

**MONITORING REPORT FORM (CDM-MR) ***
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* as contained within the document entitled "Guidelines for completing the monitoring report form



MONITORING REPORT
Version 1.0 and Date 05/09/2011

Title: Enercon Wind Farm (Hindustan) Ltd in Karnataka
Project Reference No: 1259

Monitoring Period No 2- 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: >>

>>

The project activity includes development, design, engineering, procurement, finance, construction, operation and maintenance of Enercon Wind Farm (Hindustan) Ltd. (EWHPL) 68.8 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 Company (EWHPL) is owned by Enercon (India) Ltd. and Enercon GmbH. The project activity consists of 86 WEGs and each machine capacity is of 800 kW (E-48) totalling to the capacity of 68.8 MW. The specifications of E-48 machine are given in section A.4 of the monitoring report.

The first machine under the project activity was commissioned on 29 September 2006 and last machine under the project activity was commissioned on 28 December 2006. The expected operational lifetime of the project is for 20 years. The total emission reductions achieved under this monitoring period (01 December 2009 to 31 Aug 2011) is **173,489 tCO₂**.

A.2. Project Participants

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- 1) Enercon (India) Limited
- 2) Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A. (trading as Rabo Bank International)

A.3. Location of the project activity:

>>

The turbines are uniquely identified as EWFHL-01 to EWFHL-86. The details of the physical location are as follows:

S.No.	District	Taluka	Village	No. of WEG's
1	Tumkur	Chikkanayakanahalli	Dasudi	20
		Chikkanayakanahalli	Nelenuru	5
		Chikkanayakanahalli	Ganadu	6
		Gubbi	Annenhalli	6
		Gubbi	Siddapura	9
2	Chitradurga	Hosadurga	Chikkabyaledakere	16
		Hosadurga	Kanubehalli	11
		Hosadurga	Arasinagundi	8
		Hosadurga	Elladakere	5
			Total	86



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

S.No.	WEG Unique Identification Number	Location No.	Latitude			Longitude		
			Degree	Minutes	Seconds	Degree	Minutes	Seconds
1	EWHPL 01	1	13	43	20.9	76	31	3.9
2	EWHPL 02	2	13	43	25.4	76	31	1.5
3	EWHPL 03	3	13	43	30.0	76	30	59.0
4	EWHPL 04	4	13	43	34.6	76	30	57.2
5	EWHPL 05	5	13	43	39.3	76	30	55.6
6	EWHPL 06	6	13	43	43.8	76	30	53.1
7	EWHPL 07	7	13	43	50.0	76	30	50.5
8	EWHPL 08	8	13	43	54.5	76	30	48.0
9	EWHPL 09	9	13	44	3.9	76	30	44.9
10	EWHPL 10	10	13	45	33.0	76	31	5.9
11	EWHPL 11	11	13	45	28.2	76	31	6.4
12	EWHPL 12	12	13	45	23.4	76	31	7.0
13	EWHPL 13	13	13	45	18.9	76	31	7.7
14	EWHPL 14	14	13	45	14.3	76	31	8.3
15	EWHPL 15	15	13	45	10.2	76	31	9.5
16	EWHPL 16	16	13	44	54.0	76	31	12.3
17	EWHPL 17	17	13	44	49.2	76	31	13.1
18	EWHPL 18	18	13	44	44.5	76	31	14.7
19	EWHPL 19	19	13	44	39.8	76	31	16.7
20	EWHPL 20	20	13	44	35.4	76	31	19.9
21	EWHPL 21	21	13	44	30.5	76	31	19.8
22	EWHPL 22	22	13	44	25.6	76	31	20.2
23	EWHPL 23	23	13	44	21.7	76	31	26.4
24	EWHPL 24	24	13	44	16.9	76	31	27.7
25	EWHPL 25	25	13	44	12.0	76	31	28.2
26	EWHPL 26	26	13	44	8.0	76	31	29.8
27	EWHPL 27	27	13	43	57.6	76	31	53.8
28	EWHPL 28	28	13	43	54.1	76	31	55.1
29	EWHPL 29	29	13	43	49.5	76	31	57.1
30	EWHPL 30	30	13	43	44.8	76	31	58.6
31	EWHPL 31	31	13	43	40.0	76	31	59.5
32	EWHPL 32	32	13	43	35.4	76	32	1.9
33	EWHPL 33	33	13	43	30.6	76	32	4.8
34	EWHPL 34	34	13	43	0.6	76	32	22.1
35	EWHPL 35	35	13	42	54.7	76	32	19.9
36	EWHPL 36	36	13	42	50.3	76	32	23.0
37	EWHPL 37	37	13	42	45.6	76	32	24.7
38	EWHPL 38	38	13	42	40.9	76	32	26.3
39	EWHPL 39	39	13	42	36.3	76	32	28.5
40	EWHPL 40	40	13	42	31.1	76	32	31.4
41	EWHPL 41	41	13	40	57.2	76	35	58.1
42	EWHPL 42	42	13	40	52.4	76	35	59.4



