



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

MONITORING REPORT

Title of the project activity	Chakala wind power project in Maharashtra	
UNFCCC reference number of the project activity	9472	
Version number of the PDD applicable to this monitoring report	07	
Version number of this monitoring report	01	
Completion date of this monitoring report	01/02/2018	
Monitoring period number	01	
Duration of this monitoring period	02/01/2013 to 28/10/2013	
Monitoring report number for this monitoring report	01	
Project participants	Bindu Vayu Urja Private Limited	
Host Party	India	
Sectoral scopes	Sectoral Scope: 1 - Energy industries (renewable / non-renewable sources)	
Applied methodologies and standardized baselines	Methodology: Approved consolidated baseline methodology ACM0002 (Version 13.0.0, EB 67) Standardized baselines: Not Applicable	
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
	NA	74,299
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	61,074	

SECTION A. Description of project activity

A.1. General description of project activity

Bindu Vayu Urja Private Limited (BVUPL) is setting up a 39 MW Wind Power Plant in Chakala village in the state of Maharashtra in India. The project is using 26 number Wind Turbine Generators of Suzlon (Model: S82). Each of these WTGs have a capacity of 1.5 MW. The project would be generating around 77996.41 MWh of electricity per annum. The electricity would be exported to the Maharashtra State Electricity Distribution Company Limited (MSEDCL), which falls under the NEWNE grid. The clean electricity generated from the project would aid in sustainable development of that region. It would also help in reducing greenhouse gas emissions by generating clean and green electricity. As per registered PDD, the amount of GHG reduced due to this project would be 74,307 tCO₂ equivalent, which is equal to 74,307 CERs. The baseline scenario is exactly same as the scenario prevailing before the project activity. 74,299 tCO₂ is the amount of CER generated during this monitoring period.

A.2. Location of project activity

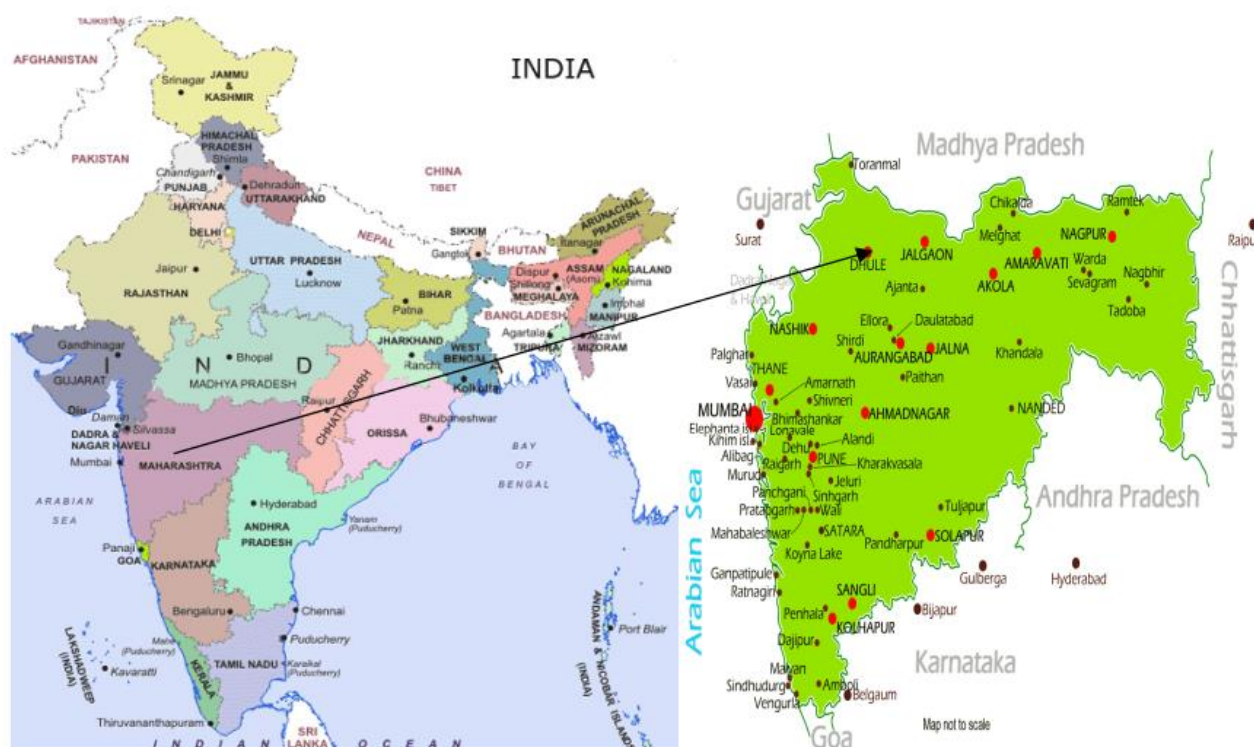
The project is located in Chakala village, Maharashtra state of India. A map of India with the project location is provided below.

