



## Monitoring report form (Version 03.2)

### Monitoring report

<b>Title of the project activity</b>	Renewable Energy Wind Power Project in Rajasthan
<b>Reference number of the project activity</b>	5090
<b>Version number of the monitoring report</b>	01
<b>Completion date of the monitoring report</b>	12/02/2014
<b>Registration date of the project activity</b>	28/02/2012
<b>Monitoring period number and duration of this monitoring period</b>	02 (01/01/2013 – 31/01/2014; including first and last days of monitoring period.)
<b>Project participant(s)</b>	Vish Wind Infrastructure LLP
<b>Host Party(ies)</b>	India
<b>Sectoral scope(s) and applied methodology(ies)</b>	Sectoral Scope: 1, ACM0002, version 12.1
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	53,070
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	46,024
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)</b>	0
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).</b>	46,024

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

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The purpose of the project activity is to utilize renewable wind energy for generation of electricity. Project activity is the installation of green field energy production using wind as a source of power generation. In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the NEWNE, which are/ will be predominantly based on fossil fuels. Whereas the operation of Wind Energy Convertors (WEG's) is emission free and no emissions occur during the lifetime of the project activity.

The project consists of 37 machines of Enercon make E-53 type WEGs of 800KW capacity each totalling to the capacity of 29.6 MW. The WEGs generates 3-phase power at 400V, which is stepped up to 33 kV and further transmitted to Enercon Sub-station. From Enercon substation electricity is further evacuated to the Rajasthan regional electricity grid which is part of the NEWNE (Northern, Eastern, Western and North-Eastern) grid in India. The clean and green electricity supplied by the project will aide in sustainable growth in the region. Vish Wind Infrastructure LLP (hereafter referred as 'VWIL') is the project owner and project participant for the project activity.

The first machine under the project activity was commissioned on 23 September 2010 and last machine under the project activity was commissioned on 26 January 2011. The expected operational lifetime of the project is for 20 years.

The total emission reductions achieved under current monitoring period (01/01/2013 to 31/01/2014) is 46,024 tCO<sub>2</sub>e.

**A.2. Location of project activity**

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The Project is located in Jaisalmer & Jodhpur district in the Indian State of Rajasthan. The Project is spread across Ugawa, Korwa & Kita villages of Jaisalmer District and Salodi & Jelu Villages of Jodhpur district in the Rajasthan state of India. The nearest railway station for project activity located at Ugawa, Korwa & Kita villages (District-Jaisalmer) is Jaisalmer approximately at a distance of 50 Kms from site, while the nearest railway station for project activity located at Salodi & Jelu villages (District-Jodhpur) is Jodhpur approximately at a distance of 50 Kms.

Individual WEG location numbers and coordinates are detailed out in below table:-

S.No.	WEG Loc No.	Village	District	State	Latitude	Longitude
1	41	Ugawa	Jaisalmer	Rajasthan	N 26° 37'51.5"	E 70° 57'51.2"
2	39	Ugawa	Jaisalmer	Rajasthan	N 26° 37'41.5"	E 70° 57'33.5"
3	38	Ugawa	Jaisalmer	Rajasthan	N 26° 37'35.4"	E 70° 57'38.7"
4	37	Ugawa	Jaisalmer	Rajasthan	N 26° 37'33.3"	E 70° 57'45.8"
5	36	Ugawa	Jaisalmer	Rajasthan	N 26° 37'27.8"	E 70° 57'49.9"
6	35	Ugawa	Jaisalmer	Rajasthan	N 26° 37'21.6"	E 70° 57'53.9"
7	34	Ugawa	Jaisalmer	Rajasthan	N 26° 37'17.7"	E 70° 57'59.2"
8	33	Ugawa	Jaisalmer	Rajasthan	N 26° 37'14.6"	E 70° 58'05.7"
9	31	Ugawa	Jaisalmer	Rajasthan	N 26° 37'11.3"	E 70° 58'13.3"
10	30	Ugawa	Jaisalmer	Rajasthan	N 26° 37'01.5"	E 70° 58'13.1"
11	50	Korwa	Jaisalmer	Rajasthan	N 26° 37'47.9"	E 70° 56'27.3"
12	53	Korwa	Jaisalmer	Rajasthan	N 26° 38'06.1"	E 70° 56'13.0"
13	121	Kita	Jaisalmer	Rajasthan	N 26° 41'05.2"	E 71° 00'07.2"
14	582	Kita	Jaisalmer	Rajasthan	N 26° 41'58.8"	E 71° 01'44.9"
15	601	Kita	Jaisalmer	Rajasthan	N 26° 40'24.0"	E 71° 04'28.4"

