



Monitoring report form (Version 03.1)

Monitoring report

Title of the project activity	Bundled Wind power project in Jaisalmer (Rajasthan in India) managed by Enercon (India) Ltd.
Reference number of the project activity	0310
Version number of the monitoring report	01
Completion date of the monitoring report	01/03/2013
Registration date of the project activity	29/05/2006
Monitoring period number and duration of this monitoring period	03- from 01/09/2011 to 31/12/2012
Project participant(s)	<ol style="list-style-type: none"> 1. Enercon (India) Limited 2. Netherlands' Ministry of Infrastructure and the Environment (IenM) 3. International Finance Corporation as Trustee of the IFC-Netherlands Carbon Facility (INCaF)
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope: 1, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", ACM0002, version 04
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	123,798
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	79,866

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

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The project activity involves the development and operation of grid-connected wind based electricity generation facilities with aggregate installed capacity of 58.2 MW as per the registered PDD (version 2.0, dated 15/12/2005). Later on, 07 WTGs of the project activity were decommissioned due to which total project capacity was reduced to 54.0¹MW as per the revised PDD (version 6.0, dated 26/04/2012) approved by UNFCCC on 13/07/2012, located within a wind park.

The project activity generates and sells electricity to the RRVPNL under 20 year power purchase agreements (PPAs) under similar tariff. Enercon (India) Limited provides operation and maintenance services under contract to the sponsors for the entire project activity. All the component wind farms have been commissioned, and supplies electricity to the RRVPNL in accordance with the preferential dispatching system.

The project activity involves development, design, engineering, procurement, finance, construction, operation and maintenance of wind energy based electricity generating stations that will provide electricity to the RRVPNL grid under the PPAs.

Apart from the generation of electrical power, the Project also contributes to the following:

- Sustainable development, through utilization of renewable wind resources available in the region where the Project will operate;
- Reduction of Green House Gases, specifically CO₂;
- Rural and Infrastructural development in the areas around the Project;
- Capacity addition to the present installed capacity and increase in the energy availability at places of scarcity;
- Strengthening the countries rural electrification coverage;
- Generation of permanent and temporary employment and production of indirect employment in the area; and
- Project contribution for community development of the local rural area.

The first machine under the project activity was commissioned on 29 September 2003 and last machine under the project activity was commissioned on 30 June 2004. The expected operational lifetime of the project is for 20 years. The total emission reductions achieved under this monitoring period (01 Sep 2011 to 31 Dec 2012) is **79,866 tCO₂**.

A.2. Location of project activity

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The wind farm is located at Soda village, in Jaisalmer District of Rajasthan state in India. The project area is located in a wind zone of geographic location 26°54'N and 70°55'E. The project area extends between 26°40'N latitude and 69°36'E longitude to 26°42'N latitude and 69°38'E longitude. The sites are located at a distance of 5 – 45 km from Jaisalmer, 300 km from Jodhpur by road. The nearest railway station is at Jaisalmer.

A.3. Parties and project participant(s)

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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)	Enercon (India) Limited	No

¹ PP has applied for notification of change in project design and same has been approved by UNFCCC.

Netherlands	'Netherlands' Ministry of Infrastructure and the Environment (IenM)	No
Netherlands	International Finance Corporation as Trustee of the IFC-Netherlands Carbon Facility (INCaF)	No

A.4. Reference of applied methodology

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Baseline Methodology: The approved baseline methodology **ACM0002**, version 04, Sectoral Scope: 1, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", by CDM Meth Panel has been used to determine the baseline emissions and emission reductions due to the project activity.

Monitoring Methodology: Approved monitoring methodology ACM0002, version 04, Sectoral Scope: 1, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources".

