



Monitoring report form (Version 03.2)

Monitoring report

Title of the project activity	75MW wind power project in Maharashtra by Essel Mining Industries Limited
Reference number of the project activity	1115
Version number of the monitoring report	01
Completion date of the monitoring report	24-03-2014
Registration date of the project activity	01-02-2008
Monitoring period number and duration of this monitoring period	Monitoring Period: 06; Duration: 02/01/2013 to 01/01/2014 (both days included)
Project participant(s)	M/s Essel Mining Industries Limited (EMIL)
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope : 01 Applied Methodology : ACM0002 (Version 6), "Consolidated baseline methodology for grid connected electricity generation from renewable sources"
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	118,203 tCO ₂
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	104,686 tCO ₂
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	0 tCO ₂
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	104,686 tCO ₂

SECTION A. Description of project activity**A.1. Purpose and general description of project activity**

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The project activity is a 75MW wind power project, comprising of 60 WTGs of 1250 KW each) which has been set up in three stages at Dhule and Nandurbar districts of Maharashtra, India. The project activity involves generation of clean electrical energy by harnessing the kinetic energy of wind.

In the absence of the project activity, an equivalent amount of electricity would have been generated from the power plants connected to the grid, majority of whom are based on fossil fuels. The entire power generated is being exported to the state grid maintained by Maharashtra State Electricity Board (MSEB) grid which is a part of NEWNE Grid (formerly known as Western Regional Grid). The electricity generated by wind turbine machines is exported to the connected substations through feeders. At the project site, in addition to WTGs owned by EMIL, there are other WTGs owned by other customers connected to the same feeders and substations and having a common metering facility at each feeder. There is an apportioning procedure as provided in the Power Purchase Agreement with the MSEDCL (MSEB) for apportioning the electricity generated by the WTG(s) with respect to their owner. This apportioning of the net electricity supplied to grid becomes the basis for subsequent invoicing and consequently for calculating the emission reductions from the project activity. The apportioning approach was further approved by CDM EB on 09/05/2010 in the form of revised monitoring plan (RMP). The details of such apportioning are provided in Section C below.

The commissioning details are given below:

Stages	Total Capacity	Commissioning dates
Stage I	15MW	<ul style="list-style-type: none"> ▪ 6 WTGs on 25-03-2005 ▪ 6 WTGs on 31-03-2005
Stage II	30MW	<ul style="list-style-type: none"> ▪ 8 WTGs on 20-09-2005 ▪ 15 WTGs on 29-09-2005 ▪ 1 WTG on 30-09-2005
Stage III	30MW	<ul style="list-style-type: none"> ▪ 4 WTGs on 09-12-2005 ▪ 7 WTGs on 05-01-2006 ▪ 13 WTGs on 07-02-2006

The total Emission reduction achieved in the current monitoring Period (Monitoring Period: 06) from 02/01/2013 to 01/01/2014 is 104,686 tCO₂e.

The total emission reductions achieved in the previous monitoring periods are tabulated below.

Monitoring period	Emission reduction achieved (tCO ₂ e)
01/02/2008 to 02/02/2009	99,201
03/02/2009 to 01/01/2011	197,865
02/01/2011 to 02/01/2012	96,913
03/01/2012 to 01/08/2012	82,890
02/08/2012 to 01/01/2013	28,138

Being completely commissioned, all the three phases of the project activity were continually operative during the Monitoring period. The plant witnessed major outages (both forced and planned), the details of which are given in Section B.1 of this report.

A.2. Location of project activity

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The following are the details of the location of the project activity :

- (a) Host party : India
- (b) Region/ State/ Province, etc. : Maharashtra, India
- (c) City/ Town/ Community, etc. : Dhule and Nandurbar

The project is located in the Dhule and Nandurbar districts of Maharashtra, India. Dhule is one of the good wind potential areas of the state. Wind farm site is about four hours drive from Diamond city – Surat (Gujarat), the nearest city from the site. The nearest railway station is Nandurbar (50 km) and Chalisgaon (50 km). Nearest airports are Aurangabad/ Baroda (250 km).

- (d) Physical/ Geographical location :

The following are the GPS co-ordinates:

Sr. No.	Location No	Latitude (N)	Longitude (E)
1	K—14	21° 10'	74° 19'
2	K—17	21° 10'	74° 19'
3	K—21	21° 11'	74° 19'
4	K—24	21° 11'	74° 19'
5	K—33	21° 11'	74° 20'
6	K—34	21° 11'	74° 20'
7	K—35	21° 11'	74° 20'
8	K—36	21° 11'	74° 20'
9	K—37	21° 11'	74° 20'
10	K—38	21° 11'	74° 20'
11	K—39	21° 11'	74° 20'
12	K—40	21° 11'	74° 20'
13	K—46	21° 12'	74° 19'
14	K—48	21° 11'	74° 20'
15	K—50	21° 11'	74° 19'
16	K—79	21° 12'	74° 21'
17	K-107	21° 13'	74° 19'
18	K-112	21° 13'	74° 20'
19	K-167	21° 13'	74° 17'
20	K-168	21° 13'	74° 17'
21	K-176	21° 13'	74° 17'
22	K-201	21° 11'	74° 16'
23	K-203	21° 11'	74° 16'
24	K-204	21° 12'	74° 15'
25	K-205	21° 12'	74° 16'
26	K-206	21° 12'	74° 15'
27	K-209	21° 12'	74° 15'
28	K-212	21° 12'	74° 15'
29	K-215	21° 12'	74° 16'
30	K-216	21° 12'	74° 15'
31	K-218	21° 12'	74° 16'
32	K-219	21° 13'	74° 15'
33	K-220	21° 13'	74° 15'
34	K-221	21° 13'	74° 15'