16	602	Kita	Jaisalmer	Rajasthan	N 26° 40'12.2"	E 71° 04'31.5"
17	603	Kita	Jaisalmer	Rajasthan	N 26° 40'08.5"	E 71° 04'19.3"
18	153	Jelu	Jodhpur	Rajasthan	N 26° 31'22.3"	E 72° 46'00.2"
19	154	Jelu	Jodhpur	Rajasthan	N 26° 31'24.2"	E 72° 45'52.0"
20	155	Jelu	Jodhpur	Rajasthan	N 26° 31'31.9"	E 72° 45'46.5"
21	156	Jelu	Jodhpur	Rajasthan	N 26° 31'44.0"	E 72° 45'39.4"
22	157	Jelu	Jodhpur	Rajasthan	N 26° 31'49.0'	E 72° 45'33.5"
23	158	Jelu	Jodhpur	Rajasthan	N 26° 31'50.8"	E 72° 45'25.1"
24	159	Jelu	Jodhpur	Rajasthan	N 26° 31'55.7"	E 72° 45'17.0"
25	161	Jelu	Jodhpur	Rajasthan	N 26° 31'22.1"	E 72° 45'03.8"
26	162	Jelu	Jodhpur	Rajasthan	N 26° 31'26.4"	E 72° 45'15.8"
27	163	Jelu	Jodhpur	Rajasthan	N 26° 31'19.3"	E 72° 45'24.0"
28	164	Jelu	Jodhpur	Rajasthan	N 26° 31'15.2"	E 72° 45'11.9"
29	165	Jelu	Jodhpur	Rajasthan	N 26° 30'49.8"	E 72° 45'18.1"
30	166	Jelu	Jodhpur	Rajasthan	N 26° 30'44.3"	E 72° 45'22.1"
31	167	Jelu	Jodhpur	Rajasthan	N 26° 30'32.8"	E 72° 45'17.4"
32	168	Jelu	Jodhpur	Rajasthan	N 26° 30'36.7"	E 72° 45'40.3"
33	169	Jelu	Jodhpur	Rajasthan	N 26° 30'43.3"	E 72° 45'35.3"
34	10	Salodi	Jodhpur	Rajasthan	N 26 ° 25'35.7"	E 72° 48'32.9"
35	11	Salodi	Jodhpur	Rajasthan	N 26 ° 25'25.2"	E 72 ° 48'35.8"
36	509	Salodi	Jodhpur	Rajasthan	N 26 ° 26'51.1"	E 72 ° 50'44.5"
37	510	Salodi	Jodhpur	Rajasthan	N 26 ° 26'57.7"	E 72 ° 50'35.8"

### 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)	Vish Wind Infrastructure LLP (Private entity)	No

### A.4. Reference of applied methodology

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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 12.1.0, EB 58)

UNFCCC web reference of methodology:

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

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

- Tool to calculate the emission factor for an electricity system – Version 02.2.0

Tool for the demonstration and assessment of additionality – Version 5.2

### A.5. Crediting period of project activity

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Type of crediting period : Fixed  
 Start date of crediting period : 28/02/2012  
 Length of crediting period : 10 years (fixed crediting period)

## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

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The project activity consists of 37 machines (800 kW) of Enercon make E-53. The first machine under the project activity was commissioned on 23 September 2010 and last machine under the project activity was commissioned on 26 January 2011. The commissioning dates for all the machines include in the project activity are given in the table below:

S.No	Village	Dist.	No. of Loc.	Loc. No.	No. of WEGs	Date of Comm.
1	Ugawa	Jaisalmer	1	41	4	23-Sep-10
		Jaisalmer	1	39		23-Sep-10
		Jaisalmer	1	38		23-Sep-10
		Jaisalmer	1	37		23-Sep-10
2	Ugawa	Jaisalmer	1	36	6	23-Sep-10
		Jaisalmer	1	35		23-Sep-10
		Jaisalmer	1	34		23-Sep-10
		Jaisalmer	1	33		23-Sep-10
		Jaisalmer	1	31		23-Sep-10
		Jaisalmer	1	30		23-Sep-10
3	Korwa	Jaisalmer	1	50	2	23-Sep-10
		Jaisalmer	1	53		23-Sep-10
4	Kita	Jaisalmer	1	121	5	30-Sep-10
		Jaisalmer	1	582		30-Sep-10
		Jaisalmer	1	601		30-Sep-10
		Jaisalmer	1	602		30-Sep-10
		Jaisalmer	1	603		30-Sep-10
5	Jelu	Jodhpur	1	153	20	30-Sep-10
		Jodhpur	1	154		30-Sep-10
		Jodhpur	1	155		30-Sep-10
		Jodhpur	1	156		30-Sep-10
		Jodhpur	1	157		30-Sep-10
		Jodhpur	1	158		30-Sep-10
		Jodhpur	1	159		30-Sep-10
		Jodhpur	1	161		30-Sep-10
		Jodhpur	1	162		30-Sep-10
		Jodhpur	1	163		30-Sep-10
		Jodhpur	1	164		30-Sep-10
		Jodhpur	1	165		30-Sep-10
		Jodhpur	1	166		30-Sep-10
		Jodhpur	1	167		30-Sep-10
		Jodhpur	1	168		17-Nov-10
		Jodhpur	1	169		17-Nov-10
	Salodi	Jodhpur	1	10		26-Jan-11
		Jodhpur	1	11		26-Jan-11
		Jodhpur	1	509		26-Jan-11

	Jodhpur	1	510		26-Jan-11
		<b>Total</b>		<b>37</b>	

Enercon operation and maintenance activities are ISO 9001:2008 certified. Referring to the data available it can be inferred that there have not been any major special events for any of the machines that are included in the project activity. As a part of regular maintenance the machines are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly. During the monitoring period there were no events or situations occurred, which may impact the applicability of the methodology.

The project activity consists of 37 WEGs of Enercon make E-53 and each machine capacity is of 800 kW (E-53) totaling to the capacity of 29.6 MW. The WEGs generates 3-phase power at 400V, which is stepped up to 33 kV and connected to 33kV metering points. From 33 kV metering point's electricity transmitted to Enercon Sub-station. At sub-station electricity is step-up to 220 kV. From Enercon substation electricity is further evacuated to the state electricity grid at 220kV. 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 other 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 drawal (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEG 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

Enercon (India) Ltd has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured. Diagram of main component of Enercon make E-53 is shown in below picture:-



Figure: Enercon make E-53 Diagram.

## 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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As per the monitoring plan of the registered PDD (version 6 dated 21 February 2012), 17 WEGs pertaining to the project activity, installed in Jaisalmer district of Rajasthan are connected through 220 kV EIL's pooling substation (220 kV Bhu substation), through 33 kV feeder lines. At EIL pooling substation (220 kV Bhu substation) electricity is stepped up to 220 kV, wherein the backup meter (one main meter) is connected. From EIL pooling substation electricity is transmitted to state utility (Discom) substation (Amarsagar substation) through 220 kV transmission line/ EHV line wherein the billing meter (one main meter) is connected. At Amarsagar substation metering is done at 220 kV side. From Amarsagar substation electricity is further transmitted to NEWNE grid of India.