A.5. Crediting period of project activity

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01 Jul 04 - 30 Jun 14 (Fixed)

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

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The first machine under the project activity was commissioned on 29 September 2003 and last machine under the project activity was commissioned on 30 June 2004. Commissioning details of individual WTGs has been provided in below table:

S. No.	Name of Customer	No. of M/C	Capacity (MW)	Discom	Commissioning date
1	Enercon Wind Farms (Jaisalmer) Pvt. Ltd.	1	0.6	Jodhpur	26-Mar-04
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	

		1	0.6	Jodhpur	29-Mar-04
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	31-Mar-04
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	18-May-04
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	
		1	0.6	Jodhpur	12-Jun-04
2	Compucom Software Ltd.	2	1.2	Jaipur	10-Mar-04
3	NuPower Renewables Ltd. (Formerly Shree Ram Transport Finance Ltd.)	7	4.2	Ajmer	29-Sep-03
4	BSL Limited	4	2.4	Jaipur	10-Mar-04
5	LA-OPALA - RG Ltd.	1	0.6	Jaipur	10-Mar-04
6	Desai Brothers Ltd	5	3.0	Ajmer	29-Sep-03
7	Hindustan Platinum Pvt. Ltd.	2	1.2	Ajmer	10-Mar-04
8	Dinesh Pouches Ltd-I	3	1.8	Ajmer	29-Sep-03
9	Enercon Wind Farm (Tungbhadra) Pvt Ltd (Formely Venlon Polyester Film Ltd)	3	1.8	Jodhpur	31-Oct-03
10	Enercon Wind Farm (Tungbhadra) Pvt Ltd (Formely .Texmo Industries Ltd.)	2	1.2	Jodhpur	30-Nov-03
11	Enercon Wind Farm (Tungbhadra) Pvt Ltd (Dinesh Pouches Ltd-II)	2	1.2	Jodhpur	24-Dec-03
12	Enercon Wind Farm (Tungbhadra) Pvt Ltd (Formely .Texmo Industries Ltd. -II)	1	0.6	Jodhpur	10-Mar-04
13	Enercon Wind Farm (Tungbhadra) Pvt Ltd (Formely Revathi Equipment Ltd.)	3	1.8	Jodhpur	10-Mar-04
14	Enercon Wind Farm (Tungbhadra) Pvt Ltd (Formely R.K.Premises Pvt. Ltd.)	1	0.6	Jodhpur	3-Mar-04
15	Enercon Wind Farm (Tungbhadra) Pvt Ltd. (Formely R.K.Marbles Pvt. Ltd.)	6	3.6	Jaipur	3-Mar-04
16	Enercon Wind Farm (Tungbhadra) Pvt Ltd. (Supreme Buildestates Pvt. Ltd..)	1	0.6	Jaipur	3-Mar-04
17	Enercon Wind Farm (Tungbhadra) Pvt Ltd. (Premier Buildestates Pvt. Ltd.)	1	0.6	Jaipur	3-Mar-04
18	Enercon Wind Farm (Tungbhadra) Pvt Ltd . (Rennaissance Asset Management Co. Pvt. Ltd.)	2	1.2	Jaipur	21-Jun-04

19	Enercon Wind Farm (Tungbhadra) Pvt Ltd (Texmo Precision Casting)	3	1.8	Ajmer	30-Jun-04
		90	54.0		

Table: 1

Enercon operation and maintenance activities are ISO certified. Referring to the data available it can be inferred that there have not been any major events pertaining to operation of 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.

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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Notification on request of approval of changes has been approved on dated 13 July 2012 by UNFCCC

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

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Notification on request of approval of changes has been approved on dated 13 July 2012 by UNFCCC

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

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Yes, Notification on request of approval of changes has been approved on dated 13 July 2012 by UNFCCC

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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The monitoring methodology is used in conjunction with the adopted baseline methodology (ACM0002), version 04 that is applicable to electricity capacity additions from wind sources.

