDCL") apportioned the electricity generation data based on

a) individual project WEGs controller reading,

b) summation of all controller reading of WEGs (belongs to CLP and other developers) connected with the common feeder and

c) joint meter reading (based on billing meter) and issues month wise "Energy Break-up Report" which contains electricity export, import and net export by the project WEGs connected to the same feeder. These values (mentioned in "Energy Break-up Report") are the main source to calculate the baseline emission by this project activity.

$EG_{f2,export}$ is the electricity supplied to the grid by turbines of the project activity connected to feeder 2 is calculated as follows:

$$EG_{f2,export} = \frac{EG_{f2,JMR,export} \times \sum_{y=0}^N EG_{f2,gross,y}}{\sum_{y=0}^N EG_{f2,gross,y} + \sum_{y=0}^M EG_{f2,gross,y}}$$

$EG_{f2,import}$ is the electricity drawn from the grid by turbines of the project activity connected to feeder 2 is calculated as follows:

$$EG_{f2,import} = \frac{EG_{f2,JMR,import} \times \sum_{y=0}^N EG_{f2,gross,y}}{\sum_{y=0}^N EG_{f2,gross,y} + \sum_{y=0}^M EG_{f2,gross,y}}$$

$EG_{f2,y}$ is the net electricity supplied to the grid by Turbines of the project activity connected to feeder 2, is calculated as follows:

$$EG_{f2,y} = EG_{f2,export} - EG_{f2,import}$$

Similarly for feeder 3, $EG_{f3,export}$, $EG_{f3,import}$ and $EG_{f3,y}$, is calculated as follows:

$EG_{f3,export}$ the electricity supplied to the grid by turbines of the project activity connected to feeder 3 is calculated as follows:

$$EG_{f3,export} = \frac{EG_{f3,JMR, export} \times \sum_{y=0}^N EG_{f3,gross,y}}{\sum_{y=0}^N EG_{f3,gross,y} + \sum_{y=0}^M EG_{f3,gross,y}}$$

$EG_{f3,import}$ is the electricity drawn from the grid by turbines of the project activity connected to feeder 3 is calculated as follows:

$$EG_{f3,import} = \frac{EG_{f3,JMR, import} \times \sum_{y=0}^N EG_{f3,gross,y}}{\sum_{y=0}^N EG_{f3,gross,y} + \sum_{y=0}^M EG_{f3,gross,y}}$$

$EG_{f3,y}$ is the net electricity supplied to the grid by Turbines of the project activity connected to feeder 3, is calculated as follows:

$$EG_{f3,y} = EG_{f3,export} - EG_{f3,import}$$

Net electricity exported to the grid by the project activity is calculated as:

$$EG_y = EG_{f2,y} + EG_{f3,y}$$

As the project WEGs are connected to a common feeder (a common pool where CLP and other project developers feed electricity), state utility (Maharashtra State Electricity Distribution Company Limited, "MSEDCL") apportioned the electricity generation data based on a) individual project WEGs controller reading, b) summation of all controller reading of WEGs (belongs to CLP and other developers) connected with the common feeder and c) joint meter reading (based on billing meter) and issues month wise "Energy Break-up Report" which contains electricity export, import and net export by the project WEGs connected to the same feeder. These values (mentioned in "Energy Break-up Report") are the main source to calculate the baseline emission by this project activity and same is in line with section B.7.1 of the PDD. As the controller reading of WEGs belongs to other project developers (which is required to calculate summation of all controller reading of WEGs connected under the common feeder) are confidential information, hence, MSEDCL is not disclosing the same and this is beyond the control of CLP.