35	K-222	21° 13'	74° 15'
36	K-227	21° 13'	74° 16'
37	K-352	21° 14'	74° 20'
38	K-353	21° 14'	74° 20'
39	K-354	21° 14'	74° 21'
40	K-355	21° 14'	74° 21'
41	K-356	21° 14'	74° 20'
42	K-360	21° 14'	74° 21'
43	K-362	21° 14'	74° 20'
44	K-363	21° 14'	74° 21'
45	K-364	21° 14'	74° 21'
46	K-365	21° 14'	74° 20'
47	K-366	21° 14'	74° 21'
48	K-368	21° 15'	74° 21'
49	K-370	21° 14'	74° 20'
50	K-371	21° 15'	74° 20'
51	K-372	21° 15'	74° 21'
52	K-374	21° 15'	74° 20'
53	K-377	21° 15'	74° 20'
54	K-378	21° 15'	74° 21'
55	K-379	21° 15'	74° 20'
56	K-381	21° 15'	74° 21'
57	K-382	21° 15'	74° 20'
58	K-385	21° 15'	74° 21'
59	K-386	21° 16'	74° 21'
60	K-388	21° 16'	74° 21'

A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	M/s Essel Mining Industries Limited (EMIL) (Private)	Yes

A.4. Reference of applied methodology

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

Reference: Approved consolidated baseline methodology ACM0002/ Version 06

<http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT>

Sectoral Scope: 01

Tools: Tool to calculate the emission factor for an electricity system version 01

A.5. Crediting period of project activity

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The crediting period is from 01/02/2008 to 31/01/2018 (10 years, fixed)
 Starting Date of Crediting Period: 01/02/2008

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

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The total capacity of the project activity is 75 MW consisting of 60 machines of 1.25 MW each. The commissioning details are given below:

Stages	Total Capacity	Commissioning dates
Stage I	15 MW	<ul style="list-style-type: none"> 6 WTGs on 25-03-2005 6 WTGs on 31-03-2005
Stage II	30 MW	<ul style="list-style-type: none"> 8 WTGs on 20-09-2005 15 WTGs on 29-09-2005 1 WTG on 30-09-2005
Stage III	30 MW	<ul style="list-style-type: none"> 4 WTGs on 09-12-2005 7 WTGs on 05-01-2006 13 WTGs on 07-02-2006

Details of the Wind Turbine Generators:

Serial No.	Location No.	Generator No.	Date of Commissioning
Stage I			
1	K14	478673	25-03-2005
2	K17	479432	31-03-2005
3	K21	479433	31-03-2005
4	K24	479247	31-03-2005
5	K33	479249	31-03-2005
6	K34	478680	25-03-2005
7	K35	479157	25-03-2005
8	K36	478702	25-03-2005
9	K37	478861	25-03-2005
10	K38	478862	25-03-2005
11	K39	479158	31-03-2005
12	K40	478930	31-03-2005
Stage II			
13	K219	64016841	29-09-2005
14	K220	64017874	29-09-2005
15	K221	64018485	29-09-2005
16	K222	64015302	29-09-2005

17	K216	64020221	29-09-2005
18	K168	64019647	29-09-2005
19	K227	64015942	29-09-2005
20	K167	5134897	20-09-2005
21	K209	5136457	20-09-2005
22	K212	5136465	20-09-2005
23	K215	64011924	20-09-2005
24	K201	64015940	29-09-2005
25	K203	64019648	29-09-2005
26	K204	64018482	29-09-2005
27	K205	470663	29-09-2005
28	K218	64017529	30-09-2005
29	K206	5136502	29-09-2005
30	K46	5136502	20-09-2005
31	K48	64017874	29-09-2005
32	K50	64015302	29-09-2005
33	K112	5136461	20-09-2005
34	K176	64017129	29-09-2005
35	K107	64014828	20-09-2005
36	K79	480645	20-09-2005
Stage III			
37	K356	64021776	09-12-2005
38	K362	64021435	09-12-2005
39	K364	64021773	09-12-2005
40	K365	64021434	09-12-2005
41	K352	64021431	05-01-2006
42	K353	64022374	05-01-2006
43	K354	64021775	05-01-2006
44	K360	64021432	05-01-2006
45	K363	64022375	05-01-2006
46	K366	64021774	05-01-2006
47	K368	64022239	05-01-2006
48	K355	64026133	07-02-2006
49	K370	64027704	07-02-2006
50	K371	64022243	07-02-2006
51	K372	64022244	07-02-2006
52	K374	64022377	07-02-2006
53	K377	64026127	07-02-2006
54	K378	64022241	07-02-2006
55	K379	64026703	07-02-2006
56	K381	64020225	07-02-2006
57	K382	64026704	07-02-2006
58	K385	64025701	07-02-2006
59	K386	64026128	07-02-2006
60	K388	64021777	07-02-2006