The methodology requires monitoring of the following:

- Electricity generation from the proposed project activity;
- Operating margin emission factor, if needed based on choice of methodology
- Build margin emission factor of the grid, if needed based on choice of methodology

For the project activity to establish its creditable emission reduction, it has to record the actual electricity generation, which would displace equivalent units of electricity at the operating and build margin of the Northern regional grid. Since the simple OM emission factor is calculated based on a 3 year average, based on the most recent statistics available at the time of PDD preparation, its updation based on ex post monitoring is not required. For BM calculation, option 1 (refer ACM 0002) has been chosen, which is calculated ex ante based on the most recent information, hence its monitoring is also not required. Thus, under the monitoring protocol for the project it is required to:

- Monitor and record the actual units of electricity supplied to the grid by the wind farms

The procedure for allocation of the net electricity exported (EG_v) to the grid is as follows:-

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

The project activity is located at Soda village, in Jaisalmer District of Rajasthan state in India. The WTG's are connected to Amarsagar substation. In addition to the project activity, the wind farms of non project activity are also connected to the Amarsagar substation. Electricity delivered by all these wind farms is metered at a common metering point. The common metering point comprises two main meters i.e. Main meter 1 and Main meter 2 that are installed at 132 kV metering point at the Amarsagar substation. Consequently, the main meter readings reflect the aggregate electricity supplied by all these wind farms, including the project activity and non project activity. The net electricity supplied by individual wind turbines is determined by following a process of allocating the total electricity (recorded at the main meters M1 and M2) to the individual turbines in proportion of the electricity generation recorded by the (Local Control System) LCS meters at the individual wind turbines. LCS meter records the electricity exported by the WTG to the grid which is used for apportioning procedure

The net electricity supplied to the grid will be calculated on monthly basis at the State utility (State utility) substations (Amarsagar) wherein the billing meter is connected. The monthly joint meter readings are taken by the representatives of state utility 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 (Temedari) is also taken by representatives of state utility and Enercon. The copy of JMR at backup meters is available with Enercon.

Since the project activity WTGs are connected through common metering system along with non project activity WTGs of other customers, apportioning of net electricity export & import as recorded in JMR is being done to calculate the electricity export & import by individual customers WTGs. Apportioning² is being done based on the Gross electricity export by WTG as recorded at LCS meter installed in individual WTGs.

Based on the monthly JMR reading, which is signed by representative of state utility and PP's representative (Enercon); Enercon prepares the monthly breakup³ 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, state utility as well as individual investors. PP raises the

² Since LCS meter records the gross electricity export (gross generation by WTG) by WTG only and doesn't record the electricity import, hence in order to calculate the net electricity generation supplied to grid by all WTGs of project activity (EG_y), PP will conservatively deduct the total Electricity imported by project activity & non project activity WTGs, as recorded by the main meter at the state utility substation ($EG_{JMR,Import}$) from the Summation of Electricity export to the grid by all the sub-Projects included in the project activity ($\sum EG_{Export,y,M}$) instead of apportioning of Import data; detailed calculation is given in following paragraphs

³ As per section 4.2 (iv) of PPA 'Measurement of Energy and Metering':- The developer will intimate/furnish the details of break-up of the energy supplied at Common Delivery Point. Based on such break-up, the power supplied by individual Power Producer shall be considered for the purpose of payment. Further the details of break-up of energy as intimated by Developer shall be final and binding on the Power Producer(s) using the common injection system and Metering equipment.

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 raised by investors, conduct the audit to cross check the net electricity values and in case all the values are found to be correct, state utility release the payment against the invoice raised 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 state utility.

Allocation plan for calculating net electricity generation supplied to the grid for project activity is as follows:-

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

Electricity exported by all WTGs of project activity is apportioned on the basis of summation of Gross electricity export⁴ by all WTGs 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 any sub-project M, included in project activity is as follows:-

Electricity Export to the grid by the sub-project M included in the project activity,

$$EG_{\text{Export},v,M} = \frac{EG_{\text{JMR,Export}} * \sum EG_{\text{Controller},N,M}}{\sum EG_{\text{Controller},i}^5} \dots\dots\dots(1)$$

As LCS meter measures the Gross electricity export by WTGs and doesn't provide individual reading of Export & Import. Therefore apportioning of export as well as import for the purpose of billing (invoicing) for all WTG of the sub-projects included in project activity is also apportioned on the basis of summation of gross electricity export by all the WTGs 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. 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 and payment.