The nearest major town is Nandurbar

Nearest airport is Aurangabad

Nearest seaport would be Mumbai.

The nearest railhead is Nandurbar



The geo coordinates of each WTGs are as follows:

Sl.No	State	WTG number	Latitude	Longitude	Date of Commissioning
1	Maharashtra	C-38	21° 15' 30"	74° 19' 48"	30/12/2011
2	Maharashtra	C-39	21° 15' 17.2"	74° 19' 39.4"	30/12/2011
3	Maharashtra	C-40	21° 15' 13.6"	74° 19' 19.7"	30/12/2011
4	Maharashtra	C-41	21° 14' 58.2"	74° 19' 26.7"	30/12/2011

5	Maharashtra	C-42	21° 15' 48.2"	74° 19' 15"	22/02/2012
6	Maharashtra	C-43	21° 15' 35.7"	74° 19' 10.5"	30/12/2011
7	Maharashtra	C-44	21° 15' 23.9"	74° 19' 3.2"	30/12/2011
8	Maharashtra	C-45	21° 15' 10.5"	74° 18' 59.2"	30/12/2011
9	Maharashtra	C-46	21° 14' 57.1"	74° 19' 0.1"	30/12/2011
10	Maharashtra	C-47	21° 15' 46.2"	74° 18' 41.2"	15/02/2012
11	Maharashtra	C-48	21° 15' 33.2"	74° 18' 37.7"	12/01/2012
12	Maharashtra	C-49	21° 15' 20"	74° 18' 36.1"	15/02/2012
13	Maharashtra	C-50	21° 15' 6.6"	74° 18' 38"	03/01/2012
14	Maharashtra	C-51	21° 15' 47.8"	74° 18' 13.7"	20/01/2012
15	Maharashtra	C-52	21° 15' 33.4"	74° 18' 10.2"	20/01/2012
16	Maharashtra	C-53	21° 15' 56.1"	74° 18' 24.4"	22/02/2012
17	Maharashtra	C-54	21° 14' 43.8"	74° 18' 30.9"	30/12/2011
18	Maharashtra	C-55	21° 15' 35.4"	74° 17' 45.6"	30/12/2011
19	Maharashtra	C-56	21° 15' 23.3"	74° 17' 52"	30/12/2011
20	Maharashtra	C-57	21° 15' 15.5"	74° 18' 19"	12/01/2012
21	Maharashtra	C-58	21° 15' 1.1"	74° 18' 9"	30/12/2011
22	Maharashtra	C-59	21° 14' 41.2"	74° 17' 53.4"	15/02/2012
23	Maharashtra	C-60	21° 14' 29.6"	74° 18' 6.5"	15/02/2012
24	Maharashtra	C-63	21° 14' 31"	74° 17' 41.1"	12/01/2012
25	Maharashtra	C-64	21° 14' 23"	74° 17' 48.3"	13/01/2012
26	Maharashtra	C-66	21° 14' 48.5"	74° 16' 37.2"	15/02/2012

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (host Party)	Bindu Vayu Urja Private Limited	No

A.4. Reference to applied methodologies and standardized baselines

Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Reference: Approved consolidated baseline methodology ACM0002 (Version 13.0.0, EB 67)¹

A.5. Crediting period type and duration

Type of crediting period	Fixed
Crediting period from	02/01/2013 – 01/01/2023
Length of the Crediting Period	10 Years
Monitoring period from	02/01/2013 to 28/10/2013
Length of the Monitoring Period	300 Days