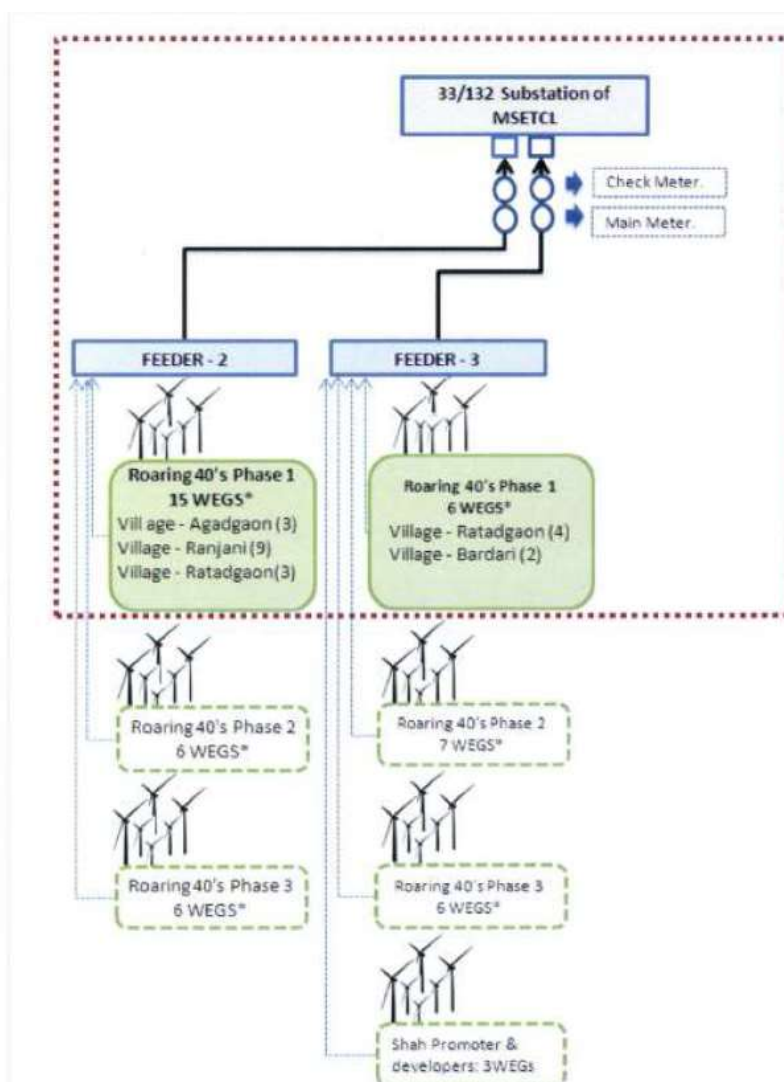
Thus, section B.7.1 of the PDD mentioned that Joint meter reading records ($EG_{f2,JMR,export}$, $EG_{f3,JMR,export}$, $EG_{f2,JMR,import}$ and $EG_{f3,JMR,import}$) would not be directly used for estimation of emission reduction and the values mentioned in "Energy Breakup Report" would be directly applied for estimation of emission reduction. As the Energy Break-up Report issued by MSEDCL, a state utility, thus, same is the most authentic document to calculate emission reduction calculation.

Further, the cross-checking of the net electricity supplied has been done with the tariff invoices raised by the CLP on the State Electricity Utility.

The meter reading from the LCS of each turbine is noted by CMS (Central Monitoring Station) directly in the soft format. The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the Turbines (Turbines). In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.