Though in order to being conservative while calculating the net electricity generation supplied to grid by all WTGs of project activity (EG_v), PP will conservatively deduct the total Electricity imported by project activity & non project activity WTGs, as recorded by the main meter at the state utility substation ($EG_{\text{JMR,Import}}$) from the summation of electricity export to the grid by all the sub-Projects included in the project activity ($\sum EG_{\text{Export},v,M}$) instead of apportioning of Import data; detailed calculation is given in following paragraphs.

This is a conservative approach to estimate net electricity supplied to the grid as import data recorded at the substation including WTGs included in the project activity and WTGs not included in the project activity ($EG_{\text{JMR,Import}}$) is deducted from the summation of electricity export to the grid by all the sub-Projects included in the project activity ($\sum EG_{\text{Export},v,M}$).

Therefore net electricity generation supplied to grid by all WTGs of the project activity is calculated as:

$$EG_y = \sum EG_{\text{Export},y,M} - EG_{\text{JMR,Import}} \dots\dots\dots(2)$$

⁴ LCS meter installed in individual WTGs control panel measures the gross electricity export by WTG and therefore $\sum EG_{\text{Controller},i}$ is used by developer to calculate electricity export by individual developer (project activity & non project activity WTGs)..

⁵ The report detailing the value of $\sum EG_{\text{Controller},i}$ can be provided to the verifying DOE on request.

Thus calculated value of EG_v will be used to calculate total emission reduction from project activity.

Wherein,

$\sum EG_{\text{Controller, N,M}}$ = Summation of net electricity generation by all WTGs (N number of WTGs) of sub project M, included in the project activity, as measured at the controller (LCS meter) at project site; where N is number of WTGs in the sub project M included in the project activity

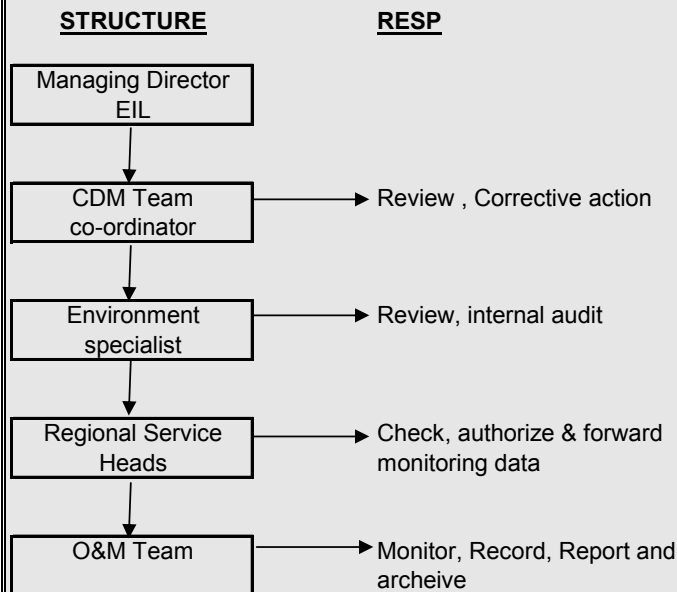
$EG_{\text{Controller, i}}$ = Summation of net electricity generation by an WTG (project or non project activity connected at main meter), as measured at the controller (LCS meter) at project site. Where i is number of WTGs including project activity and non project activity.

$\sum EG_{\text{Controller, i}}$ = Summation of net electricity generation by all WTGs of project activity as well as non project activity connected at main meter, as measured at the controller (LCS meter) at project site; where i is number of WTGs including project activity and non project activity.

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

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

The Project is operated and managed by Enercon (India) Ltd. The operational and management structure implemented by Enercon is as follows:



ORGANOGRAM OF THE CDM PROJECT MONITORING

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 ₂ e/MWh
Description:	Combined Margin Emission Factor of Northern Regional Grid
Source of data:	Revised PDD (version 6.0, dated 26/04/2012 & approved by UNFCCC on 13/07/2012).
Value(s) applied:	= 0.90852
Purpose of data:	Baseline Emissions
Additional comment:	None

