

**MONITORING REPORT FORM (CDM-MR)**
Version 01**CONTENTS**

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MONITORING REPORT
Version 2 and Date 01/12/2011
Title: Tungabhadra wind power project in Karnataka
Project Reference No: 1268
Monitoring Period II - From 01/12/2009 to 31/08/2011 (including first and last day)

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

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The project activity includes development, design, engineering, procurement, finance, construction, operation and maintenance of Tungabhadra 22.8 MW wind power project (“Project”) in the Indian state of Karnataka to provide reliable, renewable power to the Karnataka state electricity grid which is part of the Southern regional electricity grid. The Project will lead to reduced greenhouse gas emissions because it displaces electricity from grid connected fossil fuel based electricity generation plants.

The Project involves 38 wind energy converters (WECs) of Enercon make (600 kW E-40) with internal electrical lines connecting the Project with local evacuation facility. The specifications of E-40 machine are given in section A.4 of the monitoring report.

The machines under the project activity were commissioned on 23 April 2007, 12 Sep 2007 & 31 Dec 2007. The expected operational lifetime of the project is for 20 years. The total emission reductions achieved under this monitoring period (1 December 2009 to 31 August 2011) is 82, 502 tCO₂.

A.2. Project Participants

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Enercon (India) Limited

A.3. Location of the project activity:

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The project area extends between latitude 15° 3’ 0.6’’ to 15° 5’ 58.1’’ – North and 75° 50’ 0.7’’ to 75° 52’ 58.9’’ – East.

The Project is connected to the KPTCL 110/33/11 kV substation at Bannikoppa village. The project activity is located at village Singatalur, Koralahalli and Hammigi at Mundargi in Gadag district in the state of Karnataka, India. The information in regard of the Wind Energy Generators i.e. unique identification number, location number, location details (Village, Taluk & District) & latitude & longitude are defined in the table as follows:

Unique Identification Number	Loc. No.	Latitude			Longitude		
		Degree	Minutes	Seconds	Degree	Minutes	Seconds
EILKGS 1	1	15	3	27.4	75	52	4.0
EILKGS 2	2	15	3	30.0	75	52	2.0
EILKGS 3	3	15	3	29.9	75	51	57.9
EILKGS 4	4	15	3	32.4	75	51	51.3
EILKGS 5	5	15	3	36.1	75	51	43.0
EILKGS 6	6	15	3	37.3	75	51	39.6



Unique Identification Number	Loc. No.	Latitude			Longitude		
		Degree	Minutes	Seconds	Degree	Minutes	Seconds
EILKGS 7	7	15	3	38.3	75	51	34.1
EILKGS 8	8	15	3	45.3	75	51	40.0
EILKGS 9	9	15	3	49.2	75	51	39.1
EILKGS 10	10	15	3	52.2	75	51	36.7
EILKGS 11	11	15	3	54.1	75	51	32.7
EILKGS 12	12	15	3	54.3	75	51	16.4
EILKGS 13	13	15	3	58.1	75	51	15.3
EILKGS 14	14	15	4	4.2	75	51	17.2
EILKGS 15	15	15	4	7.5	75	51	14.4
EILKGS 16	16	15	4	5.7	75	51	4.8
EILKGS 17	17	15	4	9.5	75	51	1.6
EILKGS 18	18	15	4	20.9	75	51	0.7
EILKGS 19	19	15	4	23.2	75	50	58.1
EILKGS 20	20	15	4	27.2	75	50	54.0
EILKGS 21	21	15	4	34.3	75	51	5.4
EILKGS 22	22	15	4	36.7	75	50	58.9
EILKGS 23	23	15	4	38.9	75	50	51.6
EILKGS 24	24	15	4	38.1	75	50	40.6
EILKGS 25	25	15	4	37.1	75	50	30.2
EILKGS 26	26	15	4	42.4	75	50	38.5
EILKGS 27	27	15	4	45.6	75	50	35.0
EILKGS 28	28	15	4	48.0	75	50	30.7
EILKGS 29	29	15	4	51.0	75	50	26.8
EILKGS 30	30	15	4	54.5	75	50	22.4
EILKGS 31	31	15	4	57.0	75	50	19.9
EILKGS 32	32	15	5	0.6	75	50	16.6
EILKGS 33	33	15	4	16.5	75	51	3.5
EILKGS 34	34	15	5	4.8	75	50	33.7
EILKGS 35	35	15	5	8.0	75	50	30.8
EILKGS 36	36	15	5	11.5	75	50	26.1
EILKGS 37	37	15	5	12.7	75	50	19.3
EILKGS 38	38	15	5	15.5	75	50	16.3