43	EWHPL 43	43	13	40	47.7	76	36	0.9
44	EWHPL 44	44	13	40	43.1	76	36	2.6
45	EWHPL 45	45	13	40	38.4	76	36	4.2
46	EWHPL 46	46	13	40	33.7	76	36	5.8
47	EWHPL 47	47	13	40	13.7	76	36	10.7
48	EWHPL 48	48	13	40	9.1	76	36	12.6
49	EWHPL 49	49	13	40	4.7	76	36	15.7
50	EWHPL 50	50	13	39	2.8	76	36	34.8
51	EWHPL 51	51	13	38	58.7	76	36	36.8
52	EWHPL 52	52	13	38	54.1	76	36	38.9
53	EWHPL 53	53	13	38	49.5	76	36	41.3
54	EWHPL 54	54	13	38	44.9	76	36	43.1
55	EWHPL 55	55	13	38	40.2	76	36	44.9
56	EWHPL 56	56	13	38	35.6	76	36	46.9
57	EWHPL 57	57	13	38	30.9	76	36	48.7
58	EWHPL 58	58	13	38	26.4	76	36	50.9
59	EWHPL 59	59	13	38	22.3	76	36	56.3
60	EWHPL 60	60	13	38	17.8	76	36	58.8
61	EWHPL 61	61	13	38	11.8	76	37	2.5
62	EWHPL 62	62	13	38	7.2	76	37	4.6
63	EWHPL 63	63	13	38	2.6	76	37	6.8
64	EWHPL 64	64	13	37	58.0	76	37	9.2
65	EWHPL 65	65	13	37	53.5	76	37	11.5
66	EWHPL 66	66	13	37	48.9	76	37	13.7
67	EWHPL 67	67	13	37	44.3	76	37	16.0
68	EWHPL 68	68	13	37	39.8	76	37	18.4
69	EWHPL 69	69	13	37	35.1	76	37	20.3
70	EWHPL 70	70	13	37	30.5	76	37	22.3
71	EWHPL 71	71	13	37	25.9	76	37	24.7
72	EWHPL 72	72	13	32	25.1	76	43	45.2
73	EWHPL 73	73	13	32	30.0	76	43	44.4
74	EWHPL 74	74	13	32	34.8	76	43	44.7
75	EWHPL 75	75	13	32	39.7	76	43	44.5
76	EWHPL 76	76	13	32	44.6	76	43	43.9
77	EWHPL 77	77	13	32	49.5	76	43	42.5
78	EWHPL 78	78	13	32	54.4	76	43	42.1
79	EWHPL 79	79	13	33	6.1	76	43	33.2
80	EWHPL 80	80	13	33	11.0	76	43	34.1
81	EWHPL 81	81	13	33	15.9	76	43	34.6
82	EWHPL 82	82	13	33	20.8	76	43	34.5
83	EWHPL 83	83	13	34	19.9	76	44	0.8
84	EWHPL 84	84	13	34	27.5	76	44	2.3
85	EWHPL 85	85	13	34	50.5	76	44	14.8
86	EWHPL 86	86	13	34	54.9	76	44	14.8

**A.4. Technical description of the project**

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The Project involves 86 wind energy converters (WECs) of Enercon make (800 kW E-48) 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 drawal (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:

>>

Baseline Methodology: *Consolidate 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*

A.6. Registration date of the project activity:

>>

27/10/2008¹**A.7. Crediting period of the project activity and related information (start date and choice of crediting period):**

>>

27 October 2008 to 26 October 2018 (Fixed).

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

>>

Contact Information of responsible person(s)/entity(ies) is given in the table below:

¹ <http://cdm.unfccc.int/Projects/DB/DNV-CUK1185356859.49/view>



CDM – Executive Board

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Organization:	Enercon (India) Ltd.
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FAX:	+91-22-66921175
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URL:	
Represented by:	
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Salutation:	Mr.
Last Name:	Mehra
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Personal E-Mail:	yogesh.mehra@enerconindia.net

Organization:	Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A. (trading as Rabo Bank International)
Street/P.O.Box:	One Queenhithe, Thames Court, EC4V3RL
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Direct tel:	
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**SECTION B. Implementation of the project activity****B.1. Implementation status of the project activity**

>>

The first machine under the project activity was commissioned on 29 September 2006 and last machine under the project activity was commissioned on 28 December 2006. The project activity consists of 86 machines (800 KWH) of Enercon make E-48. The commissioning date for all the machines include in the project activity is given in the table below.