The following is the description of the installed technology and equipment:

Rotor Diameter	69.1m
Installed electrical output	1250 kW
Cut-in wind speed	3 m/s
Rated wind speed	12 m/s
Cut out wind speed	20 m/s
Rotor swept area	3750 m ²
Rotational speed	13.2 / 19.8 rpm
Rotor material	GRP
Regulation	Pitch
Generator	Asynchronous Generator, 4 / 6 poles
Rated output	250 / 1250 kW
Rotational speed	1010 / 1515 rpm
Operating voltage	690 V
Frequency	50 Hz
Protection	IP 56
Insulation class	H
Cooling system	Air cooled
Gear box	3 stage gear box, 1 planetary and 2 helical
Manufacturer	Winenergy
Gear ratio	77.848
Nominal load	1390 kW
Type of cooling	Oil cooling system
Yaw drive system	4 active electrical yaw motors
Yaw bearing	Polyamide slide bearing
Safety system	
Aerodynamic brake	3 times independent pitch regulation
Mechanical brake	Spring power disc brake, hydraulically
Control unit	Microprocessor controlled, indicating actual
	Operating conditions, UPS back-up system
Design standards	GL/ IEC

The project activity was in operation continuously with regular maintenance and inspection.
The following were the major breakdowns during the Monitoring period:

WTG No	Breakdown Period (Start Date)	Breakdown Period (End Date)	Period (days)	Remarks
K112	19-08-2013	29-12-2013	133	Main bearing failure
K382	01-04-2013	29-04-2013	30	Fluid coupling problem
K382	05-05-2013	14-05-2013	10	Fluid coupling problem
K168	08-10-2013	17-10-2013	10	Material Shortage

K365	19-07-2013	31-07-2013	13	Material Shortage
K377	26-07-2013	09-08-2013	15	Material Shortage

The above breakdowns had no impact on the applicability of the methodology. The project activity was in operation continuously with regular maintenance and inspection. There were no replacements or exchange of any major equipment during the monitoring period which may impact the applicability of the methodology or the revised monitoring plan. The calibration details of energy meters are given below in table B.1.a below. The monitoring plan of the registered PDD had been revised which was approved by UNFCCC on 09/05/2010.

B.2. Post registration changes

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

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Not applicable

B.2.2. Corrections

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Not applicable

B.2.3. Permanent changes from registered monitoring plan or applied methodology

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Not applicable

B.2.4. Changes to project design of registered project activity

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Not applicable

B.2.5. Changes to start date of crediting period

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Not applicable

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

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Not applicable

SECTION C. Description of monitoring system

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As per the applied monitoring methodology to the project, the project participants need to monitor the following parameters on continuous basis to monitor the net electricity EG_y supplied from the project activity:

$EG_{GENTOTAL,i}$ = Total Electricity exported to MSEB (MSEDCL) facility by all WTGs (WTGs of project proponent as well as of other promoters) connected to the feeder i (in kWh).

$EG_{AUXTOTAL,i}$ = Total Electricity imported by all WTGs (WTGs of project proponent as well as of other promoters) connected to the feeder i from MSEB (MSEDCL) (in kWh).

$EG_{CONTROLLER,i,j}$ = Electricity generation at the controller of individual WTG, j, of the project proponent connected to feeder i (in kWh).

$EG_{CONTROLLERTOTAL,i}$ = Total electricity generation at the controller of all WTGs (WTGs of project proponent as well as of other promoters) connected to the feeder i (in kWh).

$EG_{GEN,v,i}$ = Total electricity generation by the WTGs of the project proponent connected to the feeder, i (apportioned) (in kWh).

$EG_{AUX,v,i}$ = Auxiliary consumption by the WTGs of the project proponent connected to the feeder, i (apportioned) (in kWh).

$EG_{GEN,y}$ = Total electricity generation by all the wind turbines of project proponent (in kWh)

$EG_{AUX,y}$ = Auxiliary consumption by all the wind turbines of the project proponent (in kWh)

Now,

$$EG_{GEN,y,i} = (\sum EG_{CONTROLLER,i,i} / EG_{CONTROLLERTOTAL,i}) * EG_{GENTOTAL,i}$$

$$EG_{AUX,y,i} = (\sum EG_{CONTROLLER,i,i} / EG_{CONTROLLERTOTAL,i}) * EG_{AUXTOTAL,i}$$

Then,

$$EG_{GEN,y} = \sum EG_{GEN,y,i}$$

$$EG_{AUX,y} = \sum EG_{AUX,y,i}$$

Where,

i - represents the feeders.

j - represents the WTGs of the project proponent.