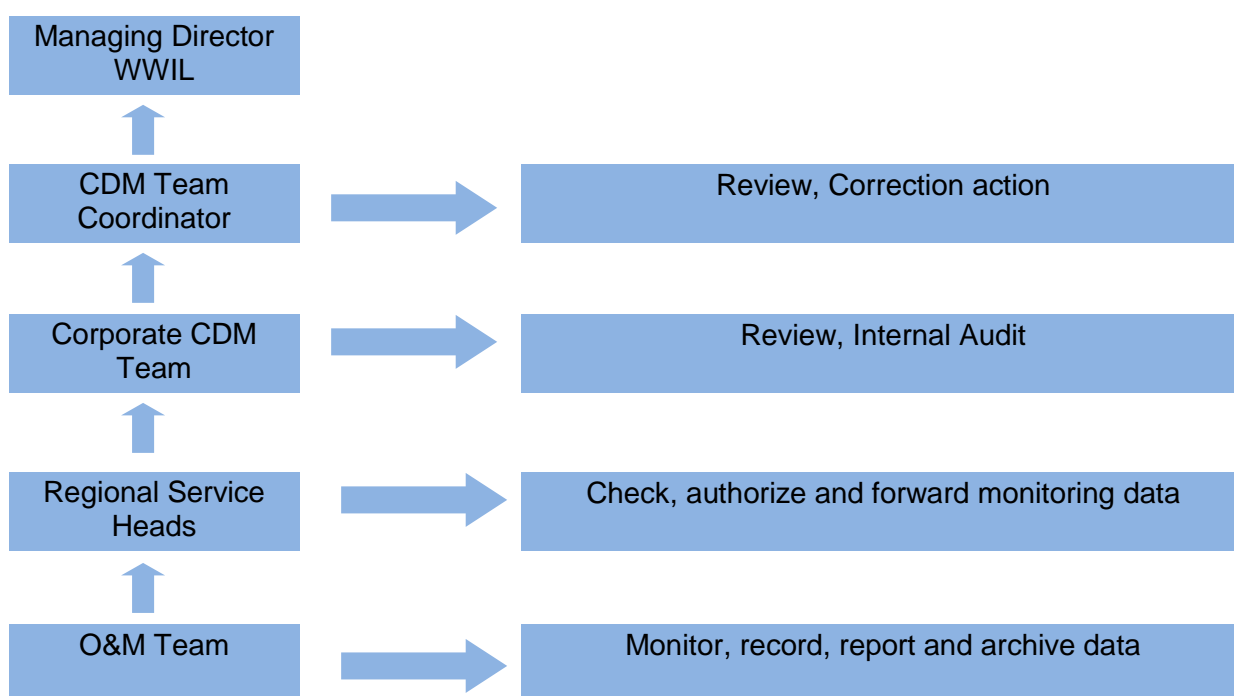
WWIL operates an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. WWIL follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, construction, commissioning and operation of the wind power project. The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project has adhered to all the mandatory regulatory and statutory requirements at the state as well as national level. WWIL is Operation and Maintenance contractor for the project activity and provides the daily generation report to CLPWFK . CLPWFK also maintains the records of daily generation report and joint meter report.

The schematic representation of metering arrangement is demonstrated below:



The project activity (Phase I) consists of 21 machines which are connected to feeder 2 and feeder 3. The feeder 2 connects of 15 machines and feeder 3 connects of 6 machine of the project activity.

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that WWIL's service staffs is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The WWIL Training Academy provides need-based training to meet the training requirements of WWIL projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving. The operational and management structure implemented is as follows:



SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/parameter:	EF _{OM,y}
Unit	tCO _{2e} /MWh
Description	Operating Margin Emission Factor of Western Regional Electricity Grid, now part of the NEWNE Grid
Source of data	"CO ₂ Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO ₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied)	0.99455
Choice of data or measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.
Purpose of data	To calculate Baseline Emissions Factor
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data/parameter:	EF _{BM,y}
Unit	tCO ₂ /MWh
Description	Build Margin emission Factor of Western Regional Electricity Grid, now part of the NEWNE Grid
Source of data	"CO ₂ Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO ₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied)	0.77722