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The project is a Greenfield project. In absence of the project an equivalent amount of electricity would have been consumed from the NEWNE grid, which is connected to fossil fuel based power plants. Power generation using wind is achieved by deploying 26 wind turbine generators (WTGs). S82-1.5

¹ <http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L>

MW is designed for generating the optimal power output even at sites with a modest wind speed regime. The wind turbine concept is based on robust design with pitch regulated blade operation, a 3-stage gearbox with 1650 kW rating and flexible coupling to the asynchronous induction generator. The Suzlon Flexi-slip System provides efficient control of the load and power control. The turbine operation is efficiently controlled by the Suzlon controller. These technologies are all well-known in the wind power industry and have proven themselves. The S82-1.5 MW is designed to withstand extreme conditions and operate effectively with low maintenance cost. Wind power generation is an environmentally safe and sound technology that has no harmful emissions during its entire lifetime operations. The WTGs was supplied by Suzlon Energy Limited to the project participant. The components are manufactured in India and assembled at the project site. There is no transfer of technology from outside the host country for this project activity.

Technical specifications of the WTGs are detailed below:

OPERATING DATA	
Rated power	1500 kW
Cut-in wind speed	4 m/s
Rated wind speed	14 m/s
Cut-off wind speed	20 m/s
Survival wind speed	52.5 m/s
Lifetime of the wind turbines	20 years
ROTOR DATA	
Type	3 Blades, Upwind / Horizontal axis
Diameter	82 m
Rotational speed at rated power	15.6 to 18.4 rpm
Rotor blade material	Epoxy bonded fibre glass
Swept area	5281 m ²
Power regulation	Active pitch regulated with Suzlon Flexi Slip System
GEARBOX	
Type	1 planetary stage / 2 helical stages
Ratio	1 : 95.09
Nominal load	1650 kW
Type of cooling	Forced oil cooling lubrication system
GENERATOR	
Type	Single speed induction generator with slip rings, variable rotor resistance via Suzlon Flexi slip system
Speed at rated power	1511 rpm
Rated power	1500 kW
Rated voltage	690 V AC
Frequency	50 Hz
Insulation	Class H
Enclosure	IP 54 / IP 23 (slip ring unit)
Cooling system	Air cooled
TOWER	
Type	Tubular tower (corrosion proof painting on inner and outer surface) with welded steel plates.
Tower Height	76 m
Hub height (including foundation)	Approximately 78.5 m
BRAKING SYSTEM	
Aerodynamic braking	3 Independent systems with blade pitching
Mechanical braking	Hydraulic fail safe disk brake system
YAW SYSTEM	
Type	Active electrical yaw motor
Bearing	Polyamide Slide bearing with gear ring & automatic greasing system
Protection	Cable twist sensor, proximity sensor
PITCH SYSTEM	

Type	3 independent blade pitch control with battery backup for each blade
Operating range	-5 ° to +90 °
Resolution	0.1 to 10 Deg

No events or situations happened during the reported monitoring period that can alter the applicability of the applied methodology.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

There is no request for deviation applied during this monitoring period.

B.2.2. Corrections

There have not been any corrections to project information or parameters fixed at validation during the current monitoring period.

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

There is no changes in the start date of the crediting 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

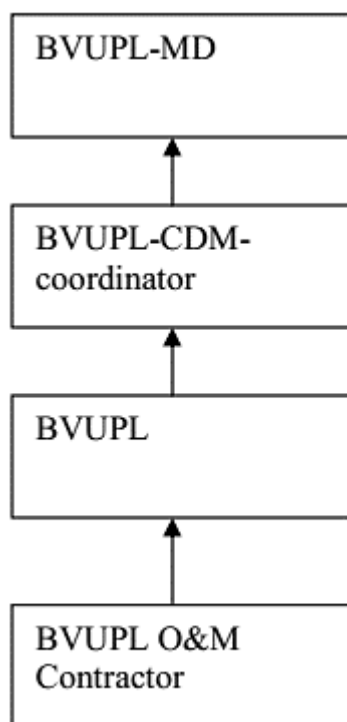
Not Applicable.