A.4. Technical description of the project

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The Project involves 38 wind energy converters (WECs) of Enercon make (600 kW E-40) with internal electrical lines connecting the Project with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V \pm 12.5%.

The 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 drawl (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEC with voltage fluctuation of -20 to +20%.
- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator which runs at maximum speed of 33 rpm and uses Air Brakes.
- Three Independent Braking System.
- 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.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

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Methodology: “*Consolidated methodology for grid-connected electricity generation from renewable sources*”, **ACM0002 Version 6.**

Baseline Methodology: *Consolidated monitoring methodology for grid-connected electricity generation from renewable sources, ACM0002, Version 6.*

Monitoring Methodology: *Consolidated monitoring methodology for grid-connected electricity generation from renewable sources, ACM0002, Version 6.*

ACM0002 draws upon the following tools:

- *Tool to calculate the emission factor for an electricity system*
- *Tool for the demonstration and assessment of additionality*

A.6. Registration date of the project activity:

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27/10/2008

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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Crediting period of the project activity as per registered PDD is from 27 October 2008 to 26 October 2018 (Fixed). The first monitoring period was from 27 October 2008 to 30 Nov 2009. The second monitoring period is considered from 1 December 2009 to 31 August 2011.

A.8. Name of responsible person(s)/entity(ies):

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Contact Information of Enercon (India) Limited is given in the table below:

Organization:	Enercon (India) Limited
Street/P.O.Box:	A-9, Veera Industrial Estate, Veera Desai Road, Andheri (West)
Building:	Enercon Towers
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 053
Country:	India
Telephone:	+91-22-5522 7794
FAX:	+91-22-5692 1175
E-Mail:	a.raghavan@enerconindia.net



URL:	www.enerconindia.net
Represented by:	
Title:	Associate Vice President
Salutation:	Mr.
Last Name:	Raghavan
Middle Name:	
First Name:	A
Department:	Corporate
Mobile:	+91-9820045724
Direct FAX:	+91-22-5692 1175
Direct tel:	+91-22-6692 4848 extn. 7169
Personal E-Mail:	a.raghavan@enerconindia.net

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

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The starting date of operation of the project activity

The first WEC under the project activity was commissioned on 23rd April 2007 and last WEC under the project activity was commissioned on 31st December 2007. The commissioning date for all the WECs included in the project activity is given in the table below.

Unique Identification Number	Loc. No.	Date of Commissioning
EILKGS 1	1	31/12/2007
EILKGS 2	2	31/12/2007
EILKGS 3	3	31/12/2007
EILKGS 4	4	31/12/2007
EILKGS 5	5	31/12/2007
EILKGS 6	6	31/12/2007
EILKGS 7	7	31/12/2007
EILKGS 8	8	31/12/2007
EILKGS 9	9	31/12/2007
EILKGS 10	10	31/12/2007
EILKGS 11	11	31/12/2007
EILKGS 12	12	23/04/2007
EILKGS 13	13	23/04/2007
EILKGS 14	14	31/12/2007
EILKGS 15	15	31/12/2007
EILKGS 16	16	23/04/2007
EILKGS 17	17	23/04/2007
EILKGS 18	18	23/04/2007
EILKGS 19	19	23/04/2007
EILKGS 20	20	23/04/2007
EILKGS 21	21	12/09/2007
EILKGS 22	22	31/12/2007