The net electricity supply is calculated as

$$EG_y = EG_{GEN,y} - E_{AUX,y}$$

The monitoring of $EG_{GEN,y}$ and $EG_{AUX,y}$ would be as per the details provided in the Article 11 of the Power Purchase Agreement signed between the MSEB and EMIL.

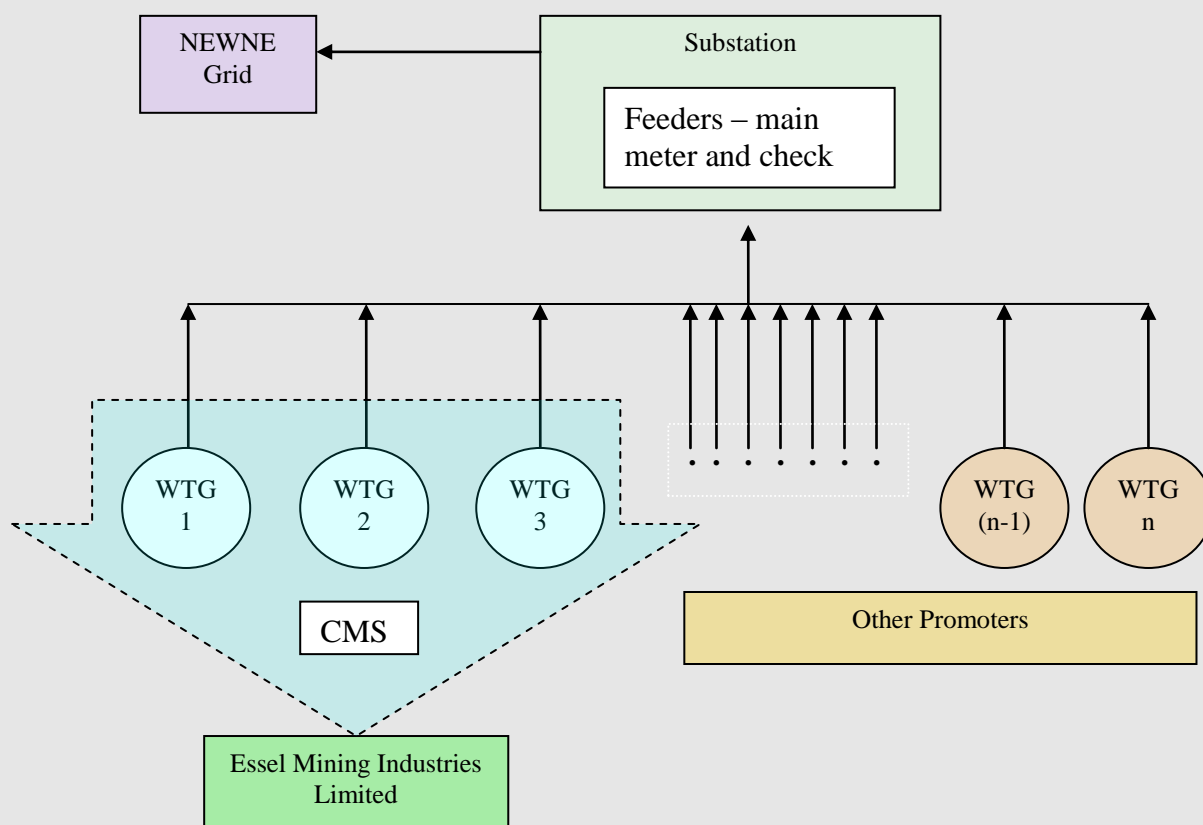
As per Article 11, section 11.05 of PPA, *"Wherever more than one Power Producer(s) are delivering energy produced by them using common evacuation system and through the common Metering equipment, then they shall identify a common agency responsible for joint meter reading with MSEB. The Joint Meter Reading taken at the common evacuation system shall be supported by meter readings of individual power producers using such common evacuation system. Based on this breakup, limited to energy delivered, the power generated from individual power plant shall be certified by MSEB"*.

The apportioning of electricity generated by the entire wind farm is entirely under the jurisdiction of the electricity board. The project proponent has no role in computing and furnishing the apportioned electricity generated for themselves or any other promoter. The above calculation for deriving the apportioned electricity generated by the project proponent has been included only to bring clarity to the apportioning and overall monitoring procedure followed by the project proponent for the project activity.

Diagrammatic Representation:

The single line diagram below is a depiction of metering point (i.e. one monitoring point) for one feeder where a set of WTGs which are part of the project activity (i.e. owned by EMIL) and a set of WTGs which are not part of the project activity (i.e. owned by other promoters), are connected to., Similar to this depiction, all sixty (60) WTGs are connected to eleven (11) metering points, through eleven (11) feeders, which are located at four (4) connected substations. Each metering point (i.e. monitoring point) consists of one main meter and one check meter.