Data / Parameter:	$EF_{OM,y}$								
Unit:	tCO ₂ e/MWh								
Description:	Operating Margin Emission Factor of Northern Regional Grid								
Source of data:	Revised PDD (version 6.0, dated 26/04/2012 & approved by UNFCCC on 13/07/2012).								
Value(s) applied:	<table border="1"> <tr> <td>2001 – 02</td><td>1.12172</td></tr> <tr> <td>2002 – 03</td><td>1.12260</td></tr> <tr> <td>2003 – 04</td><td>1.02817</td></tr> <tr> <td>Average</td><td>1.09083</td></tr> </table>	2001 – 02	1.12172	2002 – 03	1.12260	2003 – 04	1.02817	Average	1.09083
2001 – 02	1.12172								
2002 – 03	1.12260								
2003 – 04	1.02817								
Average	1.09083								
Purpose of data:	Baseline Emissions								
Additional comment:	None								

Data / Parameter:	$EF_{BM,y}$		
Unit:	tCO ₂ e/MWh		
Description:	Build Margin Emission Factor of Northern Regional Grid		
Source of data:	Revised PDD (version 6.0, dated 26/04/2012 & approved by UNFCCC on 13/07/2012).		
Value(s) applied:	<table border="1"> <tr> <td>2003 – 04</td><td>0.72621</td></tr> </table>	2003 – 04	0.72621
2003 – 04	0.72621		
Purpose of data:	Baseline Emissions		
Additional comment:	None		

D.2. Data and parameters monitored

Data / Parameter:	EG_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:	Net electricity generation supplied to the grid is a calculated value which is based on the monthly JMR reading and the LCS reading.

Value(s) of monitored parameter:	=87,908.153
Monitoring equipment:	The metering equipment (main & back up meters) were tested by State Utility on annual basis. There are two main meters at Amarsagar sub-station & 2 backup meters as Temdarai sub-station. All the main and check meters are Two-way tri-vector meters capable of recording export and import of accuracy class of 0.2s (make-secure meter). Please refer table no 2, Annex -1 for calibration details.
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Refer section 'C' (Description of monitoring system) & Annex 1 for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	Please refer equation no (1) & (2) in section C of Monitoring Report for calculation method.
QA/QC procedures:	Value of EG _y can be cross checked with the tariff invoices raised on the state utility . Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic and hard paper format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None
Data / Parameter: EG_{JMR, Export}	
Unit:	MWh (Mega-Watt hour)
Description:	Electricity exported by project activity and non-project activity WTGs, as recorded by the main meters at the Amarsagar (state utility sub-station).
Measured/ Calculated / Default:	Measured
Source of data:	Monthly JMRs sheets recorded at utility sub-station.
Value(s) of monitored parameter:	221,551.750
Monitoring equipment:	The metering equipments (main & back up meters) were tested by State Utility on annual basis. There are two main meters at Amarsagar sub-station & 2 backup meters as Temdarai sub-station. All the main and check meters are Two-way tri-vector meters capable of recording export and import of accuracy class of 0.2s (make-secure meter). Please refer table no. 2 Annex -1 for calibration details.
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Refer section 'C' (Description of monitoring system) & Annex 1 for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	Not applicable. This value will be directly sourced from monthly JMR.

QA/QC procedures:	Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic and hard paper format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None

Data / Parameter:	EG_{JMR, Import}
Unit:	MWh (Mega-Watt hour)
Description:	Electricity imported by project activity and non-project activity WTGs as recorded by the main meter at the Amarsagar (state utility sub-station).
Measured/ Calculated / Default:	Measured
Source of data:	Monthly JMRs sheets recorded at utility sub-station.
Value(s) of monitored parameter:	612.750
Monitoring equipment:	The metering equipments (main & back up meters) were tested by State Utility on annual basis. There are two main meters at Amarsagar sub-station & 2 backup meters at Temdarai sub-station. All the main and check meters are Two-way tri-vector meters capable of recording export and import of accuracy class of 0.2s (make-secure meter). Please refer table no. 2 Annex -1 for calibration details.
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Refer section 'C' (Description of monitoring system) & Annex 1 for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	Not applicable. This value will be directly sourced from monthly JMR.
QA/QC procedures:	Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic and hard paper format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None

Data / Parameter:	EG_{Controller,i}
Unit:	MWh (Mega-Watt hour)
Description:	Gross electricity export (gross electricity generation by WTG) by a WTG of project activity or non project activity, as measured at the controller (LCS meter) at project site. Where i, is the total number of WTGs connected to main meter including both project activity & non project activity.
Measured/ Calculated / Default:	Measured
Source of data:	Monthly generation report (LCS) sourced from SCADA provided by Enercon.