Loc. no.	Unique Identification Number	Date of Commissioning
1	EWHPL 01	26-Oct-06
2	EWHPL 02	26-Oct-06
3	EWHPL 03	26-Oct-06
4	EWHPL 04	28-Dec-06
5	EWHPL 05	28-Dec-06
6	EWHPL 06	28-Dec-06
7	EWHPL 07	28-Dec-06
8	EWHPL 08	28-Dec-06
9	EWHPL 09	28-Dec-06
10	EWHPL 10	29-Sep-06
11	EWHPL 11	29-Sep-06
12	EWHPL 12	29-Sep-06
13	EWHPL 13	29-Sep-06
14	EWHPL 14	29-Sep-06
15	EWHPL 15	29-Sep-06
16	EWHPL 16	29-Sep-06
17	EWHPL 17	29-Sep-06
18	EWHPL 18	29-Sep-06
19	EWHPL 19	29-Sep-06
20	EWHPL 20	29-Sep-06
21	EWHPL 21	29-Sep-06
22	EWHPL 22	29-Sep-06
23	EWHPL 23	29-Sep-06
24	EWHPL 24	29-Sep-06
25	EWHPL 25	29-Sep-06
26	EWHPL26	26-Oct-06
27	EWHPL 27	29-Sep-06
28	EWHPL 28	29-Sep-06
29	EWHPL 29	29-Sep-06
30	EWHPL 30	29-Sep-06
31	EWHPL 31	29-Sep-06
32	EWHPL 32	29-Sep-06
33	EWHPL 33	29-Sep-06
34	EWHPL 34	29-Sep-06
35	EWHPL 35	29-Sep-06
36	EWHPL 36	29-Sep-06



37	EWHP L 37	29-Sep-06
38	EWHP L 38	29-Sep-06
39	EWHP L 39	29-Sep-06
40	EWHP L 40	29-Sep-06
41	EWHP L 41	29-Sep-06
42	EWHP L 42	29-Sep-06
43	EWHP L 43	29-Sep-06
44	EWHP L 44	29-Sep-06
45	EWHP L 45	29-Sep-06
46	EWHP L 46	29-Sep-06
47	EWHP L 47	29-Sep-06
48	EWHP L 48	29-Sep-06
49	EWHP L 49	29-Sep-06
50	EWHP L 50	26-Oct-06
51	EWHP L 51	26-Oct-06
52	EWHP L 52	29-Sep-06
53	EWHP L 53	29-Sep-06
54	EWHP L 54	29-Sep-06
55	EWHP L 55	29-Sep-06
56	EWHP L 56	29-Sep-06
57	EWHP L 57	29-Sep-06
58	EWHP L 58	29-Sep-06
59	EWHP L 59	26-Oct-06
60	EWHP L 60	26-Oct-06
61	EWHP L 61	26-Oct-06
62	EWHP L 62	29-Sep-06
63	EWHP L 63	29-Sep-06
64	EWHP L 64	29-Sep-06
65	EWHP L 65	29-Sep-06
66	EWHP L 66	29-Sep-06
67	EWHP L 67	29-Sep-06
68	EWHP L 68	29-Sep-06
69	EWHP L 69	29-Sep-06
70	EWHP L 70	29-Sep-06
71	EWHP L 71	29-Sep-06
72	EWHP L 72	28-Dec-06
73	EWHP L 73	28-Dec-06
74	EWHP L 74	28-Dec-06
75	EWHP L 75	28-Dec-06
76	EWHP L 76	28-Dec-06
77	EWHP L 77	28-Dec-06
78	EWHP L 78	28-Dec-06
79	EWHP L 79	28-Dec-06
80	EWHP L 80	28-Dec-06
81	EWHP L 81	28-Dec-06
82	EWHP L 82	28-Dec-06
83	EWHP L 83	28-Dec-06
84	EWHP L 84	28-Dec-06



85	EWHP 85	28-Dec-06
86	EWHP 86	28-Dec-06

Enercon operation and maintenance activities are ISO 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 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.

B.2. Revision of the monitoring plan

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There is a revision in Monitoring Plan which has been approved on date 15th March 2011 by UNFCCC.