A comprehensive single line diagram showing the arrangement of all metering points, all feeders and all connected substations associated with the project activity, is outlined and set out as Appendix 1 to this document. This is to further submit that the comprehensive line diagram is showing the latest metering arrangement for the project activity which was existing during this monitoring period. As declared in section B.1 above, the metering arrangement has been changed during this monitoring period due to replacement of meters, and it may change in the subsequent monitoring period(s), also, which is beyond the control of the project participant. Again as explained in the Section B.1, these changes in the metering arrangement by changing the meters do not impact the applicability of the methodology.



Analytical representation:

EG_{GEN,y}

Let us assume there are 'n' WTGs,

The power generated from individual power plant (meter readings of individual power producers hereafter referred to as controller generation of each WTG) be X_i .

Therefore,

Controller generation for WTG 1 = X_1

Controller generation for WTG 2 = X_2

Controller generation for WTG n = X_n

Now, $X_1 + X_2 + X_3 + \dots + X_n = X$ (say)

Let the energy delivered (*Joint Meter Reading taken at the common evacuation system*) be Y

then as per article 11 of the PPA,

Y_i , electricity generation of each WTG at (S/s feeder) is equal to the ratio of respective controller generation at that WTG and total controller generation of all WTGs connected to the feeder (*common evacuation system*) multiplied by the total net generation (S/s feeder) Therefore,

$$Y_i = (X_i/X) \cdot Y$$

The operation and maintenance of the wind farm has been outsourced to Suzlon. All the WTGs at the site are monitored from the Central Monitoring Station (CMS) at the wind farm, where electricity generation from each WTG is continuously monitored. The CMS at the wind farm reports to the main CMS at Pune, where the daily generation report is prepared and sent to EMIL by the respective CRM (Customer Relationship Management) manager.

The electricity generation reports on joint meter reading are generated by MSEDCL and sent to EMIL through Suzlon (O&M service provider) on monthly basis. Upon receipt of reports, EMIL generates invoices on sale of electricity and sends to MSEDCL via Suzlon. Thereafter, MSEDCL makes payments against the invoices within 3 months directly to EMIL.

Table for detailed description of energy meters used for monitoring of $EG_{GENTOTAL,i}$ and $EG_{AUXTOTAL,i}$ - Table B.1. a:

Sl. No	Main Meter No	Check Meter No	Feeder No	Accuracy Class	Frequency of calibration/testing ¹	Sub Station	Validity of last calibration	Dates of Calibration/Testing	Due date of Calibration/Testing
1	4725791	4763795	Jamde 9	0.2	Annually	Jamde	25-09-2013	21-10-2013	21-10-2014
2	4738077	4738074	Jamde 7	0.2	Annually	Jamde	04-10-2013	21-10-2013	21-10-2014
3	4862465	4725796	Jamde 3	0.2	Annually	Jamde	25-09-2013	21-10-2013	21-10-2014
4	4725800	4725804	Jamde 2	0.2	Annually	Jamde	25-09-2013	21-10-2013	21-10-2014
5	4725799	4725805	Jamde 11	0.2	Annually	Jamde	25-09-2013	21-10-2013	21-10-2014
6	4738079	4738067	Jamde 8	0.2	Annually	Jamde	25-09-2013	21-10-2013	21-10-2014
7	4725784	4738059	Jamde 15	0.2	Annually	Jamde	04-10-2013	21-10-2013	21-10-2014
8	4961777	4961748	Valve VII	0.2	Annually	Valve	05-10-2013	21-10-2013	21-10-2014
9	14796472	14796471	Gangapur 6	0.2	Annually	Gangapur	25-05-2013	21-10-2013	21-10-2014
10	4890559	4725809	Jamde 12	0.2	Annually	Jamde	25-09-2013	21-10-2013	21-10-2014
11	4890557	4738078	Jamde 16	0.2	Annually	Jamde	04-10-2013	21-10-2013	21-10-2014

QA/QC procedures:

Essel Mining & Industries Ltd has established, documented and implemented Integrated Management Systems. The company maintains and continually improves the effectiveness of QMS, EMS and OHSMS in accordance with the requirements of ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007. The company has developed "Documentation structure" and it comprises of:

- Level1- Manual
- Level 2- Process approach and Procedures
- Level 3- Specifications, Process Flow Diagrams, Aspect and Hazard Register, Legal Register, Emergency Plan, Work Instructions and Management Programmes
- Level 4- Formats, Registers, Tags, Labels, Files and Records

Integrated Management Systems Manual describes the organization structure with responsibilities; and measures for documentation, implementation & control of the system. Integrated Management Procedures provide information and instructions for achieving and maintaining functional controls, meeting the requirements of International Standard ISO9001: 2000, ISO 14001:2004 & OHSAS 18001:2007 and the organization's IMS Policy. Head of the departments (HODs) effectively implement these procedures into practice, involving all personnel concerned.