Unique Identification Number	Loc. No.	Date of Commissioning
EILKGS 23	23	31/12/2007
EILKGS 24	24	12/09/2007
EILKGS 25	25	12/09/2007
EILKGS 26	26	23/04/2007
EILKGS 27	27	23/04/2007
EILKGS 28	28	23/04/2007
EILKGS 29	29	31/12/2007
EILKGS 30	30	31/12/2007
EILKGS 31	31	31/12/2007
EILKGS 32	32	31/12/2007
EILKGS 33	33	12/09/2007
EILKGS 34	34	12/09/2007
EILKGS 35	35	12/09/2007
EILKGS 36	36	12/09/2007
EILKGS 37	37	12/09/2007
EILKGS 38	38	12/09/2007

The information regarding the actual operation of the project

The project activity consists of 38 WECs (600 kW) of Enercon make E-40 totaling to a capacity of 22.8 MW. During the monitoring period, the WECs were operating normally. Hence no major breakdown was found during this period.

A brief description of: (i) events or situations that occurred during the monitoring period (ii) how the issues resulting from these events or situations are being addressed.

Enercon (India) limited is responsible for operation and maintenance activities for this project. Enercon (India) limited operation and maintenance activities are ISO 9001:2008 certified and all the events are recorded in the log book available at the project site. Referring to the data available it can be inferred that there have not been any major special events for any of the WECs that are included in the project activity. As a part of regular maintenance the WECs are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly.

B.2. Revision of the monitoring plan

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We have applied for the revision in monitoring plan. The same has been approved by EB on 18-Feb-2011.

B.3. Request for deviation applied to this monitoring period

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Not applicable

B.4. Notification or request of approval of changes

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Not Applicable

**SECTION C. Description of the monitoring system**

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Approved monitoring methodology ACM0002 / Version 06 Sectoral Scope: 1, “Consolidated methodology for grid-connected electricity generation from renewable sources”, by CDM - Meth Panel to be used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the following:

- Electricity generation 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

Since the baseline methodology is based on *ex ante* determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required. There is one main and check meter dedicated to project activity at 33 kV metering point for the project activity. In addition to this there are two main and check meters (bulk meters) at 110 kV metering point at the Enercon substation and are connected to the machines of the project activity and the machines commissioned by the other project developers. Therefore in order to determine the electricity supplied to the grid by the project at 110 kV at the Bannikoppa substation, the state utility applies the transmission loss to the meter reading recorded at the 33 kV metering point. The transmission loss calculated by the state utility is endorsed / confirmed jointly by the representatives of Enercon and the state utility. The transmission loss applied to the project activity by the state utility is reflected in the JMR (Form B) recorded at 33kV metering point. Electricity supplied to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering location of the project activity.

The procedure for calculation of transmission loss as given in the PPA is set-out below:

$$Z = \frac{(X1+X2+X3...+Xn)-Y}{(X1+X2+X3...+Xn)} \times 100$$

Z = Percentage transmission loss for export incurred in transmission line between the meter located at 33 kV metering point and the meters located at 110kV metering point (two bulk meters) high voltage side of receiving sub-station.

Xi = Energy Export Reading of energy meter installed at 33kV metering point

Here Xi represents X1, X2, X3,...Xn which are the meters that are installed at 33kV metering point and are connected to the receiving substation by internally connected lines to the receiving station.

Y = Energy Export Readings at bulk meters (two in number) installed at high voltage side of transformer of the receiving station at 110 kV.

The Export Reading Xi is adjusted for transmission loss that is determined by the state utility and is applied directly to the JMR (Form B) taken at 33 kV metering point. This can be checked from the JMR signed jointly by the representatives of Enercon and the state utility.

Transmission Loss in Export (TE) = Percentage Transmission Loss (Z) * Energy Export at 33kV metering point (EGExport)

**Empirical Formula for Energy Export after adjustment of transmission loss (Equation 1)**

Net Energy Export after adjustment of transmission loss = **EG_{export} – Transmission Loss (TE)**

The transmission loss in export is generally less than 5%. However in case of Energy Import, the state utility conservatively applies adjustment of 15% to the import values noted at 33 kV metering point.