However on 21 May 2011 based on the instruction of RDPPC, metering point for EIL pooling sub-station (220 kV Bhu substation) is shifted from 220 kV Amarsagar substation to state utility's Akal substation (400 kV GSS substation) and new meters were installed, commissioned and sealed at state utility's Akal substation (400 kV GSS substation) to record the total generation of 220 kV Amarsagar substation with effect from today (21 May 2011).

However the above mentioned change in metering location doesn't impact on applied methodology. These changes are in line with Appendix 1 of the Project Standard (para 5), hence does not require a prior approval from CDM EB. The changes have been addressed in revised PDD (version 7 dated 06 March 2013).

**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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Enercon (India) Limited is O&M contractor for the project activity. Enercon (India) Limited will be responsible for the maintaining all the monitoring data on behalf of Vish Wind Infrastructure LLP in respect of the project activity. Enercon (India) Limited has implemented the management structure for managing the monitored data.

This approved monitoring methodology requires monitoring of the following:

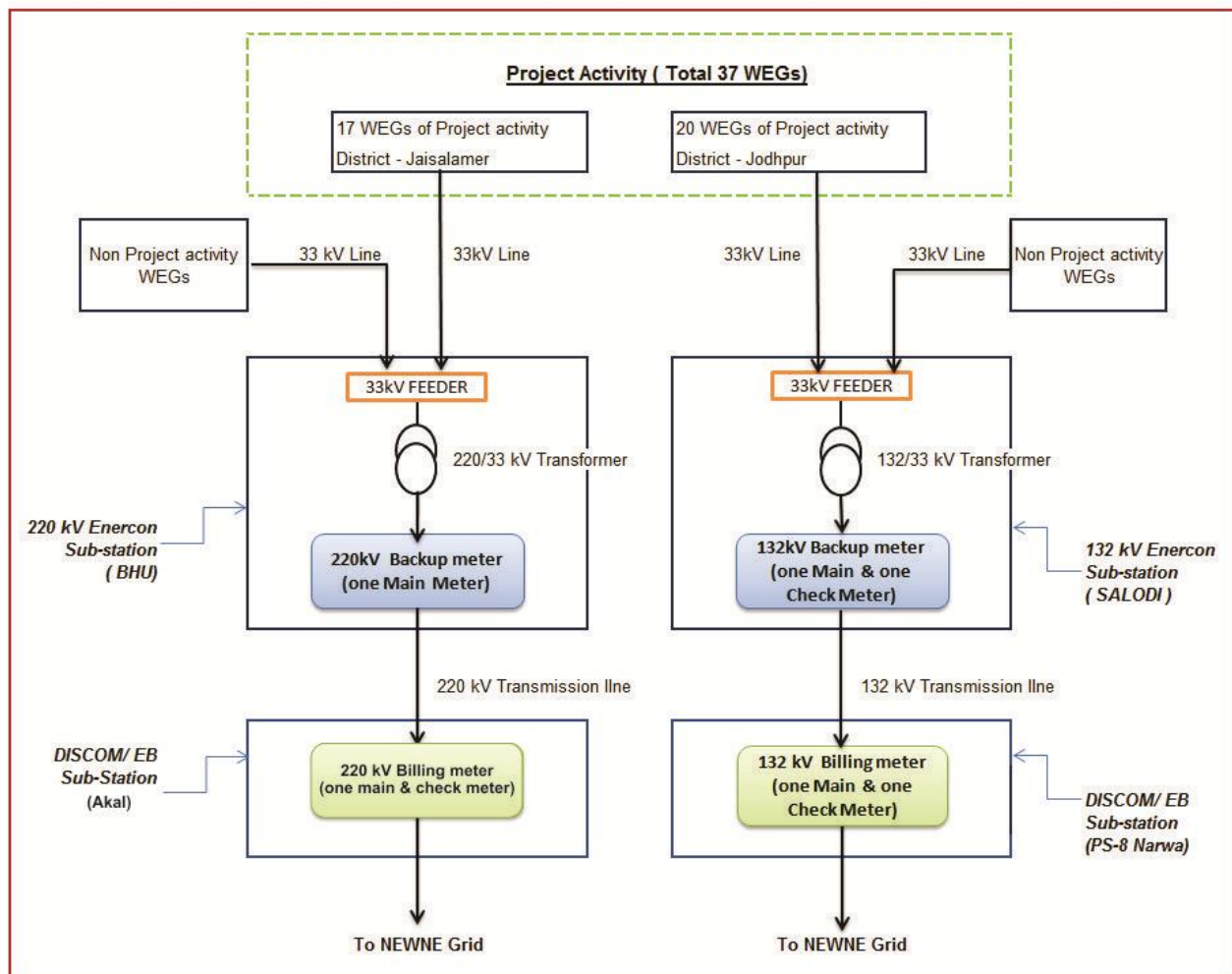
- Net electricity supplied from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

Emission factor of the project activity is fixed *ex ante* hence no further monitoring of this parameter is required. As per ACM0002 leakage need not be considered hence leakage has not been considered for the project activity. Hence, the sole parameter for monitoring is the net electricity supplied by the project activity to the grid.

The Project activity is operated by Enercon (O&M contractor for the project activity) and managed by the PP. The operational and maintenance contract for the project activity is with Enercon, which is an ISO 9001 certified company. Enercon 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.