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

>>

Not Applicable

B.4. Notification or request of approval of changes

>>

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 --- Version 6”, by CDM - Meth Panel is proposed 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 are two main and check meters dedicated to project activity at 33 kV metering point for the project activity. The one set of main and check meter is connected to 56.8 MW and other set of the main and check meter is connected to 12 MW of the project activity. In addition to this there is one set of main and check meter (bulk meter) at 220 kV metering point at the Enercon substation is connected to the machines of the project activity and the machines commissioned by the other project developers. Therefore in order to determine the net electricity supplied to the grid by the project at 220 kV at the Enercon 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. Net 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:-



$$Z = \frac{(X1 + X2 + X3 + X4 + \dots + Xn) - Y}{(X1 + X2 + X3 + X4 + \dots + Xn)} \times 100$$

Where,

Z = Percentage transmission loss for export incurred in transmission line between the meters located at 33 kV metering point (including the machines of the project activity and other project developers) and the meters located at 220kV metering point (bulk meter: main and check) at high voltage side of receiving sub-station. **Refer Appendix 1 for schematic of the flow diagram.**

Summation of meter readings at 33 kV metering points for all the project developers connected to receiving substation (including the machines of the project activity and other project developers)

$$= (X1 + X2 + X3 + X4 + \dots + Xn)$$

X_i = Energy Export Reading (X_i) noted at energy meter installed at 33kV metering point where i vary from 1 to n which represents the meters connected to project activity and other project developers. $X_1, X_2, X_3, \dots, X_n$ are the meters that are installed at 33kV metering point (including the machines of the project activity and other project developers) and further connected to the receiving substation at 220 kV by internally connected lines. **Refer Appendix 1 for schematic of the flow diagram**

Y = Energy Export Reading at bulk meter installed at high voltage side of transformer of the receiving sub-station at 220 kV connecting machines of the project activity and other project developers. **Refer Appendix 1 for schematic of the flow diagram.**

Energy Export by the project activity at 33 kV metering point is as follows:

$$EG_{\text{export}} = X1 + X2$$

Where, X_1 & X_2 is the export reading recording at 33kV metering points for project activity.

$$\text{Transmission Loss in Export (TE)} = \text{Transmission Loss (Z)} * \text{Energy Export at 33kV metering point (EG}_{\text{Export}})$$

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

$$\text{Net Energy Export after adjustment of transmission loss} = EG_{\text{Export}} - \text{Transmission Loss (TE)}$$

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.

$$\text{Transmission Loss in Import (TI)} = 15\% * \text{Energy Import at 33kV metering point (EG}_{\text{Import}})$$

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

$$\begin{aligned} \text{Net Energy Import after adjustment of transmission loss} &= EG_{\text{Import}} + 15\% * EG_{\text{Import}} \\ &= 115\% * EG_{\text{Import}} \end{aligned}$$



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.

$$\text{EGy} = \text{EGexport} - 115\% * \text{EGimport} - \text{Transmission Loss (TE)}$$

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

1. Electricity Export (EGexport)
2. Electricity Import (EGimport)
3. Transmission Loss (TE) between 33 kV metering point and 220 kV metering point at Enercon substation
4. Net Electricity supplied to the Grid [EGexport-115%*EGimport-TE]

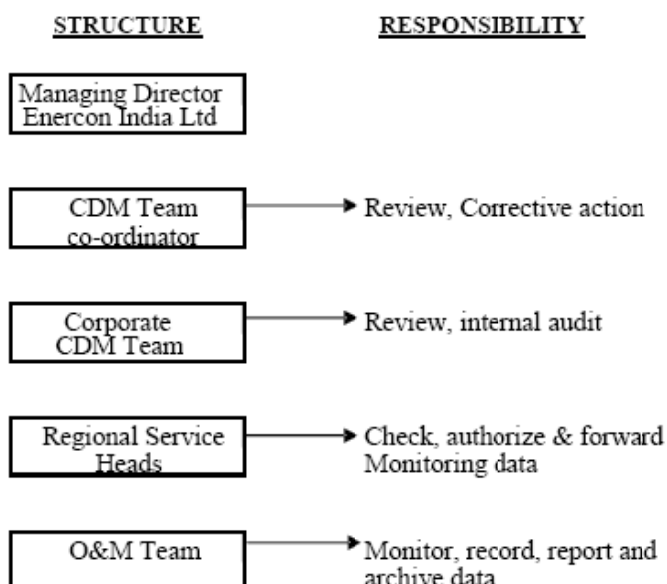
JMR is signed by the representatives of Enercon and the state utility. The meter readings (both export and import), transmission loss and net electricity supplied to the grid are recorded in the JMR (33 kV metering point). Hence all these values will be reproduced from the JMR for calculation of emission 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 220kV metering point (bulk meters: main and check) at Enercon substation
2. Transmission loss calculation endorsed / confirmed jointly by the representatives of Enercon and the state utility.