Transmission Loss in Import (**TI**) = 15% * Energy Import at 33kV metering point (EG_{Import})

Empirical Formula for Energy Import after adjustment of transmission loss (Equation 2)

Net Energy Import after adjustment of transmission loss = **EG_{import} + 15%*EG_{import}**
= 115%* EG_{import}

Therefore Energy Supplied to Grid after adjustment of transmission loss is difference of equation 1 and 2 as given in the JMR (Form B) signed jointly by Enercon and the state utility.

EG_y = EG_{export} – 115%*EG_{import} – Transmission Loss (TE)

The Joint meter reading noted at 33 kV metering location contains the following data:-

1. Electricity Export (EG_{export})
2. Electricity Import (EG_{import})
3. Transmission Loss (TE) between 33 kV metering point and 110 kV metering point (two bulk meters) at Enercon substation
4. Electricity supplied to the Grid [EG_{export}-115%*EG_{import}-TE]

JMR is signed by the representatives of Enercon and the state utility. The meter readings (both export and import), transmission loss and electricity supplied to the grid are recorded in the JMR (33 kV metering point). Hence all these values have been reproduced from the JMR for calculation of emission reductions.

In addition to the JMR (Form B) at 33kV metering location for the project activity, the following documents will also be provided to the DoE for verification:

1. JMR (Form B) at 110kV metering point (two bulk meters) at Enercon substation
2. Transmission loss calculation endorsed / confirmed jointly by the representatives of Enercon and the state utility.

The electricity supplied to the grid can be cross checked from the invoices raised on the state utility for supply of electricity supplied to the grid.

Monitoring Information:

The reference of the monitoring information as described under this section has been taken from the PPA.

Metering: Electricity supplied to the grid is metered jointly by state utility and Enercon through one main and one check meter at 33 kV metering point connecting exclusively the machines of project activity.



In addition to this there are two main and check meters (Bulk meters) at 110 kV metering point at Enercon substation covering machines of the project activity and machines of other project developers. The schematic diagram indicating location of meters at 33 kV and 110 kV metering points for the project activity is attached as Appendix 1.

Metering Equipment: Metering system for the project activity consists of one main and one check meter of 0.2 percent accuracy class at 33kV metering point and two main and check meters at 110 kV metering point. All the meters are two-way Trivector meters capable of recording import and export of electricity. The meters installed are capable of recording and storing half hourly readings of all electrical parameters for a minimum period of 35 days with digital output.

Meter Readings: The electricity supplied to the grid is recorded by taking JMR for 22.8 MW at 33kV metering point in the presence of representatives of state utility and Enercon. The JMR at 33kV metering point contains the value of energy exported, energy imported, transmission loss and electricity supplied to the grid during the recording period. This JMR is certified by state utility. These certified readings are then used to prepare the invoices to be raised on Discom. Thus the electricity supplied to the grid as mentioned in the JMR can be crosschecked with the value mentioned in the invoices.

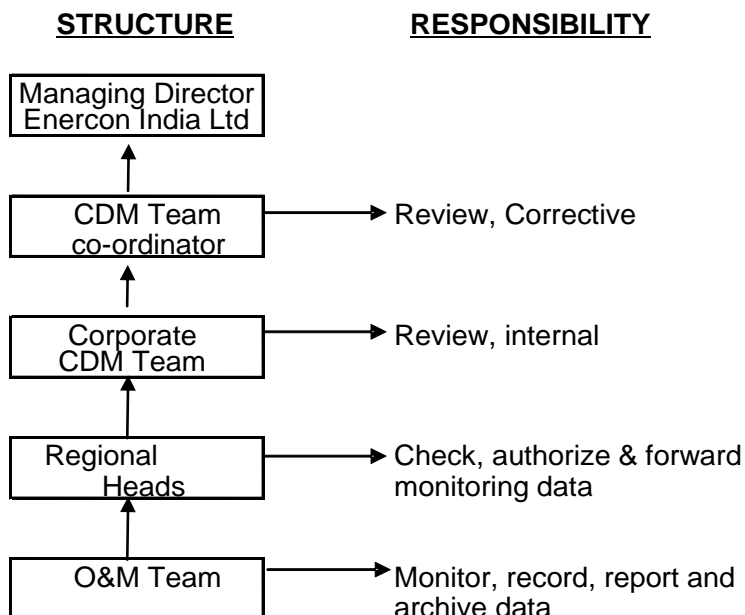
Inspection of Energy Meters: All main and check energy meters and all associated instruments, transformers installed at the Project are of 0.2% accuracy class. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its authorized representatives.