Value(s) of monitored parameter:	Please refer CER calculation sheet
Monitoring equipment:	LCS meter (controller) is in-built electronic panel installed inside the WTG tower. All the LCS meters are auto calibrated. Please refer Annex-1 for detailed description.
Measuring/ Reading/ Recording frequency:	The value is monitored continuously and recorded daily by the online monitoring station at the site. In addition to the daily generation report and monthly generation report are also available at monitoring station
Calculation method (if applicable):	-
QA/QC procedures:	Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None
Data / Parameter:	$\sum EG_{\text{Controller},i}$
Unit:	M h (Mega-Watt hour)
Description:	Summation of Gross electricity export (Gross electricity generation by WTG) by all WTG of project activity and non project, as measured at the controller (LCS meter) at project site,
Measured/ Calculated / Default:	Calculated
Source of data:	Monthly generation report (LCS) sourced from SCADA provided by Enercon.
Value(s) of monitored parameter:	231,743.003
Monitoring equipment:	LCS meter (controller) is in-built electronic panel installed inside the WTG tower. All the LCS meters are auto calibrated. Please refer Annex-1 for detailed description.
Measuring/ Reading/ Recording frequency:	The value is monitored continuously and recorded daily by the online monitoring station at the site. In addition to the daily generation report and monthly generation report are also available at monitoring station.
Calculation method (if applicable):	-
QA/QC procedures:	Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None
Data / Parameter:	$\sum EG_{\text{Controller}, N,M}$

Unit:	MWh (Mega-Watt hour)
Description:	Summation of Gross electricity export (Gross electricity generation by WTG) by all the WTGs (N number of WTGs) of sub-project (M) included in the project activity, as measured at the LCS where M is any sub project included in the project activity and N is the number of WTGs in a sub-project.
Measured/ Calculated / Default:	Calculated
Source of data:	Monthly generation report (LCS) sourced from SCADA provided by Enercon.
Value(s) of monitored parameter:	92,591.639
Monitoring equipment:	LCS meter (controller) is in-built electronic panel installed inside the WTG tower. All the LCS meters are auto calibrated. Please refer Annex-1 for detailed description.
Measuring/ Reading/ Recording frequency:	The value is monitored continuously and recorded daily by the online monitoring station at the site. In addition to the daily generation report and monthly generation report are also available at monitoring station.
Calculation method (if applicable):	-
QA/QC procedures:	Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None

Data / Parameter:	EG_{Export,y,M}
Unit:	MWh (Mega-watt hour)
Description:	Electricity export to the grid by all WTGs of a sub-Project included in the project activity, where M is any sub project included the project activity.
Measured/ Calculated / Default:	Calculated
Source of data:	Generation break-up sheets prepared by the O&M contractor which is based on the monthly JMR reading and the LCS reading.
Value(s) of monitored parameter:	Refer CER calculation sheet
Monitoring equipment:	The metering equipments (main & back up meters) were tested by State Utility on annual basis. There are two main meters at Amarsagar sub-station & 2 backup meters as Temdarai sub-station. All the main and check meters are Two-way tri-vector meters capable of recording export and import of accuracy class of 0.2s (make-secure meter). Please refer table no 2, Annex -1 for calibration details.

Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Refer section 'C' (Description of monitoring system) & Annex 1 for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	Please refer equation no (1) section C of Monitoring Report for calculation method.
QA/QC procedures:	Value of $EG_{Export,y,M}$ can be cross checked with the tariff invoices raised on the state utility . Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic and hard paper format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None

Data / Parameter:	$\sum EG_{Export,y,M}$
Unit:	MWh (Mega-watt hour)
Description:	Summation of Electricity export to the grid by all the sub-Projects included in the project activity.
Measured/ Calc lated / Default:	Calculated
Source of data:	Generation break-up sheets prepared by the O&M contractor which is based on the monthly JMR reading and the LCS reading.
Value(s) of monitored parameter:	=88,520.903
Monitoring equipment:	The metering equipments (main & back up meters) were tested by State Utility on annual basis. There are two main meters at Amarsagar sub-station & 2 backup meters as Temdarai sub-station. All the main and check meters are Two-way tri-vector meters capable of recording export and import of accuracy class of 0.2s (make-secure meter). Please refer table no 2, Annex -1 for calibration details
Measuring/ Reading/ Recording frequency:	Frequency of recording data: Monthly Refer section 'C' (Description of monitoring system) & Annex 1 for an illustration of the provisions for measurement methods.
Calculation method (if applicable):	The value is calculated by the summation of $EG_{Export,y,M}$ for all the sub projects (M).
QA/QC procedures:	Please refer annex 1 for detailed monitoring information. The data will be archived both in electronic and hard paper format for crediting period + 2 years.
Purpose of data:	Calculation of baseline emissions
Additional comment:	None

The data will be stored in hard format and soft format by PP (Enercon) at the project site office. Joint meter reading is taken in the presence of the persons representing Enercon [Operation and Maintenance Contractor]. The archive will be kept for the period up to two years after the completion of the crediting period.

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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"The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO₂e/kWh) calculated in a transparent and conservative manner as the weighted average emissions (in kg CO₂e/kWh) as described in registered PDD.

$$BE_y = EG_y * EF_y$$

Where,

BE is baseline emissions in year y, tCO₂e

EG_y is the net electricity supplied to the grid in year y.

EF_y is the CO₂ emission factor of the grid (0.90852 tCO₂e/MWh fixed ex-ante).

Baseline emission reductions for project activity:-

Duration	Net Export to grid (MWh)	Baseline Emission Factor (tCO ₂ e/MWh)	Baseline Emission Reductions (tCO ₂ e)
	[EG _y]	[EF _y]	[BE _y]
Sep 11 to Dec 11	13,287.705	0.90852	12,072
Jan 12 to Dec 12	74,620.448	0.90852	67,794
Total	87,908.153		79,866

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

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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

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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 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)
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Total	79,866	0	0	79,866
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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)	123,798 (16 months equivalent of emission reductions estimated in the revised PDD (version 6.0, dated 26/04/2012 & approved by UNFCCC on 13/07/2012 PDD))	79,866

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

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There is change of 35.49% (downside) in the expected and annual emission reductions. The difference in the total CERs is due to low wind availability leading to low plant load factor.

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)	79,866	NA

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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**MONITORING INFORMATION****Metering and Monitoring Plan details**

The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be applicable as per the PPA (Power purchase agreement) with the State electricity board.

The Project is operated and managed by Enercon (India) Ltd. The general conditions of monitoring are described below :-