The net electricity supplied to the grid can be cross checked from the invoices raised on the state utility for supply of net electricity supplied to the grid. Refer Annex – 2 for an illustration of the provisions for measurement methods.

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

**Calibrations Details of Meters:**

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

Parameter	Meter description	Meter Serial No.	Accuracy class	Metering point	Calibration Dates		
					2009	2010	2011
EGy from RR No: KBCWP-01 (88.0 MW)	Main Meter	06605121	0.2	220kV	30-Dec-09	1) 23 Mar 10, 2) 25 June 10, 3) 22 Nov 10	1) 14 Feb 11, 2) 10 June 11
	Check Meter	06605122	0.2	220kV			
EGy from RR No: KBCWP-02 (56.8 MW)	Main Meter	05389967	0.2	33kV	14-Dec-09	1) 16 Apr 10 2) 18 Oct 10	13-Apr-11
	Check Meter	05389970	0.2	33kV			
EGy from RR No: KBCWP-03 (12 MW)	Main Meter	05463844	0.2	33kV		1) 16 Apr 10 2) 18 Oct 10	13-Apr-11
	Check Meter	05463845	0.2	33kV			

The main and check meters are tested and in case of error, are calibrated by state utility.

We refer to the Guidelines For Assessing Compliance With The Calibration Frequency Requirements – Annex 60 to EB 52, Paragraph 4(a) states that where calibration is not carried out in line with the frequency mentioned in the monitoring plan, 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 certificates for main and check meters for KBCWP-03 between year 2008 to 2010 wasn't done annually, and calibration certificate dated 16 April 2010 clearly show that meters are performing within their accuracy class, 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 period of Dec 2009 to April 2010.

The line diagram showing all relevant monitoring points for the project activity has been given in Appendix 1.

SECTION D. Data and parameters

>>

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

Data / Parameter:	$EF_{CM,V}$
Data unit:	tCO ₂ e/MWh
Description:	Combined Margin Emission Factor of Southern Regional Electricity Grid
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 “CO ₂ 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 / Parameter:	$EF_{OM,V}$						
Data unit:	tCO ₂ e/MWh						
Description:	Operating Margin Emission Factor of Southern Regional Electricity Grid						
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 “CO ₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in						
Value(s) :	<table border="1"> <tr> <td>2002 – 03</td><td>0.9970</td></tr> <tr> <td>2003 – 04</td><td>1.0094</td></tr> <tr> <td>2004 – 05</td><td>1.0038</td></tr> </table>	2002 – 03	0.9970	2003 – 04	1.0094	2004 – 05	1.0038
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						



calculations)	
Additional comment:	None

Data / Parameter:	$EF_{BM,v}$		
Data unit:	tCO ₂ e/MWh		
Description:	Build Margin Emission Factor of Southern Regional Electricity Grid 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) :	2004 – 05	0.718	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions		
Additional comment:	None		

Please refer Annex 1 for combined margin calculation.

D.2. Data and parameters monitored

>>

Data / Parameter:z	EGy
Data unit:	MWh (Mega-Watt hour)
Description:	Net electricity supplied to the grid by the Project
Source of data to be used:	Electricity supplied to the grid as per two joint meter readings (Form B) taken at 33 kV metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual electricity supplied to the grid by the Project = 186151.699 MWh
Description of measurement methods and procedures to be applied:	<p>Monitoring: The procedures for metering and meter reading will be as per the provisions of the power purchase agreement and details of metering has been explained in monitoring plan in section C. Metering system for the project activity consists of two sets of main and check meters at 33 kV metering location. Both sets of meters are two-way trivector meters capable of recording import and export of electricity.</p> <p>In addition to this there is one set of main and check meter (bulk meter) at 220 kV metering point at the Enercon (India) Ltd. (hereafter referred as “Enercon” in the revised monitoring plan) substation. 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 net electricity supplied to the grid by the project activity at high voltage (220 kV) side of Enercon substation, the KPTCL/Discom (hereafter referred as “state utility” in the revised monitoring plan) applies the transmission loss between 220 kV</p>



	<p>metering point at Enercon substation at Dasudi village and meter reading recorded at the 33 kV metering points for all the machines that are connected to 220 kV bulk meter at Enercon substation. 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 220 kV.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of net electricity supplied to the grid is sourced from two JMR for 56.8 MW and 12 MW at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility.</p> <p>Refer section C and Annex – 2 for an illustration of the provisions for measurement methods.</p>
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. The values of net electricity supplied to the grid mentioned in the two JMRs of the project for 56.8 MW and 12 MW at 33kV metering point can be cross checked with values mentioned in the invoice raised on the state utility. Refer Annex – 2 for an illustration of the provisions for QA/QC procedures. Refer Appendix 1 for location of metering points at 33kV and 220 kV.
Any comment:	The data for net 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.