B.2.6. Changes to project design

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

SECTION C. Description of monitoring system

The organisational structure of this CDM project activity is as follows:

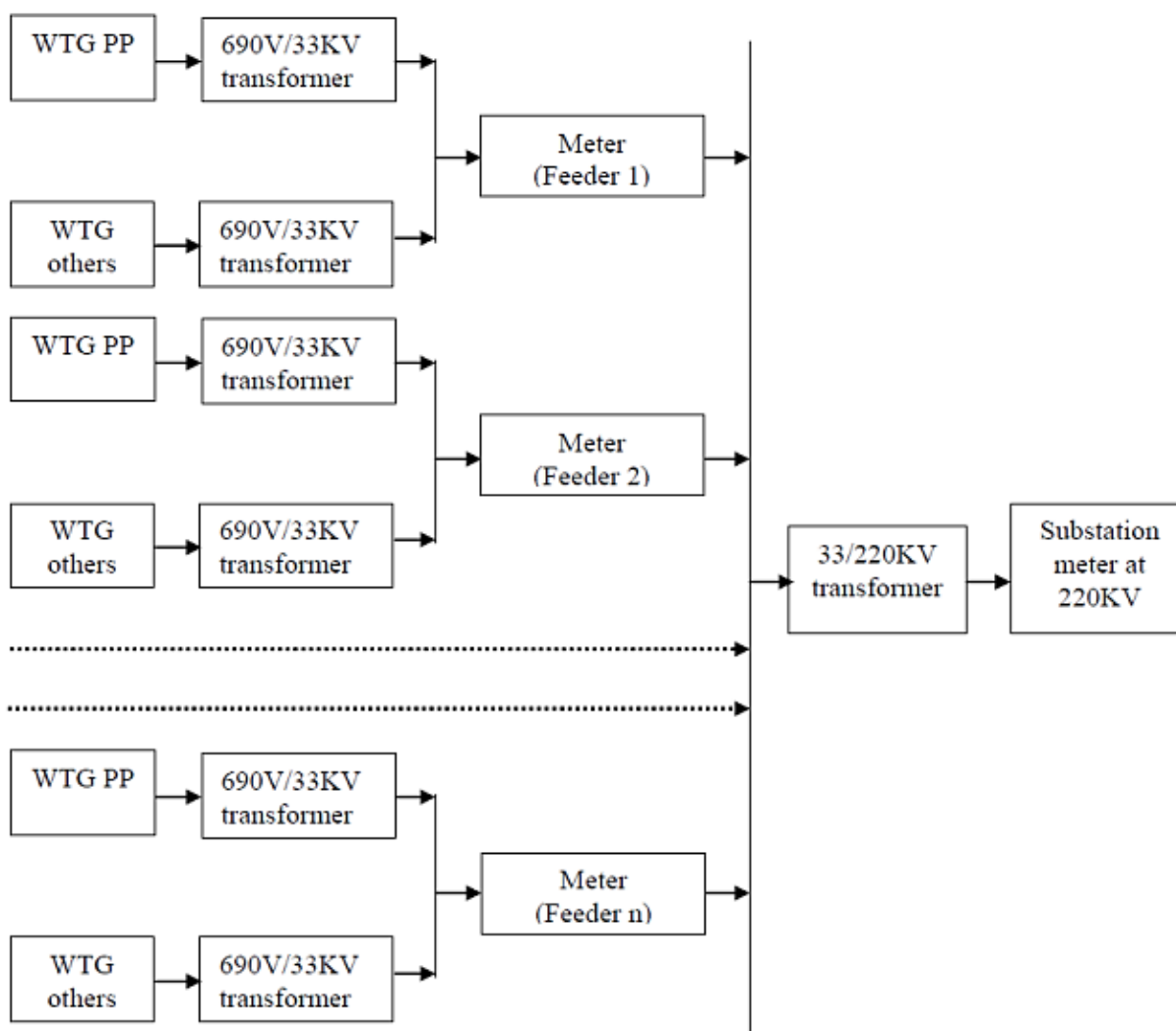


The project proponent has entered into agreement with the WTG- Supplier – Suzlon Energy Limited for the operation and maintenance of WTGs. The WTG supplier has dedicated and technically well equipped O&M team for day-to-day Operation and maintenance of each WTG. O&M contractor provide a monthly report, which includes wind data, generation data, major breakdown events and machine availability. Project Manager is responsible for recording of monthly Joint Meter Readings of export and import. Monthly power export and import data is being sent regularly to CDM coordinator of BVUPL.