#### **Calculation of Net Electricity Supplied to the grid by project activity:**

Layout of Metering arrangement for project activity is as follows:-



From the above layout it is clear that project activity WEGs (37Nos) along with WEGs of other customers, who are not the part of project activity are connected to Enercon Sub-stations which are further connected to EB sub-station through EHV line. The detail of metering points are as follows;-

- 1) 17 WEGs of project activity installed in Jaisalmer district is connected through 220kV Enercon (India) Limited (herein after referred as EIL) pooling sub-station (220kV BHU sub-station), through 33kV feeder lines. At EIL pooling sub-station BHU electricity is stepped up to 220kV, wherein the backup meter (one main meter) is connected. From EIL pooling sub-station electricity is transmitted to state utility

(DISCOM) sub-station (AKAL sub-station) through 220kV transmission line/ EHV line wherein the billing meter (one main & one check meter) is connected. At Akal sub-station metering is done at 220kV billing meter. From EB sub-station electricity is further transmitted to NEWNE grid.

- 2) 20 WEGs of project activity installed in Jodhpur district is connected through 132kV Enercon (India) Limited (herein after referred as EIL) pooling sub-station (132kV SALODI sub-station), through 33kV feeder lines. At EIL pooling sub-station SALODI electricity is stepped up to 132kV, wherein the backup meter (one main & one check meter) connected. From EIL pooling sub-station electricity is transmitted to state utility (DISCOM) sub-station (PS-8 Narwa Sub-station) through 132kV transmission line/ EHV line wherein billing meter (one main & one check meter) is connected. At EB sub-station metering is done at 132kV billing meter. From EB sub-station electricity is further transmitted to NEWNE grid.

The net electricity supplied to the grid will be calculated on monthly basis at the EB/DISCOM substations (Akal & PS-8 Narwa) wherein the billing meter is connected. The monthly joint meter readings are taken by the representatives of DISCOM and Enercon (PP's representative) who also signs the JMR. Simultaneously, the monthly joint meter reading of backup meters available at EIL pooling sub-stations (BHU & SALODI) is also taken by representatives of RVPN/DISCOM and Enercon. The copy of JMR at backup meters is available with Enercon.

Since the project activity WEGs are connected through common metering system along with non project activity WEGs of other customers at the main meter, apportioning of electricity export & import as recorded in JMR is being done to calculate the electricity export & import by individual customer's WEGs. Apportioning is being done based on the net electricity generation (Gross Export-Gross Import) recorded at LCS meter installed in individual WEGs.

Based on the monthly JMR reading, which is signed by representative of DISCOM and PP's representative (Enercon); Enercon prepares the monthly breakup generation sheets which indicate the export, import & net electricity supplied by individual customers to the grid. An apportioning procedure is used by PP's representative to arrive at net electricity supplied to the grid by individual investors.

The monthly generation sheet is submitted to both, DISCOM as well as individual investors. PP raises the invoice based on the monthly breakup sheet corresponding to the net electricity generation value indicated in the monthly breakup sheet. DISCOM based on the JMR reading along with monthly breakup sheet prepared by Enercon and the invoice rose by investors, conduct the audit to cross check the net electricity values and in case all the values are found to be correct, DISCOM release the payment against the invoice rose by individual investors.

The values of the net electricity supplied to grid by project activity can be cross checked with invoices raised by the PP on DISCOM and/or RTGS transaction or cheque copy.

#### **Procedure for apportioning:-**

##### **Case 1:- Procedure used by PP's representative to prepare monthly breakup sheets for project activity.**

The monthly JMR reading contains the electricity export, import & net electricity supplied by all the WEGs of project activity as well as non project activity connected to the metering system at DISCOM substation. Hence in order to arrive at the electricity export, import & net electricity supplied by WEGs of the project activity based on the net electricity generation (Gross Export-Gross Import) recorded at LCS meter, following procedure is used by O&M contractor (Enercon):-

As LCS meter measures the net electricity generation (Gross Export-Gross Import) by individual WEG, which is the difference of export and import and doesn't provide individual reading of Export & Import; the apportioning of electricity export & import at recorded at billing meter as indicated in JMR sheet is done based on net electricity generation (Gross Export-Gross Import) of WEGs. This is a standard procedure that is followed in the state of Rajasthan and is accepted by the state DISCOM for payment of tariff invoices.

Electricity exported by all WEGs of project activity is apportioned on the basis of summation of net electricity generation (Gross Export-Gross Import) ( by all the WEGs (j number of WEGs) of project activity, as measured at the controller (LCS meter) at project site and the electricity export recorded at the main meter mentioned in the JMR. The formula used for computing electricity export to the grid by the project activity is as follows:-



Electricity Export to the grid by the Project activity,

$$EG_{\text{Export},y} = \frac{EG_{\text{JMR,Export}} * \sum EG_{\text{Controller}, i}}{\sum EG_{\text{Controller}, i}} \dots\dots\dots(1)$$

As LCS meter measures the net electricity generation (Gross Export – Gross Import) by WEGs and doesn't provide individual reading of Export & Import. Therefore apportioning of export as well as import for all WEG of the project activity is also apportioned on the basis of summation of net electricity generation by all the WEGs (j number of WEGs) of project activity, as measured at the controller (LCS meter) at project site and the electricity import recorded at the main meter mentioned in the JMR. The formula used for computing electricity import from the grid by the project activity is as follows

Electricity Import from the grid by the Project activity,

$$EG_{\text{Import},y} = \frac{EG_{\text{JMR,Import}} * \sum EG_{\text{Controller}, i}}{\sum EG_{\text{Controller}, i}} \dots\dots\dots(2)$$

Wherein,

$\sum EG_{\text{Controller}, j}$  = Summation of net electricity generation by all the WEGs (j number of WEGs) of project activity, as measured at the controller (LCS meter) at project site

$\sum EG_{\text{Controller}, i}$  = Summation of net electricity generation by all WEG (i number of WEGs) of project activity and non-project activity, as measured at the controller (LCS meter) at project site,

$EG_{\text{JMR,Export}}$  = Electricity export by project and non-project recorded at respective billing meters located at DISCOM sub-station. This can be checked from JMR certificates.