Data / Parameter:	EGexport
Data unit:	MWh (Mega-Watt hour)
Description:	Summation of electricity Export recorded at meters (two main and two check) connecting 86 machines of the project activity and can be sourced from two JMR issued by BESCOM for 56.8 MW and 12 MW at 33 kV metering point.
Source of data to be used:	Electricity export to the grid as per two joint meter readings (FormB) taken at 33 kV metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	=188706.750 MWh
Description of measurement methods and procedures to be applied:	<p>Monitoring: Electricity export to the grid will be recorded by the meters (two main and two check) connecting 86 turbines at 33kV point. Refer section C and Annex – 2 for an illustration of the provisions for measurement methods.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values electricity export to the grid is sourced from two JMR for 56.8 MW and 12 MW at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility</p>



QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer Annex – 2 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data 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.

Data / Parameter:	EGimport
Data unit:	MWh (Mega-Watt hour)
Description:	Summation of electricity Import recorded at the meters (two main and two check) connecting 86 machines of the project activity and can be sourced from two JMR issued by BESCOM for 56.8 MW and 12 MW at 33 kV metering point.
Source of data to be used:	Electricity import from the grid as per two joint meter reading taken at 33kV metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	=77.700 MWh
Description of measurement methods and procedures to be applied:	Monitoring: Electricity import from the grid will be recorded by meters (two main and two check) connected to the 86 machines at 33kV point. Refer section C and Annex – 2 for an illustration of the provisions for measurement methods. Frequency of recording data: Monthly Recording: The values electricity import to the grid is sourced from two JMR for 56.8 MW and 12 MW at 33 kV metering point. Responsibility: Joint responsibility of Enercon and state utility
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer section C. Annex – 2 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data 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.

Data / Parameter:	T_E
Data unit:	MWh (Mega-Watt hour)
Description:	Transmission loss for export between the metering location at 33 kV point and the metering location at 220 kV at the Enercon substation.
Source of data to be used:	Transmission Loss for export will be sourced from the joint meter reading (Form B) taken at 33kV metering point for the project activity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	=2456.785 MWh
Description of measurement methods and procedures to	Monitoring: Transmission loss between metering location at 33 kV and the metering location at 220 kV at Enercon substation is applied to



be applied:	<p>the meter reading taken at meters connected at 33 KV point for the project activity.</p> <p>Enercon 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. The JMR is signed by the representatives of Enercon and the state utility. Refer section C and Annex – 2 for an illustration of the provisions for measurement methods.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The value of transmission loss is sourced from two JMR for 56.8 and 12 MW at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility</p> <p>Refer section C and Annex – 2 for an illustration of the provisions for measurement methods.</p>
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP. Refer section C and Annex – 2 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be stored in hard format and values will be taken from JMR.

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

>>

“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).

**1) Generation details for meter KBCWP-02 (56.8 MW)**

Months	Export (kWh)	Import (kWh)	Transmission loss (kWh)	Net Export to grid (kWh)
	[EG _{export}]	[EG _{import}]	[T _E]	[EG _y]
1-Dec-09 to 31-Dec-09	5,418,750	3,750	74,941	5,339,497
1-Jan-10 to 31-Jan-10	4,020,000	3,750	51,376	3,964,312
1-Feb-10 to 28-Feb-10	3,176,250	0	56,156	3,120,094
1-Mar-10 to 31-Mar-10	4,927,500	3,750	75,933	4,847,255
1-Apr-10 to 30-Apr-10	4,530,000	3,750	64,190	4,461,498
1-May-10 to 31-May-10	3,941,250	3,750	52,813	3,884,125
1-June-10 to 30-June-10	11,235,000	0	139,988	11,095,012
1-July-10 to 31-July-10	13,387,500	0	155,161	13,232,339
1-Aug-10 to 31-Aug-10	11,853,750	0	153,032	11,700,718
1-Sep-10 to 30-Sep-10	7,530,000	3,750	107,604	7,418,084
1-Oct-10 to 31-Oct-10	1,035,000	900	14,345	1,019,620
1-Nov-10 to 30-Nov-10	3,618,750	7,500	53,449	3,556,676
1-Dec-10 to 31-Dec-10	4,365,000	0	60,062	4,304,938
1-Jan-11 to 31-Jan-11	4,867,500	3,750	72,574	4,790,614
1-Feb-11 to 28-Feb-11	4,245,000	3,750	47,586	4,193,102
1-Mar-11 to 31-Mar-11	4,818,750	3,750	60,572	4,753,866
1-Apr-11 to 30-Apr-11	3,727,500	3,750	22,253	3,700,935
1-May-11 to 31-May-11	7,650,000	3,750	76,347	7,569,341
1-June-11 to 30-June-11	18,187,500	0	375,000	17,812,500
1-July-11 to 31-July-11	18,172,500	0	198,444	17,974,056
1-Aug-11 to 31-Aug-11	14,947,500	0	159,490	14,788,010