Meter Test Checking: All main and check meters are tested for accuracy with reference to a portable standard meter. The portable standard meter is owned by state utility. The main and check meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The consumption registered by the main meters alone will hold good for the purpose of metering electricity supplied to the grid as long as the error in the main meters is within the permissible limits. All the meters will be tested / calibrated for accuracy annually.

If during the meter test checking,

- The main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then the meter reading will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
- The main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible of error, then the meter reading for the month up to the date and time of such test shall be as per the check meter. There will be a revision in the meter reading for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and meter reading for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.
- Both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the main meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive the correct reading of energy supplied for metering electricity supplied to the grid for the period from the last month's meter reading up to the current test. Meter reading for the period thereafter till the next monthly reading shall be as per the calibrated main meter.

Operational and Management structure implemented by Enercon:



The reading is monitored continuously by the online monitoring station (online monitoring station is located at the project site where all the data [historical and instantaneous] from the LCS or panel meters of all WECs is retrieved) at the project site. In case of data loss, the data can be archived from this online monitoring system.

The data (electricity supplied to the grid) will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Training imparted to the Personnel

Enercon (India) Limited has been instrumental in imparting training to the persons it recruits to serve in the organisation. EIL has a separate training facility, called Enercon Training Academy, which gives training to the persons who are to be deployed On-Site to take care of all the activities starting from project construction to operation to maintenance. The training facility is located at Daman and is fully functional and equipped with qualified trainers, training equipments, classrooms and hostel facilities. The training academy has a fixed schedule which is applicable to all those who reside in the training academy. The training schedule and the training period depend upon the role the trainee has to perform. The trainers are well equipped to judge the capabilities of the trainees.

All trainees, who are to be associated to the technical side of project are given six to twelve months' rigorous training on all the aspects of wind turbine installation and maintenance depending upon the requirements. Enercon conducts periodical test to rate the trainees and thus they are deployed as per the outcomes of their performance during the training period.

Calibration Details

The metering equipments were inspected & calibrated by state utility. Meter details for the all the main and check meters are as follows:-



Meter description	Serial No.	Make	Accuracy class	Metering point	Calibration for 2009	Calibration for 2010	Calibration for 2011
Main meter (Bulk Meter I)	6607369	L&T	0.2	Bannikoppa S/s 110 KV	30-Mar-09	25-May-10	14-Jul-11
Check meter (Bulk Meter I)	6606801	L&T	0.2	Bannikoppa S/s 110 KV	30-Mar-09	25-May-10	14-Jul-11
Main meter (Bulk Meter II)	6605135	L&T	0.2	Bannikoppa S/s 110 KV	30-Mar-09	25-May-10	14-Jul-11
Check meter (Bulk Meter II)	6607373	L&T	0.2	Bannikoppa S/s 110 KV	30-Mar-09	25-May-10	14-Jul-11
Main meter at 33 KV	6767626	L&T	0.2	Kapathgudda South 33KV	28-Feb-09	8-Dec-09	5-Oct-10
Check Meter at 33 KV	6767637	L&T	0.2	Kapathgudda South 33KV	28-Feb-09	8-Dec-09	5-Oct-10