$EG_{\text{JMR,Import}}$  = Electricity import by project and non-project recorded at respective billing meters located at DISCOM sub-station. This can be checked from JMR certificates.

$EG_{\text{Export},y}$  = Electricity export by project activity calculated as per formula 1 above

$EG_{\text{import},y}$  = Electricity import by project activity calculated as per formula 2 above.

Therefore net electricity supplied to grid by 37 WEGs of the project activity is calculated as the difference of equation (1) & (2),

$$EG_{\text{Facility},y} = EG_{\text{Export},y} - EG_{\text{Import},y}$$

Even though the above mentioned of apportioning is done by the developer Enercon (PP's representative) and submitted to respective DISCOM, the same undergoes the series of audit by the hierarchy of auditors (Asst. Auditors, divisional auditors & account auditors) and then finally authorised by the Superintending engineer (SE) of the circle office of respective DISCOMs. The above mentioned procedure of apportioning will be done separately for WEGs of project activity installed at Jaisalmer & Jodhpur site.

#### **Case 2:- Apportioning procedure in case the date of verification period doesn't match with the billing cycle dates**

In case the date of project registration is not in line with billing cycle of project activity then the calculation of net electricity supplied to grid for period between date of registration and next date of billing cycle will be

done by PP based on data provided by O&M contractor (Enercon).

Net electricity export to the grid by a WEG @ SEB meter for n no. of days =

(Daily controller net electricity generation (Gross Export-Gross Import) of that WEG for n no. of days)  
x (Total Net generation of that WEG @ SEB main meter for a month)

Monthly controller net electricity generation (Gross Export-Gross Import) of that WEG for that month

#### **Procedure to deal with data uncertainty:**

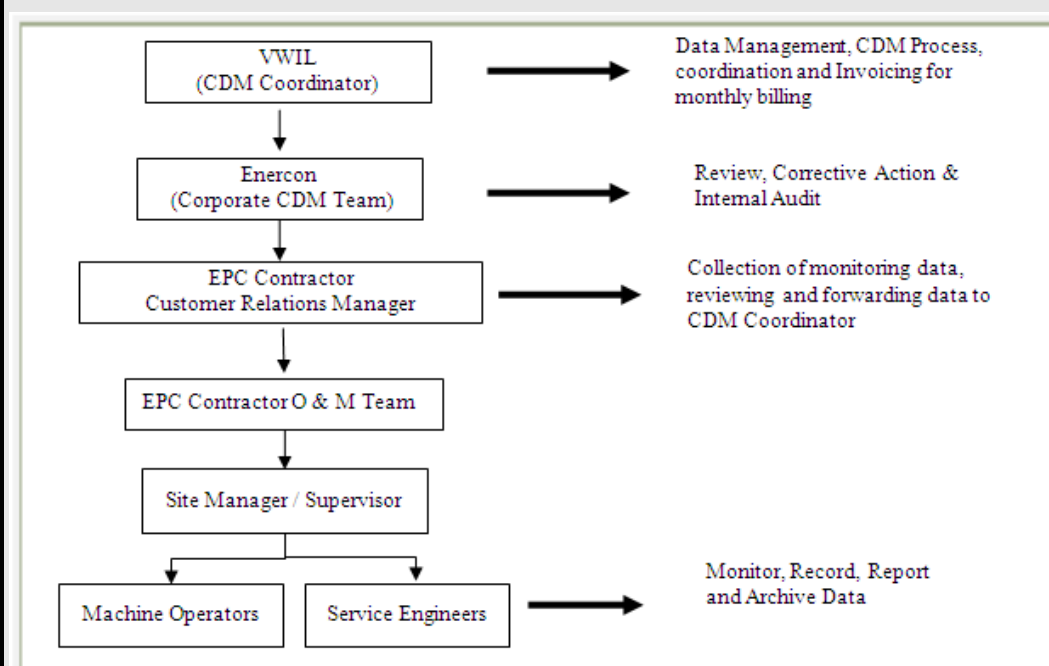
During the annual calibration, if the meter is found to be outside the permissible limits of the error and if that meter readings have been used in JMR, the (-ve) error value would be applied to electricity export and (+ve) error value will be applied to import of electricity from grid to all the JMR values since the date of last calibration. The meter would be replaced immediately with new calibrated meter.

#### **Training and maintenance requirements:**

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 Generators (WEGs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon'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 Enercon Training Academy provides need-based training to meet the training requirements of Enercon 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.

#### **Monitoring roles and responsibilities**

The operational and management structure implemented for data monitoring is as follows:



#### **Meter Test Checking Details:**

The metering equipments were inspected & tested by State Utility. Meter details & calibration details for the

all the main and check meters are as follows:-

Jaisalmer Site (220 KV Feeder Line)				
Location of meter		Akal Sub -station (Electricity board)		Bhu Sub-station (Enercon)
Type of meter		Main Meter	Check Meter	Back up meter
Meter Sr. No.		11068579	11068580	RJB 00050
Meter Make		L&T	L&T	Secure
Accuracy class		0.2%	0.2%	0.2%
Type		All the meters are two-way Tri-vector meters capable of recording import and export of electricity.		
Calibration Details	2012	20-Mar-12	20-Mar-12	20-Mar-12
	2012	26-Dec-12	26-Dec-12	29-Dec-12
	2013	26-Dec-13	26-Dec-13	28-Dec-13