1) Generation details for meter KBCWP-03 (12 MW)

Months	Export (kWh)	Import (kWh)	Transmission loss (kWh)	Net Export to grid (kWh)
	[EG _{export}]	[EG _{import}]	[T _E]	[EG _y]
1-Dec-09 to 31-Dec-09	985,500	900	13,629	968,863
1-Jan-10 to 31-Jan-10	1,001,700	900	12,802	985,858
1-Feb-10 to 28-Feb-10	945,900	1,800	16,724	925,210
1-Mar-10 to 31-Mar-10	1,163,700	900	17,933	1,142,403
1-Apr-10 to 30-Apr-10	347,400	5,400	4,923	335,560
1-May-10 to 31-May-10	681,300	900	9,129	671,136
1-June-10 to 30-June-10	2,060,100	900	25,669	2,033,396



1-July-10 to 31-July-10	1,939,500	0	22,479	1,917,021
1-Aug-10 to 31-Aug-10	1,872,900	900	24,179	1,847,686
1-Sep-10 to 30-Sep-10	1,266,300	900	18,095	1,247,170
1-Oct-10 to 31-Oct-10	5,043,750	3,750	69,906	4,969,532
1-Nov-10 to 30-Nov-10	853,200	1,800	12,602	838,528
1-Dec-10 to 31-Dec-10	877,500	900	12,074	864,391
1-Jan-11 to 31-Jan-11	1,117,800	900	16,666	1,100,099
1-Feb-11 to 28-Feb-11	999,000	900	11,199	986,766
1-Mar-11 to 31-Mar-11	1,275,300	1,800	16,031	1,257,199
1-Apr-11 to 30-Apr-11	773,100	1,800	4,615	766,415
1-May-11 to 31-May-11	1,356,300	1,800	13,536	1,340,694
1-June-11 to 30-June-11	3,265,200	900	6,792	3,257,373
1-July-11 to 31-July-11	2,885,400	0	31,509	2,853,891
1-Aug-11 to 31-Aug-11	2,340,900	0	24,977	2,315,923

Baseline Emission Reductions calculation for project activity:-

Months	Net Export to grid for meter KBCWP-2 (56.8 MW) (kWh)	Net Export to grid for meter KBCWP-3 (12 MW) (kWh)	Net Generation for 68.8 (kWh)	Baseline Emission Factor (tCO ₂ e/MWh)	Baseline Emission Reductions (tCO ₂ e)
	A	B	[EGy] =A+B	[EFy]	[BEy]
1-Dec-09 to 31-Dec-09	5,339,497	968,863	6,308,359	0.9320	5,879
1-Jan-10 to 31-Jan-10	3,964,312	985,858	4,950,169	0.9320	4,613
1-Feb-10 to 28-Feb-10	3,120,094	925,210	4,045,304	0.9320	3,770
1-Mar-10 to 31-Mar-10	4,847,255	1,142,403	5,989,657	0.9320	5,582
1-Apr-10 to 30-Apr-10	4,461,498	335,560	4,797,057	0.9320	4,471
1-May-10 to 31-May-10	3,884,125	671,136	4,555,261	0.9320	4,245
1-June-10 to 30-June-10	11,095,012	2,033,396	13,128,408	0.9320	12,236
1-July-10 to 31-July-10	13,232,339	1,917,021	15,149,360	0.9320	14,119
1-Aug-10 to 31-Aug-10	11,700,718	1,847,686	13,548,404	0.9320	12,627
1-Sep-10 to 30-Sep-10	7,418,084	1,247,170	8,665,254	0.9320	8,076
1-Oct-10 to 31-Oct-10	1,019,620	4,969,532	5,989,152	0.9320	5,582
1-Nov-10 to 30-Nov-10	3,556,676	838,528	4,395,204	0.9320	4,096
1-Dec-10 to 31-Dec-10	4,304,938	864,391	5,169,329	0.9320	4,817
1-Jan-11 to 31-Jan-11	4,790,614	1,100,099	5,890,713	0.9320	5,490
1-Feb-11 to 28-Feb-11	4,193,102	986,766	5,179,868	0.9320	4,827
1-Mar-11 to 31-Mar-11	4,753,866	1,257,199	6,011,065	0.9320	5,602
1-Apr-11 to 30-Apr-11	3,700,935	766,415	4,467,350	0.9320	4,163
1-May-11 to 31-May-11	7,569,341	1,340,694	8,910,035	0.9320	8,304