- As per revised Monitoring plan, the meters shall be tested for accuracy once annually. However it can be seen from above table that the consecutive calibrations are not done for the bulk meter annually on time. Therefore in accordance with “Guidelines For Assessing Compliance With The Calibration Frequency Requirements”–Annex 60 to EB 52, Paragraph 4(a) where calibration is not carried out in line with the frequency mentioned in the registered PDD, as a conservative approach, the energy export and import values (as mentioned in the JMR) can be considered after applying the maximum possible value of error of the instrument to the measured values.
- Since the latest test certificate shows that meters are operating within their accuracy class 0.2%. In accordance with Annex 60, EB 52 we have applied a correction factor of +0.2% for imports & transmission loss and -0.2% for exports for the entire monitoring period. The correction factor applied to meter reading can be validated from calculation of emission reductions provided in spreadsheet and section D.
- In 2009, the Bulk main & check meters were calibrated on 30-Mar-2009 and the next calibration was due in 29 Mar 2010. In 2010, the Bulk main & check meters were calibrated on 25-May-2010 and the next calibration was due in 24-May-2010. There was gap of three months i.e Mar-2010, Apr-2010 & May-2010. Similarly in 2011, the Bulk main & check meters were calibrated on 14-Jul-2011. Here the gap in calibration was of three months i.e. May-2011, June-2011 & Jul-2011. Therefore, we have applied the error factor for the months Mar-2010, Apr-2010, May-2010, May-2011, June-2011 & Jul-2011.
- The error factor has been applied only for the transmission loss and not for export and import values because of the reason that delay in the calibration happened in the case of bulk meter 110 KV at Bannikoppa S/s. The bulk meters are only used for calculation of the transmission loss.

The line diagrams showing all relevant monitoring points are attached as Appendix 1.

**SECTION D. Data and parameters**

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D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	$EF_{OM,y}$		
Data unit:	tCO ₂ e/MWh		
Description:	Operating Margin Emission Factor of Southern Regional Electricity Grid		
Source of data used:	<p>“CO₂ Baseline Database for Indian Power Sector” published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in</p>		
Value(s) :	2002 – 03	0.9970	
	2003 – 04	1.0094	
	2004 – 05	1.0038	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions		
Additional comment:	None		

Data / Parameter:	$EF_{BM,y}$		
Data unit:	tCO ₂ e/MWh		
Description:	Build Margin Emission Factor of Southern Regional Electricity Grid (year 2004-05)		
Source of data used:	<p>“CO₂ Baseline Database for Indian Power Sector” published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in</p>		
Value(s) :	0.7180		
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions		
Additional comment:	None		

Data / Parameter:	$EF_{CM,y}$		
Data unit:	tCO ₂ e/MWh		
Description:	Combined Margin Emission Factor of Southern Regional Electricity Grid (year 2004-05)		
Source of data used:	“CO ₂ Baseline Database for Indian Power Sector” published by the Central Electricity Authority, Ministry of Power, Government of India.		



	The “CO2 Baseline Database for Indian Power Sector” is available at www.cea.nic.in
Value(s) :	0.93204
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions
Additional comment:	None

Data and parameters monitored:

Data / Parameter:	EGy
Data unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied to the grid by the Project
Measured /Calculated /Default:	Calculated by subtracting import & transmission loss value from Export value. Refer section C of the MR.
Source of data:	Electricity supplied to the grid as per Joint Meter Readings (Form B) taken at 33 kV metering point for each of the sub project included in the project activity.
Value(s) of monitored parameter:	Electricity supplied to the grid by the Project = 88530.925 MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Calculated as per formulas better described under section C.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	<p>Monitoring: The procedures for metering and meter reading will be as per the provisions of the power purchase agreement except or otherwise explicitly stated in the monitoring plan in section B.7.2 of the PDD. Metering system for the project activity consists of one main and check meter at 33 kV metering location. Both meters are two-way tri-vector meters capable of recording import and export of electricity.</p> <p>In addition to this there are two main and check meters (bulk meters) at 110 kV metering point at the Enercon (India) Limited (herein after referred as “Enercon”) substation at Bannikoppa. The bulk meter is connected to the machines of the project activity and the machines commissioned by the other project developers. Therefore in order to determine the electricity supplied to the grid by the project activity at high voltage (110 kV) side of Enercon substation, the state utility (herein after referred to as “KPTCL/HESCOM”) applies the transmission loss between 110 kV metering points (two in number) and meter reading recorded at the 33 kV metering points for all the machines that are connected to 110 kV bulk</p>



	<p>meters at Enercon substation at Bannikoppa. The transmission loss calculated by the state utility is endorsed / confirmed jointly by the representatives of Enercon and the state utility. The transmission loss applied to the project activity by the state utility is reflected in the JMR (Form B) recorded at 33kV metering point. Refer Appendix 1 for location of metering points at 33kV and 110 kV.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of electricity supplied to the grid is sourced from JMR for 22.8 MW at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility.</p>
QA/QC procedures applied:	Refer section C for an illustration of the provisions for QA/QC procedures.