Choice of data or measurement methods and procedures	Build Margin emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.
Purpose of data	To calculate Baseline Emissions Factor
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data/parameter:	EF_y or EF_{CM,y}
Unit	tCO ₂ /MWh
Description	Combined Margin Emission Factor of Western Regional Electricity Grid, now part of the NEWNE Grid
Source of data	Combined Margin Emission Factor (EF _{CM,y}) is calculated as the weighted average of Operating Margin Emission Factor (EF _{OM,y}) and Build Margin Emission Factor (EF _{BM,y}). "CO ₂ Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO ₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied	0.94022
Choice of data or measurement methods and procedures	CEA has calculated it as per ACM0002 with 3 years vintage data and option of ex ante calculation based on "75% of OM and 25% of BM values approach." The "CO ₂ Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Purpose of data	To calculate Baseline Emissions Factor
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

D.2. Data and parameters monitored

Data/parameter:	EG_{f2,JMR,export} and EG_{f3,JMR,export}
Unit	MWh
Description	Electricity exported by all the Turbines connected to feeder 2 and feeder 3 (Turbines included in the project activity and Turbines that are not part of the project activity) at main (14796488 ³ -feeder 2 and 14796497- feeder 3) and the check meter (14796490- feeder 2 and 14796478- feeder 3) at 33 kV.
Measured/calculated/default	Measured
Source of data	Monthly Joint Meter Reading (JMR)
Value(s) of monitored parameter	Feeder 2: 45,253.95 Feeder-3: 35,101.62

³ Main meter and check meters have been replaced with ABT meters

Monitoring equipment	Refer section C for an illustration of the provisions for measurement methods
Measuring/reading/recording frequency:	<p>Joint Meter Reading of the billing energy meter is carried out on first day of every month in presence of the representatives of the WWIL (the O&M contractor) & MSEDCL (distribution wing of Maharashtra state electricity board).</p> <p>Frequency of recording data: Monthly</p>
Calculation method (if applicable):	Not Applicable
QA/QC procedures:	<p>Joint Meter Reading of the billing energy meter is carried out on first day of every month in presence of the representatives of the WWIL (the O&M contractor) & MSEDCL (distribution wing of Maharashtra state electricity board).</p> <p>It can be cross checked against sales invoices raised to state electricity utility by CLPWFK.</p> <p>Electricity meters has been calibrated by MSEDCL (distribution wing of Maharashtra state electricity board) on annual basis.</p>
Purpose of data:	This value has not been directly used for estimation of emission reduction.
Additional comments:	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/parameter:	$EG_{f2,JMR,Import}$ and $EG_{f3,JMR,Import}$
Unit	MWh
Description	Electricity imported by all the Turbines (Turbines included in the project activity and Turbines that are not part of the project activity) connected to feeder 2 & feeder 3 at main (14796488 ⁴ -feeder 2 and 14796497- feeder 3) and the check meter (14796490- feeder 2 and 14796478- feeder 3) at 33 kV.
Measured/calculated/default	Measured
Source of data	Monthly Joint Meter Reading (JMR)
Value(s) of monitored parameter	Feeder 2: 11.08 Feeder-3: 9.57
Monitoring equipment	Refer section C for an illustration of the provisions for measurement methods
Measuring/reading/recording frequency:	<p>Joint Meter Reading of the billing energy meter is carried out on first day of every month in presence of the representatives of the WWIL (the O&M contractor) & MSEDCL (distribution wing of Maharashtra state electricity board).</p> <p>Frequency of recording data: Monthly</p>
Calculation method (if applicable):	Not Applicable