- Project activity consists of two metering points, main & backup metering points. Main metering point is located at Amarsagar sub-station (33/132/220kV) which is managed by state utility (RRVPN) while backup metering point is located at Temdarai sub-station (33/132 kV) which is managed by Enercon (India) Limited.
- At Temdarai Sub-station there are two backup meters (Back up meters B1 & B2) which records the electricity supplied to the grid by the project activity and non project activity WTGs at 132kV Level. From Temdarai sub-station electricity is transmitted to Amarsagar sub-station through two EHV transmission lines (132kV each).
- At Amarsagar sub-station there are two main meters (main meters M1 and M2) at 132 kV Level which is connected at each 132kV EHV lines coming from Temdarai sub-station. Main meters records the electricity supplied to the grid by the project activity as well non project activity WTGs.
- The electricity supplied to the grid will be metered at the main meters at 132 kV level at the RRVPN substation at Amarsagar. Representatives of RRVPN/respective Discom and Enercon will take Joint Meter reading at the main meter at Amarsagard sub-station and sign the meter readings. Simultaneously, the Joint Meter Reading at the 132 kV level of the backup metering system at Temdarai substation (Enercon Sub-station) will also be taken by representatives of RRVPN/respective Discom and Enercon. Main meter reading recorded at Amarsagar sub-station will be used in ER calculation
- Joint meter reading records the values of export & import based on which the net export by all the WTGs (Project as well as non-project) connected to billing metering points at the DISCOM sub-station (Amarsagar) is calculated.
- Based on the monthly JMR reading and the LCS controller reading of Project as well as non-project WTGs, Enercon prepares the breakup sheet which indicates the energy Exported, Imported & net electricity supplied by the individual project owner/investor. This breakup sheet is then submitted to Discom authority as well as the individual investors.
- Based on this breakup sheet the PP raises an invoice and submits to the Discom.
- The Discom authority conducts a thorough review based on the JMR readings, breakup sheets and the invoice raised by individual investors. The audits are conducted by senior official based at the circle office of individual Discom and only after the authorisation of submitted documents/ records by the superintending engineer of the respective Discom, are the payments released to the individual investor.
- Net electricity supplied to the grid is a calculated value and is used in calculation of emission reduction of the project activity.
- The meters will jointly inspected/tested once in a year as per the terms of the PPA. Joint inspection and testing will also be carried out as and when difference in monthly meter readings exceeds the sum of maximum error as per accuracy class of main and back up meters.

Measurement & Recording of electricity:

-Main and Backup meters measures the electricity (export & Import) on continuous basis and recorded by state utility on monthly basis.

-Panel meter (LCS controller) measures the Gross electricity export by WTG on continuous basis and daily/monthly data can be sourced/recorded from online SCADA system.

QA/QC procedure

- The meters installed at Amarsagar & Temdarai sub-statio are Trivector and the manufacturer is the Secure Meter. The meters are two-way meter and measure the electricity import and export and give the net electricity.
- As per the Power Purchase Agreement entered into with the electricity distribution utility, there will be a set of main meter and backup meter in each feeder. Main and backup meters would be two-way export import meters that measure both export and import of electricity and provide net electricity exported to the grid.
- In case the meters are found to operate outside the permissible limits, the meters will be either replaced immediately or calibrated by authorised representative of state utility.
- If main meter goes defective and the backup meter is working within the permissible limits of error, the consumption recorded by the backup meter will be referred.
- The main and the backup metering systems will be sealed in presence of representatives of Enercon and RRVPN/respective Discom.
- The LCS meter readings recorded at the WTGs are used for allocation of the net electricity exported to the grid from the project activity. The LCS meter readings are archived electronically on hourly basis. Joint meter reading at the Amarsagar substation (State utility sub station) and at the Temdarai substation (Enercon sub station) is noted each month. Therefore cumulative LCS meter reading for each month is used for purpose of allocation of net electricity supplied to the grid from the project activity.
- The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WTGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will calibrate or replace the meter immediately.

Details of metering equipment:

The metering equipments (main & back up meters) were tested by State Utility on annual basis. There are two main meters at Amarsagar sub-station & 2 backup meters as Temdarai sub-station. The entire main and check meters are Two-way tri-vector meters capable of recording export and import of accuracy class of 0.2s (make-secure meter). Meter details for the all the meters are as follows:-

Sub-Station			Amarsagar		Temdarai	
Meter Description			Main Meter – Line 1	Main Meter – Line 2	Backup Meter – Line 1	Backup Meter – Line 2
Meter Calibration Details	2011	Meter Sr. No	TNU00946	TNU00945	RJB00052	ABB00691
		Date of calibration	26-Mar-11	26-Mar-11	28-Mar-11	28-Mar-11
	2012	Meter Sr. No	TNU00946	TNU00945	RJB00052	ABB00691
		Date of calibration	19-Mar-12	19-Mar-12	23-Mar-12	23-Mar-12
	2012	Meter Sr. No	TNU00946	TNU00945	RJB00052	ABB00691
		Date of calibration	26-Dec-12	26-Dec-12	28-Dec-12	28-Dec-12
	Due date of calibration		25-Dec-13	25-Dec-13	27-Dec-13	27-Dec-13

Table: 2