Data / Parameter:	EG_{export}
Data unit:	MWh (Mega-watt hour)
Description:	Electricity Export recorded at meters (main and check meters). All the subprojects included in the project activity have dedicated main and check meters at 33 kV metering point.
Measured /Calculated /Default:	Measured at Main & Check Meters
Source of data:	Electricity Export recorded at meters (main and check meters). All the subprojects included in the project activity have dedicated main and check meters at 33 kV metering point.
Value(s) of monitored parameter:	This value has been taken from the JMR (Form B) taken at 33kV metering point and has been applied directly. 90681.000 MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Accuracy Class-0.2</p> <p>Serial Number of Main Meter: Refer section C of the MR</p> <p>Serial Number of Check Meter: Refer section C of the MR</p> <p>Calibration Frequency: Annually</p> <p>Date of Last Calibration: Refer section C of the MR</p> <p>Validity of Last Calibration: Refer section C of the MR</p>
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	<p>Monitoring: Electricity export to the grid is recorded by the meters (main and check meters) at 33kV point. Refer section C & D.2 for an illustration of the provisions for QA/QC procedures.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of electricity exports to the grid are sourced from JMR for the sub projects at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility</p>



QA/QC procedures applied:	Refer section C for an illustration of the provisions for QA/QC procedures.
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Data / Parameter:	EG_{import}
Data unit:	MWh (Mega-watt hour)
Description:	Electricity Import recorded at the meters (main and check meters). All the subprojects included in the project activity have dedicated main and check meters at 33 kV metering point.
Measured /Calculated /Default:	Measured at Main & Check Meters
Source of data:	Electricity import from the grid as per joint meter reading for each of the sub project taken at 33kV metering point.
Value(s) of monitored parameter:	56.925 MWh (115% * EG_{import})
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Accuracy Class-0.2 Serial Number of Main Meter: Refer section C of the MR Serial Number of Check Meter: Refer section C of the MR Calibration Frequency: Annually Date of Last Calibration: Refer section C of the MR Validity of Last Calibration: Refer section C of the MR
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Monitoring: Electricity import from the grid is recorded by meters (main and check meters) at 33kV metering point. Refer section C & D.2 for an illustration of the provisions for measurement methods. Frequency of recording data: Monthly Recording: The values of electricity import to the grid are sourced from JMR for the sub projects at 33 kV metering point. Responsibility: Joint responsibility of Enercon and state utility
QA/QC procedures applied:	Refer section C for an illustration of the provisions for QA/QC procedures.

Data / Parameter:	TE
Data unit:	MWh (Mega-watt hour)
Description:	Transmission loss for export between the metering location at 33 kV metering point and the high voltage side of the substation to which the subproject is connected.
Measured /Calculated /Default:	Calculated as per the procedure mentioned in the PPA. Refer section C of the MR.
Source of data:	Transmission Loss for export is sourced from the joint meter reading (Form B) taken at 33kV metering point for all the sub projects included in the project activity.
Value(s) of monitored parameter:	2093.150 MWh
Indicate what the data	Baseline Emissions



are used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Calculated as per formulas better described under section C.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	<p>Monitoring: Transmission loss between metering location at 33 kV and the metering location at receiving substation is applied to the meter reading taken at meters connected at 33 KV point for the project activity.</p> <p>The Substation is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore transmission loss is applied by the state utility as reflected in the JMR (Form B) taken at 33kV point for all the sub projects included in the project activity. The JMR is signed by the representatives of Enercon and the state utility. Refer section C of MR.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The value of transmission loss is sourced from JMR for all the sub projects at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility</p>
QA/QC procedures applied:	Refer section C for an illustration of the provisions for QA/QC procedures.