Roles and Responsibilities:

The entire operation and maintenance of the project activity has been outsourced to Suzlon, which is also the

¹ Calibration frequency of 1 year has been mentioned in the Power Purchase Agreement signed between MSEDCL and project proponent

equipment supplier. The monitoring of export and import of electricity would be as per the details provided in the Article 11 of the Power Purchase Agreement signed between the MSEB and EMIL, which clearly identifies the following:

Metering and recording process of power generation and consumption data

Calibration of metering instruments

Validation of data

Recording and approving authority

EMIL has outsourced the operations and monitoring the performances of the WTGs to Suzlon Infrastructure Services Limited who sends daily and monthly performance records to EMIL. All the WTGs at the site are connected to a Central Monitoring Station of Suzlon being operated from Pune wherein data are directly captured through digital system. The captured data are then directly uploaded to the CRM (customer relationship management) system. From CRM the daily generation reports are directly sent to EMIL on a daily basis. A CRM manager deputed by Suzlon, is responsible for the monitoring of the WTGs. EMIL has daily communication with CRM manager. The electricity generation reports on joint meter reading are generated by MSEDCCL and send to EMIL through Suzlon (O&M service provider) on monthly basis.

SECTION D. Data and parameters

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

Data / Parameter:	$EF_{OM,y}$
Unit:	tCO ₂ /MWh
Description:	Operating Margin emission factor for western regional grid
Source of data:	Computed from data sourced from Website of Central Electricity Authority of India
Value(s) applied:	0.99 tCO ₂ /MWh
Purpose of data:	For Baseline Emission calculation.
Additional comment:	Calculated as per ACM0002 with 3years vintage (2002-2003, 2003-2004, 2004- 2005) data obtained from CEA database on CO ₂ baseline for Indian Power Sector. Computed once during PDD finalization (ex-ante). Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.

Data / Parameter:	$EF_{BM,y}$
Unit:	tCO ₂ /MWh
Description:	Build Margin emission factor for western regional grid
Source of data:	Computed from data sourced from Website of Central Electricity Authority of India
Value(s) applied:	0.78 tCO ₂ /MWh
Purpose of data:	For Baseline Emission calculation.
Additional comment:	Calculated as per ACM0002 with vintage (2004-2005) data obtained from CEA database on CO ₂ baseline for Indian Power Sector. Computed once during PDD finalization (ex-ante). Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.

Data / Parameter:	$EF_{BM,y}$
Unit:	tCO ₂ /MWh
Description:	Build Margin emission factor for western regional grid

Source of data:	Computed from data sourced from Website of Central Electricity Authority of India
Value(s) applied:	0.78 tCO ₂ /MWh
Purpose of data:	For Baseline Emission calculation.
Additional comment:	Calculated as per ACM0002 with vintage (2004-2005) data obtained from CEA database on CO ₂ baseline for Indian Power Sector. Computed once during PDD finalization (ex-ante). Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.

Data / Parameter:	EF _y
Unit:	tCO ₂ /MWh
Description:	Combine Margin CO ₂ emission factor for western regional grid
Source of data:	Estimated figure based on 75% of OM and 25% of BM values calculated using data obtained from CEA database on CO ₂ baseline emission factor for Indian Power Sector.
Value(s) applied:	0.940 tCO ₂ /MWh
Purpose of data:	Calculated 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”. Computed once during PDD finalization. (ex-ante)
Additional comment:	Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	EG _y
Unit:	MWh/yr
Description:	Net Electricity supplied to MSEB facility
Measured/ Calculated / Default:	Calculated
Source of data:	Joint Meter Readings (JMRs) and Invoices available at Project site and at EMIL Corporate Office
Value(s) of monitored parameter:	111368.317 (Details as per table D-3)
Monitoring equipment:	This is calculated on the basis of continuously measured data and monthly recording. The monitoring of EG _{GEN,y} and EG _{AUX,y} are as per the details provided in the Article 11 of the Power Purchase Agreement signed between the MSEB and EMIL which clearly identifies the following: <i>Metering and recording process of power generation and consumption data</i> <i>Calibration of metering instruments</i> <i>Validation of data by both the parties</i> <i>Recording and approval from authorised personnel</i>

Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	As per Section C above and detail calculation is given in ER computation sheet.
QA/QC procedures:	<p>Uncertainty level of data: Low; This data has been cross referred with the invoices raised to MSEB by EMIL and payment against the invoice.</p> <p>We have also calculated the EGy (Net Electricity supplied to MSEDCL facility) based on the apportioning formulae provided in the approved RMP (in line with the Annex 1 of PPA) and results of the apportioning formulae are provided in the ER computation sheet (for each WTG)</p>
Purpose of data:	Baseline emission calculation
Additional comment:	<p>EMIL has outsourced the operation and monitoring the performance of the WTGs to Suzlon Infrastructure Services Limited who sends daily and monthly performance records² to EMIL.</p> <p>Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.</p>