Energy generated from the wind farm recorded at the metering point at the HT end of the respective Pooling station. This reading considered as the energy for billing purposes. The WTGs of other PPs is also connected to the pooling station.

The option for considering the meter reading is Main meter in normal practice. In case of fault in the Main meter check Meter reading will be considered. The meter reading is taken jointly by MSETCL (representative of state grid)/ MSEDCL and the company/ its representative every month. The Main meter reading is jointly certified by the above entity. Using the above meter reading MSEDCL provides the credit note on generation through letter. The energy referred in the credit note is considered for raising invoice accordingly payment will be received from MSEDCL. All the meters are calibrated by MSEDCL once a year.

The schematic representation of project WTG and metering arrangement is shown below:



SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	EF _{grid,OM,y}
Unit	tCO ₂ e/MWh
Description	Operating Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data	"Last 3 years average from CO ₂ Baseline Database for Indian Power Sector", version 7 published by the Central Electricity Authority, Ministry of Power, Government of India. ²
Value(s) applied	0.9851
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/parameter	This is required for the calculation of the baseline emissions.
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period

² http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Data/Parameter	EF_{grid, BM,y}
Unit	tCO ₂ e/MWh
Description	Build Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data	"The value for most recent year BM from CO ₂ Baseline Database for Indian Power Sector" version 7 published by the Central Electricity Authority, Ministry of Power, Government of India. ³
Value(s) applied	0.8587
Choice of data or measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002
Purpose of data/parameter	This is required for the calculation of the baseline emissions.
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period

Data/Parameter	EF_{grid, CM,y}
Unit	tCO ₂ e/MWh
Description	Combined Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data	"CO ₂ Baseline Database for Indian Power Sector" version 7 published by the Central Electricity Authority, Ministry of Power, Government of India.
Value(s) applied	0.9527
Choice of data or measurement methods and procedures	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodology: ACM0002, and Tool to Calculate the emission Factor for an Electricity System
Purpose of data/parameter	This is required for the calculation of the baseline emissions.
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_{pj,y}
Unit	MWh/yr
Description	Net Electricity exported to the grid by the project activity in the year y
Measured/calculated/default	Calculated based on the difference between measured values of "export" and "import" on the MSEDCL meter
Source of data	Monthly Joint Meter Readings
Value(s) of monitored parameter	77988.759 MWh
Monitoring equipment	All the meters will be trivector meters, capable of measuring both export and import of electricity. The meters will have an accuracy class of 0.2s The meter reading is taken by MSEDCL officials in presence of BVUPL officials. The measurement is done once a month. Refer to Annex 4 of the registered PDD for more details on apportioning and accounting of transmission loss percentage.
Measuring/reading/recording frequency	Reading frequency on monthly basis
Calculation method (if applicable)	Delivered/Net electricity supplied to the MSEDCL is calculated based on the difference between measured values of "export" and "import" on the MSEDCL meter and the percentage transmission loss incurred in the transmission line between the project and the interconnection point (i.e. substation).

³ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

QA/QC procedures	The quantity of net electricity supplied will be cross-verified from the invoices raised on MSEDCL by the project proponent and the readings available from the meter available at site. The meters is calibrated annually as per the metering code by MSEDCL. The PP has no control over the calibration of the meters.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	Data will be archived for crediting period plus two years after the end of Crediting period.

Data/Parameter	EG_{exp,y}
Unit	MWh/yr
Description	Electricity exported from each WEG of the project activity during the year y
Measured/calculated/default	Calculated based on the difference between measured values of “export” and “import” on the MSEDCL meter
Source of data	Monthly Joint Meter Readings
Value(s) of monitored parameter	78226.052 MWh
Monitoring equipment	All the meters will be trivector meters, capable of measuring both export and import of electricity. The meters will have an accuracy class of 0.2s The meter reading is taken by MSEDCL officials in presence of BVUPL officials. The measurement is done once a month. Refer to Annex 4 of the registered PDD for more details on apportioning and accounting of transmission loss percentage.
Measuring/reading/recording frequency	Continuous measuring and at least monthly recording
Calculation method (if applicable)	Delivered/Net electricity supplied to the MSEDCL is calculated based on the difference between measured values of “export” and “import” on the MSEDCL meter and the percentage transmission loss incurred in the transmission line between the project and the interconnection point (i.e. substation).
QA/QC procedures	The quantity of net electricity supplied will be cross-verified from the invoices raised on MSEDCL by the project proponent and the readings available from the meter available at site. The meters will be calibrated annually as per the metering code by MSEDCL. The PP has no control over the calibration of the meters.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	Data will be archived for crediting period plus two years after the end of Crediting period.