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.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

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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 and is applied directly from JMR (Form B) certified by state utility. This value can also be cross checked from the invoice.

EF_y is the CO₂ emission factor of the grid (932.04 tCO₂e/GWh fixed ex-ante)

Electricity Generation and CER Calculation								
Duration of Generation		Month	Export	Import	Transmission Loss	Net Export	Baseline Emission Factor	Emission Reductions
From	To		[kWh]	[kWh]	[kWh]	[kWh]	[tCO ₂ e/MWh]	[tCO ₂ e]
1-Dec-09	1-Jan-10	Dec-09	3,207,000	1,725	56,964	3,148,311	0.932	2,934
1-Jan-10	1-Feb-10	Jan-10	2,334,000	1,725	40,365	2,291,910	0.932	2,136
1-Feb-10	1-Mar-10	Feb-10	1,389,000	8,625	32,221	1,348,154	0.932	1,256
1-Mar-10	1-Apr-10	Mar-10	2,458,500	3,450	56,964	2,398,086	0.932	2,235
1-Apr-10	1-May-10	Apr-10	2,608,500	5,175	60,966	2,542,359	0.932	2,369
1-May-10	1-Jun-10	May-10	5,379,000	3,450	142,062	5,233,488	0.932	4,877
1-Jun-10	1-Jul-10	Jun-10	7,081,500	1,725	169,132	6,910,643	0.932	6,440
1-Jul-10	1-Aug-10	Jul-10	8,070,000	-	207,745	7,862,255	0.932	7,327
1-Aug-10	1-Sep-10	Aug-10	6,493,500	-	159,946	6,333,554	0.932	5,903
1-Sep-10	1-Oct-10	Sep-10	4,531,500	3,450	102,289	4,425,761	0.932	4,124
1-Oct-10	1-Nov-10	Oct-10	3,213,000	3,450	66,167	3,143,383	0.932	2,929
1-Nov-10	1-Dec-10	Nov-10	2,053,500	5,175	39,093	2,009,232	0.932	1,872
1-Dec-10	1-Jan-11	Dec-10			50,106			



			2,784,000	1,725		2,732,169	0.932	2,546
1-Jan-11	1-Feb-11	Jan-11	2,643,000	1,725	43,125	2,598,150	0.932	2,421
1-Feb-11	1-Mar-11	Feb-11	2,362,500	1,725	49,298	2,311,477	0.932	2,154
1-Mar-11	1-Apr-11	Mar-11	2,041,500	3,450	44,045	1,994,005	0.932	1,858
1-Apr-11	1-May-11	Apr-11	1,933,500	5,175	47,146	1,881,179	0.932	1,753
1-May-11	1-Jun-11	May-11	4,867,500	3,450	120,341	4,743,709	0.932	4,421
1-Jun-11	1-Jul-11	Jun-11	8,907,000	-	180,031	8,726,969	0.932	8,133
1-Jul-11	1-Aug-11	Jul-11	8,823,000	-	237,539	8,585,461	0.932	8,001
1-Aug-11	1-Sep-11	Aug-11	7,500,000	1,725	187,605	7,310,670	0.932	6,813
		Total	90,681,000	56,925	2,093,150	88,530,925		82,502

E.2. Project emissions calculation

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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. Leakage calculation

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

E.4. Emission reductions calculation / table



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The total emission reductions achieved during the monitoring period is 82,502 tCO₂.

Total baseline emissions: 82,502 tCO₂

Total project emissions: Zero

Total leakage: Zero

Emission reductions

$E_{Ry} = B_{Ey} - P_{Ey} - L_y$

= 82,502 tCO₂

Total emissions reductions for the monitoring period are **82,502**.

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

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Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	86,329 (21 months equivalent of annually 49,331 emission reductions estimated in the registered PDD)	82,502

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

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There is very minor change of 4.4% in the expected and annual emission reductions. The registered PDD also captures the change in PLF to the extent of +/-10% and therefore the change of 4.4% is within the range of sensitivity mentioned in the registered PDD.

History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Guideline, Form Business Function: Issuance		



Appendix 1