Data / Parameter:	EG_{GENTOTAL,i}
Unit:	KWh
Description:	Total Electricity exported to MSEB (MSEDCL) facility by all WTGs (WTGs of project proponent as well as of other promoters) connected to the feeder, i.
Measured/ Calculated / Default:	Measured
Source of data:	Monthly Generation Report obtained from Suzlon Infrastructure Services Limited
Value(s) of monitored parameter:	33,99,72,254 (Details as per table D-3)
Monitoring equipment:	<p>The measurement is done through the energy meters, having accuracy class of 0.2s, for each feeder at the grid sub-station. The meters are duly approved, tested and sealed by the electricity board. The meter details (Sr. No., calibration details, etc) are provided in Section C above.</p> <p>Monthly readings are taken jointly by the electricity board and the authorized representative of the project proponent. These readings are furnished by the electricity board in the master JMR³.</p> <p>Details as per Table B.1.a above</p>
Measuring/ Reading/ Recording frequency:	Continuous measuring and monthly recording

² Daily performance report provides details about gross electricity generation at the controller for each WTG while monthly performance record provides details about net electricity generation (apportioned value) by all the WTGs of the project proponent.

³ Master JMR is issued by MSEDCL to Suzlon Energy Limited for the entire windfarm, wherein, monthly energy generation details for all the promoters are mentioned. This report is not under the jurisdiction of the project proponent and available only at the plant site.

Calculation method (if applicable):	Not applicable
QA/QC procedures:	Uncertainty level of data: Low; As per the power purchase agreement, the electricity board carries out the calibration and maintenance of meters. Calibration is done annually.
Purpose of data:	Baseline emission calculation
Additional comment:	EMIL has outsourced the operation and monitoring the performance of the WTGs to Suzlon Infrastructure Services Limited who sends daily and monthly performance records to EMIL. Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.

Data / Parameter:	EG_{AUXTOTAL,i}
Unit:	KWh
Description:	Total Electricity imported from MSEB (MSEDCL) by all WTGs (WTGs of project proponent as well as of other promoters) connected to the feeder, i.
Measured/ Calculated / Default:	Measured
Source of data:	Monthly Generation Report obtained from Suzlon Infrastructure Services Limited
Value(s) of monitored parameter:	15,05,302 (Details as per table D-3)
Monitoring equipment:	The measurement is done through the energy meters, having accuracy class of 0.2s, for each feeder at the grid sub-station. The meters are duly approved, tested and sealed by the electricity board. The meter details (Sr. No., calibration details, etc) are provided in Section C above. Monthly readings are taken jointly by the electricity board and the authorized representative of the project proponent. These readings are furnished by the electricity board in the master JMR. Details as per Table B.1.a above
Measuring/ Reading/ Recording frequency:	Continuous measuring and monthly recording
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Uncertainty level of data: Low; As per the power purchase agreement, the electricity board carries out the calibration and maintenance of meters. Calibration is done annually.
Purpose of data:	Baseline emission calculation
Additional comment:	EMIL has outsourced the operation and monitoring the performance of the WTGs to Suzlon Infrastructure Services Limited who sends daily and monthly performance records to EMIL. Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.

Data / Parameter:	EG_{CONTROLLER,i,j}
Unit:	KWh
Description:	Electricity generation at the controller of individual WTG, j, of the project proponent connected to feeder, i.
Measured/ Calculated / Default:	Measured
Source of data:	Monthly Generation Report obtained from Suzlon Infrastructure Services Limited
Value(s) of monitored parameter:	11,53,63,744 (Details as per table D-3)
Monitoring equipment:	The measurement is done through the controller at each WTG. Recording of the same is done at the Central Monitoring Station (CMS) in the windfarm. This data is provided to MSEDCL on a monthly basis for computation of electricity generation by individual promoters. All the WTGs in the windfarm are monitored from the CMS.
Measuring/ Reading/ Recording frequency:	Continuous measuring and monthly recording
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Uncertainty level of data: Low; This data can be cross referred with the JMR issued by MSEDCL (MSEDCL) to EMIL.
Purpose of data:	Baseline emission calculation
Additional comment:	EMIL has outsourced the operation and monitoring the performance of the WTGs to Suzlon Infrastructure Services Limited who sends daily and monthly performance records to EMIL. Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.