Jodhpur Site (132 KV Feeder Line)					
Location of meter		PS-8 Sub-station (Electricity Board)		Salodi Sub-station (Enercon)	
Type of meter		Main Meter	Check Meter	Backup main meter	Backup check meter
Meter Sr. No.		RJB 00354	RJB 00356	RJB 00358	RJB 00357
Meter Make		Secure	Secure	Secure	Secure
Accuracy class		0.2%	0.2%	0.2%	0.2%
Type		All the meters are two-way Tri-vector meters capable of recording import and export of electricity.			
Calibration Details	2012	16-Mar-12	16-Mar-12	15-Mar-12	15-Mar-12
	2012	20-Dec-12	20-Dec-12	20-Dec-12	20-Dec-12
	2013	19-Dec-13	19-Dec-13	19-Dec-13	19-Dec-13

The main and check meters are tested for accuracy on annual basis by state utility and in case of error; meters are calibrated by state utility. Further during the annual meter testing, all the meters were under the permissible limit of error and accordingly none of the meter was replaced during the current monitoring period.

## SECTION D. Data and parameters

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

Data / Parameter:	$EF_{CM,y}$
Unit:	tCO <sub>2</sub> e/MWh
Description:	Combined Margin Emission Factor of NEWNE Electricity Grid.
Source of data:	<p>Combined Margin Emission Factor (<math>EF_{grid,CM,y}</math>) is calculated as the weighted average of Operating Margin Emission Factor (<math>EF_{grid,OM,y}</math>) and Build Margin Emission Factor (<math>EF_{grid,BM,y}</math>).</p> <p>The "CO<sub>2</sub> Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO<sub>2</sub> Baseline Database for Indian Power Sector" is available at <a href="http://www.cea.nic.in">www.cea.nic.in</a></p>

Value(s) applied:	<p>"CO<sub>2</sub> Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <table border="1"> <tr> <td>Combined Margin Emission Factor (<math>EF_{grid,CM,y}</math>)</td><td>0.9225</td></tr> </table> <p>Refer Annex – 3 for comprehensive calculation of Combined Margin Emission Factor.</p>	Combined Margin Emission Factor ( $EF_{grid,CM,y}$ )	0.9225
Combined Margin Emission Factor ( $EF_{grid,CM,y}$ )	0.9225		
Purpose of data:	Calculation of Baseline Emissions		
Additional comment:	Value is fixed ex-ante for entire crediting period.		

<b>Data / Parameter:</b>	$EF_{OM,y}$
Unit:	tCO <sub>2</sub> e/MWh
Description:	Operating Margin Emission Factor of NEWNE Electricity Grid
Source of data:	<p>"CO<sub>2</sub> Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO<sub>2</sub> Baseline Database for Indian Power Sector" is available at <a href="http://www.cea.nic.in">www.cea.nic.in</a></p>
Value(s) applied:	1.0050
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	Calculated as weighted average of OM and BM emission factor. Value is fixed ex-ante for entire crediting period.

<b>Data / Parameter:</b>	$EF_{BM,y}$
Unit:	tCO <sub>2</sub> e/MWh
Description:	Build Margin Emission Factor of NEWNE Electricity Grid
Source of data:	<p>"CO<sub>2</sub> Baseline Database for Indian Power Sector, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO<sub>2</sub> Baseline Database for Indian Power Sector" is available at <a href="http://www.cea.nic.in">www.cea.nic.in</a></p>
Value(s) applied:	0.6752
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	Value is fixed ex-ante for entire crediting period.

## D.2. Data and parameters monitored

<b>Data / Parameter:</b>	$EG_{facility,y}$
Unit:	MWh (Mega-watt hour)
Description:	Net electricity generation supplied to the grid by the Project activity.
Measured/ Calculated / Default:	Calculated

Source of data:	Generation break-up sheets prepared by the developer <sup>1</sup> (Enercon), which is based on the monthly JMR reading recorded at main meters installed at DISCOM sub-stations and the LCS controller meters (panel meter) reading.
Value(s) of monitored parameter:	Net electricity supplied to the grid by the Project = 49890.778 MWh
Monitoring equipment:	Since it is calculated value, hence not applicable.
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Refer section 'C' (Description of monitoring system) for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	The procedures for calculation of net electricity supplied to grid has been followed as per the provisions of the power purchase agreement and details of calculation method has been explained in monitoring plan under section C of monitoring report.
QA/QC procedures:	Value of $EG_{\text{facility},y}$ can be cross checked with the tariff invoices raised on the DISCOM and/or RTGS transaction or cheque copy. All the billing Main & Backup meters are calibrated by DISCOM annually and the records are available with the representative of PP (Enercon)
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

<b>Data / Parameter:</b>	<b><math>EG_{\text{Export},y}</math></b>
Unit:	MWh (Mega-watt hour)
Description:	Electricity export to the grid by the Project activity.
Measured/ Calculated / Default:	Calculated
Source of data:	Generation break-up sheets prepared by the developer (Enercon), which is based on the monthly JMR reading recorded at main meters installed at DISCOM sub-stations and the LCS controller meters (panel meters) reading
Value(s) of monitored parameter:	=49936.834 MWh
Monitoring equipment:	Since it is calculated value, hence not applicable.
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly. Further all the meters have the capability of continuous measurement of data. Refer section 'C' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	Based on the monthly JMR reading recorded at main meters installed at DISCOM sub-stations and the LCS controller meters (panel meters) readings.
QA/QC procedures:	Value of $EG_{\text{Export},y}$ can be cross checked with the tariff invoices raised on the DISCOM. All the billing & Backup meters are calibrated by DISCOM annually and the records are available with the representative of PP (Enercon).
Purpose of data:	Calculation of Baseline Emissions

<sup>1</sup> As per PPA (refer page 3) developer shall be responsible to set up requisite power injection system in to RVPN/ Discom(s) grid, to take joint meter reading at Common Delivery Point and to furnish breakup of energy supplied by individual Power Producer(s) commensurate with the total energy supplied at Common Delivery Point.

Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.
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<b>Data / Parameter:</b>	<b>EG<sub>Import,y</sub></b>
Unit:	MWh (Mega-watt hour)
Description:	Electricity Import from grid by the Project activity.
Measured/ Calculated / Default:	Calculated
Source of data:	Generation break-up sheets prepared by developer (Enercon), which is based on the monthly JMR reading recorded at main meters installed at DISCOM sub-stations and the LCS controller meter (panel meters) readings
Value(s) of monitored parameter:	=46.056 MWh
Monitoring equipment:	Since it is calculated value, hence not applicable.
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Further all the meters have the capability of continuous measurement of data. Refer section 'C' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	based on the monthly JMR reading recorded at main meters installed at DISCOM sub-stations and the LCS controller meter (panel meters) readings
QA/QC procedures:	Value of EG <sub>Import,y</sub> can be cross checked with the tariff invoices raised on the DISCOM. All the billing & Backup meters are calibrated by DISCOM annually and the records are available with the representative of PP (Enercon).
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years

<b>Data / Parameter:</b>	<b>EG<sub>JMR, Export</sub></b>
Unit:	MWh (Mega-watt hour)
Description:	Electricity export by project activity & non project activity recorded by main meter installed at DISCOM sub-stations
Measured/ Calculated / Default:	Measured
Source of data:	Monthly JMR sheets recorded by representative of both DISCOM & Enercon
Value(s) of monitored parameter:	=708590.609 MWh
Monitoring equipment:	Please refer section 'C' (Description of monitoring system) for the details of meter type, accuracy class, serial number, meter test checking frequency, date of last meter test checking and validity under the heading 'Meter Test Checking Details'

Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly  Further all the meters have the capability of continuous measurement of data.  Refer section 'C' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	-
QA/QC procedures:	All the billing & Backup meters are calibrated by DISCOM annually and the records are available with the representative of PP (Enercon)
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years

<b>Data / Parameter:</b>	<b>EG<sub>JMR, Import</sub></b>
Unit:	MWh (Mega-watt hour)
Description:	Electricity import by project activity & non project activity recorded by main meter installed at DISCOM sub-station
Measured/ Calculated / Default:	Measured
Source of data:	Monthly JMR sheets recorded by representative of both DISCOM & Enercon.
Value(s) of monitored parameter:	=597.647 MWh
Monitoring equipment:	Please refer section 'C' (Description of monitoring system) for the details of meter type, accuracy class, serial number, meter test checking frequency, date of last meter test checking and validity under the heading 'Meter Test Checking Details'
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly  Further all the meters have the capability of continuous measurement of data.  Refer section 'C' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	-
QA/QC procedures:	All the billing & Backup meters are calibrated by DISCOM annually and the records are available with the representative of PP (Enercon).
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years

<b>Data / Parameter:</b>	<b>EG<sub>Controller, i</sub></b>
Unit:	MWh (Mega-watt hour)

Description:	<p>Net electricity generation (Gross Export-Gross Import) by a WEG of project activity or non-project activity, as measured at the controller (LCS meter) at project site. Each WEG has exclusive LCS meter that records net electricity generation (Gross Export-Gross Import) from the WEG (project or non-project).</p> <p>Where,</p> <p>i is any WEG between 1 to j+ k and connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p> <p>j is number of WEGs of project activity connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p> <p>k is number of WEG of non-project activity connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p>
Measured/ Calculated / Default:	Measured
Source of data:	Monthly controller generation report (LCS) sourced from SCADA system installed at project site.
Value(s) of monitored parameter:	Please refer CER calculation sheet for the values of parameter.
Monitoring equipment:	Please refer section 'C' for details of controller meter (LCS).
Measuring/ Reading/ Recording frequency:	<p>Frequency of recording data: Monthly</p> <p>Further all the meters have the capability of continuous measurement of data.</p> <p>Refer section 'C' for an illustration of the provisions for measurement methods.</p>
Calculation method (if applicable):	-
QA/QC procedures:	All the LCS meters are auto calibrated. In case of any fault WEG stops automatically and meter is replaced immediately.
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived in electronic form for crediting period + 2 years.
<b>Data / Parameter:</b>	$\sum EG_{\text{Controller},i}$
Unit:	MWh (Meg -watt hour)



Description:	<p>Summation of net electricity generation (Gross Export-Gross Import) by all WEG (i number of WEGs) of project activity (j number of WEGs) and non-project activity (k number of WEGs), as measured at the controller (LCS meter) at project site. Each WEG has exclusive LCS meter that records net electricity generation (Gross Export-Gross Import) from the WEG (project or non-project).</p> <p>Where,</p> <p>i is any WEG between 1 to j+ k and connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p> <p>j is number of WEGs of project activity connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p> <p>k is number of WEG of non-project activity connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p>
Measured/ Calculated / Default:	Calculated
Source of data:	Monthly controller generation report (LCS) sourced from SCADA system installed at project site.
Value(s) of monitored parameter:	= 734,202.300MWh
Monitoring equipment:	Please refer section 'C' for details of controller meter (LCS).
Measuring/ Reading/ Recording frequency:	<p>Frequency of recording data: Monthly</p> <p>Further all the meters have the capability of continuous measurement of data.</p> <p>Refer section 'C' for an illustration of the provisions for measurement methods.</p>
Calculation method (if applicable):	Please refer section 'C' for calculation procedure.
QA/QC procedures:	All the LCS meters are auto calibrated. In case of any fault WEG stops automatically and meter is replaced immediately.
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived in electronic form for crediting period + 2 years.