Data/Parameter	EG_{imp,y}
Unit	MWh/yr
Description	Electricity imported from the grid by the project activity during the year y.
Measured/calculated/default	Calculated based on the difference between measured values of “export” and “import” on the MSEDCL meter
Source of data	Monthly Joint Meter Readings
Value(s) of monitored parameter	237.293
Monitoring equipment	All the meters will be trivector meters, capable of measuring both export and import of electricity. The meters will have an accuracy class of 0.2s The meter reading is taken by MSEDCL officials in presence of BVUPL officials. The measurement is done once a month. Refer to Annex 4 of the registered PDD for more details on apportioning and accounting of transmission loss percentage.
Measuring/reading/recording frequency	Continuous measuring and at least monthly recording

Calculation method (if applicable)	Delivered/Net electricity supplied to the MSEDCL is calculated based on the difference between measured values of “export” and “import” on the MSEDCL meter and the percentage transmission loss incurred in the transmission line between the project and the interconnection point (i.e. substation).
QA/QC procedures	The quantity of net electricity supplied will be cross-verified from the invoices raised on MSEDCL by the project proponent and the readings available from the meter available at site. The meters will be calibrated annually as per the metering code by MSEDCL. The PP has no control over the calibration of the meters.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	Data will be archived for crediting period plus two years after the end of Crediting period.

Data/Parameter	E_{WTG,i, y}
Unit	MWh
Description	Quantity of Electricity generated by the individual WTGs of the PP in year y
Measured/calculated/default	Measured
Source of data	WTG Controller meter reading
Value(s) of monitored parameter	80937.929 MWh
Monitoring equipment	Each WTG of provided by Suzlon will be equipped with a controller that continuously measures the electricity generated by the WTG. These reading are recorded online by the technology supplier. Refer to Annex 4 of the registered PDD for more details on the calculation procedure. Calibration Frequency: The WTG controller does not require calibration as per the specification provided by the technology supplier
Measuring/reading/recording frequency	Continuous measuring and at least monthly recording
Calculation method (if applicable)	Each WTG of provided by Suzlon will be equipped with a controller that continuously measures the electricity generated by the WTG. These reading are recorded online by the technology supplier.
QA/QC procedures	The quantity of electricity generated by the individual WTG is being crosschecked with the online tracking system provided by the technology supplier.
Purpose of data/parameter	Cross checking with the net electricity generation.
Additional comments	Data will be archived for crediting period plus two years after the end of Crediting period.

D.3. Implementation of sampling plan

No sampling is required for the current monitoring period.

SECTION E. Calculation of emission reductions or net anthropogenic removals

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

According to the approved methodology ACM0002 Emission Reductions are calculated as:-

$$ER_y = BE_y - PE_y$$

Where,

ER_y = Emission reductions in year y (t CO₂e)

BE_y = Baseline emissions in year y (t CO₂)

PE_y = Project emissions in year y (t CO₂e)

The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where,

BE_y = Baseline emissions in year y (tCO₂)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO₂/MWh)

$$EG_{PJ,y} = EG_{facility,y}$$

Where,

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

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

As the project activity is wind power project, project emissions are zero and the resulting emission reduction is as follows.

Therefore,

$$ER_y = BE_y$$

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

$$BE_y = 77,988 \times 0.9527$$

$$BE_y = 74,299 \text{ tCO}_2$$

E.3. Calculation of leakage emissions

As per ACM0002, no leakage has been considered for the calculation of emission factor.

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	74,299	0	0	0	74,299	74,299

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)
74,299	61,074

E.6. Remarks on increase in achieved emission reductions

From E.5 above, we can observe that actual emission reduction for the monitoring is higher than estimated emission reductions by 21.66% due the change in expected wind flow patterns that is not in control of the Project participant. There is no change in project design of project activity. Also it is to be noted that with increased actual PLF, the IRR remains within benchmark and do not have any adverse impact on additionality.

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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.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		