⁴ Main meter and check meters have been replaced with ABT meters

QA/QC procedures:	<p>Joint Meter Reading of the billing energy meter is carried out on first day of every month in presence of the representatives of the WWIL (the O&M contractor) & MSEDCL (distribution wing of Maharashtra state electricity board).</p> <p>It can be cross checked against sales invoices raised to state electricity utility by CLPWFK.</p> <p>Electricity meters has been calibrated by MSEDCL (distribution wing of Maharashtra state electricity board) on annual basis.</p>
Purpose of data:	This value is not directly used for estimation of emission reduction.
Additional comments:	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/parameter:	EG _{r2,y} and EG _{r3,y}
Unit	MWh
Description	Net Electricity supplied to the grid by the WTGs of the project activity connected to feeder 2 & feeder 3.
Measured/calculated/default	<p>The main and the check meters are connected to the machines of the project activity and other WTGs that are not part of project activity but connected to feeder 2 & feeder 3.</p> <p>The net electricity exported by the project activity is determined by system of apportioning wherein the aggregate electricity exports and imports (recorded by the main or check meter, as applicable) are allocated to project and non-project WECs in proportion to their generated electricity by MSEDCL.</p> <p>The apportioning is done based on LCS meters readings of all WTGs connected to feeder 2 and 3 and joint meter reading. The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.</p> <p>CLPWFK does not have any control over the LCS meter readings of other project developers and therefore the values certified by the MSEDCL have been directly used for the purpose of calculating the electricity exports to the grid.</p>
Source of data	Energy Breakup Report certified by MSEDCL
Value(s) of monitored parameter	Feeder 2: 24,605.56 Feeder-3: 9,435.57
Monitoring equipment	Calculated from monitored parameters
Measuring/reading/recording frequency:	Monthly (Calculated)
Calculation method (if applicable):	Refer to Section C

QA/QC procedures:	The net electricity supplied to the grid can be verified from the Energy Breakup Report certified by MSEDCL and same can be cross checked against sales invoices raised to state electricity utility by CLPWFK.
Purpose of data:	This value have been used to calculate baseline emission calculations.
Additional comments:	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/parameter:	EG _y
Unit	MWh
Description	Net electricity supplied to the grid by the WTGs of the project activity
Measured/calculated/default	Net Electricity supplied to the grid is calculated based on the net electricity supplied to the grid by the Turbines of the project activity connected to feeder 2 (EG _{r2,y}) and net electricity supplied to the grid by the Turbines of the project activity connected to feeder 3 (EG _{r3,y}).
Source of data	Energy Breakup Report certified by MSEDCL
Value(s) of monitored parameter	34,041.13
Monitoring equipment	Calculated from monitored parameters
Measuring/reading/recording frequency:	Monthly (Calculated)
Calculation method (if applicable):	Refer to Section C
QA/QC procedures:	The net electricity supplied to the grid can be verified from the Energy Breakup Report certified by MSEDCL and same can be cross checked against sales invoices raised to state electricity utility by CLPWFK.
Purpose of data:	This value has been used to calculate baseline emission calculations.
Additional comments:	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

D.3. Implementation of sampling plan

>>

Not Applicable for this project activity

SECTION E. Calculation of emission reductions or net anthropogenic removals

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

>>

The baseline is the electricity produced by the renewable generating unit multiplied by an emission coefficient (measured in tCO₂e/MWh) calculated in a transparent and conservative manner as the weighted average emissions (in tCO₂e/MWh) as described in registered PDD.

$$BE_y = EG_y * EF_y$$

Where,

BE is baseline emissions in year y, tCO₂e

EG_y is the net electricity supplied to the grid in year y and is applied directly from JMR certified by state utility. This value can also be cross-checked from the invoice.

EF_y is the CO₂ emission factor of the grid (0.94022 tCO₂e/MWh fixed ex-ante).

The details of electricity generation during the monitoring period are presented below:

Duration ⁵			EG _{f2,JMR,export}	EG _{f3,JMR,export}	EG _{f2,JMR,Import}	EG _{f3,JMR,Import}
Start		End	MWh	MWh	MWh	MWh
01/01/2012	To	31/01/2012	1,781.20	1,493.60	1.40	1.20
31/01/2012	To	29/02/2012	1,771.60	1,570.80	0.40	0.60
29/02/2012	To	31/03/2012	2,197.20	1,944.80	0.60	0.40
31/03/2012	To	30/04/2012	2,799.80	2,377.00	1.00	1.20
30/04/2012	To	31/05/2012	6,062.40	4,272.20	0.20	0.00
31/05/2012	To	30/06/2012	6,295.40	4,529.00	1.00	0.80
30/06/2012	To	31/07/2012	8,257.20	5,648.00	0.40	0.40
31/07/2012	To	31/08/2012	6,858.00	5,103.60	1.20	0.00
31/08/2012	To	01/10/2012	3,828.00	2,886.00	1.20	0.00
01/10/2012	To	31/10/2012	1,526.40	1,675.20	1.20	2.40
31/10/2012	To	30/11/2012	2,062.80	1,891.20	1.20	1.20
30/11/2012	To	31/12/2012	1,813.95	1,710.22	1.28	1.37
Total			45,253.95	35,101.62	11.08	9.57

Duration			EG _{f2,y} ⁶	EG _{f3,y}	EG _y
Start		End	MWh	MWh	MWh
01/01/2012	To	31/01/2012	945.19	407.04	1,352.23
31/01/2012	To	29/02/2012	934.64	429.53	1,364.18
29/02/2012	To	31/03/2012	1,149.42	500.18	1,649.60
31/03/2012	To	30/04/2012	1,468.46	574.13	2,042.59
30/04/2012	To	31/05/2012	3,317.64	1,063.45	4,381.09
31/05/2012	To	30/06/2012	3,560.22	1,217.45	4,777.67
30/06/2012	To	31/07/2012	4,491.81	1,544.82	6,036.63

⁵ There is no double accounting of emission reduction despite of end date of previous month is the start date of consequent month. The reason for the same is that ABT Meters stored the generation data (cumulatively) and during joint meter reading engineer from state utility used to download the generation data from the energy meter for the last month. For example, generation for the period 01/10/2012 to 01/11/2012 would denote generation data from 00:00 hr of 01/10/2012 to 00:00 hrs of 01/11/2012. These date and timing are also reflected in the Joint Meter Reading prepared by State Utility based on which ER calculation has been prepared. Hence, it is clear that there would not be any double accounting of emission reduction.

⁶ Energy Break-up Report is the source of electricity export and import of electricity for project turbines. For a specific month, the net electricity generation by wind turbines under same feeder have been aggregated. Same is applicable to EG_{f3,y} also

Duration			EG _{f2,y} ⁶	EG _{f3,y}	EG _y
Start		End	MWh	MWh	MWh
31/07/2012	To	31/08/2012	3,743.79	1,446.37	5,190.16
31/08/2012	To	01/10/2012	2,146.54	763.20	2,909.74
01/10/2012	To	31/10/2012	786.29	484.41	1,270.71
31/10/2012	To	30/11/2012	1,062.74	524.55	1,587.29
30/11/2012	To	31/12/2012	998.82	480.44	1,479.25
Total			24,605.56	9,435.57	34,041.13

Baseline Emission (BE_y) = 34,041.13 MWh * 0.94022 tCO₂/MWh
= 32,006.00 tCO₂ (after rounding down)

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

>>

The project activity uses wind power to generate electricity and hence the emissions from the project activity have been taken as zero.

$$PE_y = 0$$

E.3. Calculation of leakage emissions

>>

No leakage has been considered from the project activity as per approved methodology ACM0002.

$$L_y = 0$$

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

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	32,006	0	0	32,006	0	32,006

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 ₂ e)	Amount estimated ex ante (t CO ₂ e)
32,006	29,233

E.6. Remarks on increase in achieved emission reductions

>>

The actual emission reduction achieved during this monitoring period is 9.49% higher than the estimated value as per registered PDD which is due to higher wind availability at site. Thus, project performance is better than envisaged during validation. Wind availability is a natural phenomenon which is beyond the control of PP. However, higher electricity generation ($\pm 10\%$) was already considered during validation in the sensitivity analysis and the incremental generation of (9.49%)

electricity is within the limit of sensitivity analysis. Thus, project is still additional and there is no any change in project design for the project activity.

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • 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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