<b>Data / Parameter:</b>	$\sum EG_{\text{Controller, j}}$
Unit:	MWh (Mega-watt hour)
Description:	<p>Summation of net electricity generation (Gross Export-Gross Import) by all the WEGs of project activity (j number of WEGs), as measured at the controller (LCS meter) at project site. Each WEG has exclusive LCS meter that records net electricity generation (Gross Export-Gross Import) from the WEG (project or non-project).</p> <p>j is number of WEGs of project activity connected to main meter (JMR/billing meter) at DISCOM substation and backup meter at Enercon substation.</p>
Measured/ Calculated / Default:	Calculated

Source of data:	Monthly controller generation report (LCS) sourced from SCADA system installed at project site.
Value(s) of monitored parameter:	= 51,567.628
Monitoring equipment:	Please refer section 'C' for details of controller meter (LCS).
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Further all the meters have the capability of continuous measurement of data. Refer section 'C' for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	Please refer section 'C' for calculation procedure.
QA/QC procedures:	All the LCS meters are auto calibrated. In case of any fault WEG stops automatically and meter is replaced immediately.
Purpose of data:	Calculation of Baseline Emissions
Additional comment:	The data will be archived in electronic form for crediting period + 2 years.

### D.3. Implementation of sampling plan

&gt;&gt;

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

&gt;&gt;

"The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO<sub>2</sub>e/kWh) calculated in a transparent and conservative manner as the weighted average emissions (in kg CO<sub>2</sub>e/kWh) as described in PDD.

$$BE_y = EG_y * EF_y$$

Where,

**BE<sub>y</sub>** is baseline emissions in year y, tCO<sub>2</sub>e.

**EG<sub>y</sub>** is the net electricity supplied to the grid in year y by project activity.

**EF<sub>y</sub>** is the CO<sub>2</sub> emission factor of the grid (0.9225 tCO<sub>2</sub>e/MWh fixed ex-ante).

#### Baseline Emission Reductions calculation for project activity:-

Duration	Electricity export to the grid by the Project activity [MWh]	Electricity import from grid by the Project activity [MWh]	Net electricity generation supplied to the grid by the Project activity [MWh]	Baseline Emission Factor (tCO <sub>2</sub> e/MWh)	Baseline Emissions (tCO <sub>2</sub> e)
	[EG <sub>Export,y</sub> ]	[EG <sub>Import,y</sub> ]	[EG <sub>facility,y</sub> ]	[EF <sub>y</sub> ]	[BE <sub>y</sub> ] = [EG <sub>facility,y</sub> ] * [EF <sub>y</sub> ]
01/01/2013 – 31/01/2014	49,936.834	46.056	49,890.778	0.9225	46,024

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

&gt;&gt;

Since the project activity is a renewable energy project which generates electricity using wind power and hence does not result in project emissions.

**E.3. Calculation of leakage**

&gt;&gt;

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

**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 <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO <sub>2</sub> e)
<b>Total</b>	46,024	0	0	46,024

**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
<b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b>	53,070	46,024

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

&gt;&gt;

There is marginal change of 13.28% (downside) in the expected and annual emission reductions due to lower PLF achieved during the monitoring period.

**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
<b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b>	0	46,024

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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).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory		
Document Type: Form		
Business Function: issuance		
Keywords: monitoring report, performance monitoring		

**Annex 1****BASELINE INFORMATION**

The Operating Margin data for the most recent three years and the Build Margin data for the NEWNE Region Electricity Grid as published in the CEA database version 5.0 <sup>2</sup> are as follows:

**Simple Operating Margin**

	<b>NEWNE Grid (tCO<sub>2</sub>e/GWh)</b>
Simple Operating Margin – 2006-07	1.0085
Simple Operating Margin – 2007-08	0.9999
Simple Operating Margin – 2008-09	1.0066
Average Operating Margin of last three years	1.0050

**Build Margin**

<sup>2</sup> [http://www.cea.nic.in/reports/planning/cdm\\_co2/cdm\\_co2.htm](http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)

	tCO <sub>2</sub> e/GWh
Build Margin- 2008-09	0.6752

**Combined Margin calculations**

	Weights	tCO <sub>2</sub> e/GWh
Operating Margin	0.75	1.0050
Build Margin	0.25	0.6752
Combined Margin		0.9225

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at [www.cea.nic.in](http://www.cea.nic.in).

**Appendix 1: Summary of monitored parameters**

Description of parameter	Unit	Parameter	Value of Parameter
Electricity export by project activity & non project activity recorded by main meter installed at DISCOM sub-stations	(MWh)	$[EG_{JMR, Export}]$	708,590.609
Electricity import by project activity & non project activity recorded by main meter installed at DISCOM sub-station	(MWh)	$[EG_{JMR, Import}]$	597.647
Summation of Panel Generation by project activity & non project activity recorded at the controller (LCS meter) at project site	(MWh)	$[\sum EG_{Controller,i}]$	734,202.300
Summation of Panel Generation by project activity recorded at the controller (LCS meter) at project site	(MWh)	$[\sum EG_{Controller,j}]$	51,567.628
Electricity export to the grid by the Project activity	(MWh)	$[EG_{Export,y}]$	49,936.834
Net electricity generation supplied to the grid by the Project activity	(MWh)	$[EG_{Import,y}]$	46.056
Net electricity generation supplied to the grid by the Project activity	(MWh)	$[EG_{facility,y}]$	49,890.778
Baseline Emission Factor	(tCO <sub>2e</sub> /MWh)	$[EF_y]$	0.9225
Baseline Emissions	(tCO <sub>2e</sub> )	$[BE_y] = [EG_{facility,y}] * [EF_y]$	46,024
Project Emissions	(tCO <sub>2e</sub> )	$[PE_y]$	0
Emission Reductions	(tCO <sub>2e</sub> )	$[ER_y] = [BE_y] - [PE_y]$	46,024