Data / Parameter:	EG_{CONTROLLERTOTAL,i}
Unit:	KWh
Description:	Total of electricity generation at the controller of all WTGs (WTGs of project proponent as well as of other promoters) connected to the feeder, i).
Measured/ Calculated / Default:	Measured
Source of data:	Monthly Generation Report obtained from Suzlon Infrastructure Services Limited.
Value(s) of monitored parameter:	35,00,81,608 (Details as per table D-3)

Monitoring equipment:	<p>The measurement is done through the controller at each WTG. Recording of the same is done at the Central Monitoring Station (CMS) in the windfarm. This data is provided to MSEDCL on a monthly basis for computation of electricity generation by individual promoters. All the WTGs in the windfarm are monitored from the CMS.</p> <p>This data is the summation of electricity generation at the controller of all WTGs (WTGs of project proponent as well as of other promoters) connected to the feeder, i. Monthly recording of the same is done by Suzlon at the CMS.</p>
Measuring/ Reading/ Recording frequency:	Continuous measuring and monthly recording
Calculation method (if applicable):	Not applicable
QA/QC procedures:	<p>Uncertainty level of data: Low;</p> <p>This data can be verified with the master JMR for the entire windfarm issued by MSED (MSEDCL) to Suzlon.</p>
Purpose of data:	Baseline emission calculation
Additional comment:	<p>EMIL has outsourced the operation and monitoring the performance of the WTGs to Suzlon Infrastructure Services Limited who sends daily and monthly performance records to EMIL.</p> <p>Records to be archived for 12 years from the start of the crediting period either on paper or in electronic media.</p>

Monitored Results:

The details of the net electricity generated from the project activity for the monitoring period is as given in table below:

Month	EG _{CONTROLLER, TOTAL, i} (kWh)	EG _{GEN, TOTAL, i} (kWh)	EG _{AUX, TOTAL, i} (kWh)	EG _{CONTROLLER, i, j} (kWh)	Total Export (kWh)	Total Import (kWh)	Net Net Electricity supplied to MSEB facility (kWh)	Net Electricity supplied to MSEB facility (kWh) - based on apportioned value from formula as per approved RMP
Jan '13	9019825	8551700	180832	2965950	2804652	60460	2744192	2744194
Feb '13	11005276	10508780	182170	3661035	3493662	62203	3431459	3431462
March '13	14283015	13670260	156920	4692362	4488740	51550	4437190	4437188
April '13	34398791	33537100	66110	11381232	11077196	20874	11056322	11056316
May '13	71768075	70280060	2656	24178340	23632766	946	23631820	23631825
June '13	43481881	42426640	70658	14274979	13910895	23833	13887062	13887060
July '13	66263278	64780274	3582	21470079	20959396	1982	20957414	20957417
Aug '13	52343053	50971640	2308	17257718	16788906	1348	16787558	16787564
Sept '13	28619116	27770340	145378	9388731	9098472	48121	9050351	9050350

Oct '13	10144812	9554060	215204	3244813	3055129	67720	2987409	2987411
Nov '13	4969447	4488340	191064	1625973	1462756	70120	1392636	1392631
Dec'13	3785039	3433060	288420	1222532	1105262	100358	1004904	1004900
Total	350081608	339972254	1505302	115363744	111877832	509515	111368317	111368319

D.3. Implementation of sampling plan

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Not Applicable

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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$$BE_y = EG_y \times EF_y$$

where,

BE_y = Baseline Emissions due to displacement of electricity during the year y (in tons of CO₂)

EG_y = Net units of electricity substituted in the grid during the year y (in MWh)

EF_y = Emission Factor of the grid (in tCO₂/ MWh) and

y is any year within the crediting period of the project activity

Carbon dioxide emission factor as per the baseline adopted, $EF_y = 0.940$ tCO₂/MWh

Net Electricity supplied to MSEB facility, EG_y (taken from JMR issued by MSEDCL) = 11,13,68,317 kWh

Also, the Net Electricity supplied to MSEB facility (EG_y) is calculated as per the apportioning formulae mentioned in the approved RMP (the application of apportioning formulae and the detailed calculations are shown in the ER computation sheet) and based on the apportionment formulae;

Net Electricity supplied to MSEB facility (EG_y) = 11,13,68,319 kWh

Considering the conservative approach, the lower of the above two calculation as been considered in the ER computation (the difference in the value from the two approach (value directly taken from the JMR issued by MSEDCL or calculation of the EG_y based on apportioning formulae as mentioned in the approved RMP) is because the JMR contains only whole numbers).

Hence, Net electricity supplied to MSEB facility taken for calculation purpose = 11,13,68,317 kWh

Baseline emissions is

$$BE_y = EG_y \times EF_y = 11,13,68.317 \text{ MWh} \times 0.940 \text{ tCO}_2/\text{MWh} = 1,04,686 \text{ tCO}_2\text{e (rounded down)}$$

(Detailed calculation is given in ER computation sheet)

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

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As per applied Methodology and registered PDD, Project Emissions, $PE_y = \text{NIL tCO}_2\text{e}$

E.3. Calculation of leakage

>>

As per applied Methodology and registered PDD, Leakage Emissions, L_y = NIL tCO₂e

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO ₂ e)
Total	1,04,686	0	0	1,04,686

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO₂e)	1,18,203	1,04,686

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

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The actual value of emission reductions achieved for the current monitoring period is 11.4 % lower than the estimated value in the PDD. This is primarily due to the seasonal nature of wind power projects and the difference is only due to variation in wind patterns.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO₂e)	0	1,04,686

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
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