1-June-11 to 30-June-11	17,812,500	3,257,373	21,069,873	0.9320	19,637
1-July-11 to 31-July-11	17,974,056	2,853,891	20,827,947	0.9320	19,412
1-Aug-11 to 31-Aug-11	14,788,010	2,315,923	17,103,933	0.9320	15,941
			186,151,699	Total CERs	173,489

E.2. Project emissions calculation

>>

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

>>

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

E.4. Emission reductions calculation / table

>>

The total emission reductions achieved during the monitoring period is **173,489 tCO₂**.

Total baseline emissions: tCO₂

Total project emissions: Zero

Total leakage: Zero

$$\begin{aligned} \text{Emission reductions } E_{Ry} &= B_{Ey} - P_{Ey} \\ &= \mathbf{173,489 \text{ tCO}_2} \end{aligned}$$

Months	Baseline Emissions [tCO ₂ e]	Project Emissions [tCO ₂ e]	Emission Reductions [tCO ₂ e]
	[B _{Ey}]	[P _{Ey}]	[E _{Ry}] = [B _{Ey}] - [P _{Ey}]
1-Dec-09 to 31-Dec-09	5,879	0	5,879
1-Jan-10 to 31-Jan-10	4,613	0	4,613
1-Feb-10 to 28-Feb-10	3,770	0	3,770
1-Mar-10 to 31-Mar-10	5,582	0	5,582
1-Apr-10 to 30-Apr-10	4,471	0	4,471
1-May-10 to 31-May-10	4,245	0	4,245
1-June-10 to 30-June-10	12,236	0	12,236
1-July-10 to 31-July-10	14,119	0	14,119
1-Aug-10 to 31-Aug-10	12,627	0	12,627
1-Sep-10 to 30-Sep-10	8,076	0	8,076
1-Oct-10 to 31-Oct-10	5,582	0	5,582
1-Nov-10 to 30-Nov-10	4,096	0	4,096
1-Dec-10 to 31-Dec-10	4,817	0	4,817
1-Jan-11 to 31-Jan-11	5,490	0	5,490



1-Feb-11 to 28-Feb-11	4,827	0	4,827
1-Mar-11 to 31-Mar-11	5,602	0	5,602
1-Apr-11 to 30-Apr-11	4,163	0	4,163
1-May-11 to 31-May-11	8,304	0	8,304
1-June-11 to 30-June-11	19,637	0	19,637
1-July-11 to 31-July-11	19,412	0	19,412
1-Aug-11 to 31-Aug-11	15,941	0	15,941
Total	173,489	0	173,489

Total Emission Reductions for the monitoring period are **173,489**

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

>>

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO₂e)	260,501 (21 months equivalent of annually 148,858 emission reductions estimated in the registered PDD)	173,489

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

>>

There is change of 33.40% (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.

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		

**BASELINE INFORMATION**

The Operating Margin data for the most recent three years and the Build Margin data for the Southern Region Electricity Grid as published in the CEA database are as follows:

Simple Operating Margin

	tCO₂e/GWh
Simple Operating Margin - 2002-03	997.02
Simple Operating Margin - 2003-04	1,009.37
Simple Operating Margin - 2004-05	1,003.76
Average Operating Margin of last three years	1,003.38

Build Margin

	tCO₂e/GWh
Build Margin- 2004-05	717.99

Combined Margin calculations

	Weights	tCO₂e/GWh
Operating Margin	0.75	1003.38
Build Margin	0.25	717.99
Combined Margin		932.04

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.



Annex 2

MONITORING INFORMATION

- **Metering:** Net electricity supplied to the grid is metered jointly by state utility and Enercon through two sets of main and check meters at 33 kV metering point connecting exclusively the machines of project activity after adjusting for transmission loss.

In addition to this there is one set of main and check meter (Bulk meter) at 220 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 220 kV metering points for the project activity is attached as Appendix 1.

- **Metering Equipment:** Metering system for the project activity consists of two sets of main and checks meters at 33kV metering point and one set of main and check meters at 220 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 two JMRs at 56.8 MW and 33 MW at 33kV metering point in the presence of representatives of state utility and Enercon. The JMRs at 33kV metering point contains the value of energy exported, energy imported, transmission loss and net electricity supplied to the grid during the recording period. This JMR is certified by the Executive Engineer of the state utility and Enercon. These certified readings are then used to prepare the invoices to be raised on Discom. Thus the net 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 main & check meters connected at metering points with RR. No. KBCWP 01 (220kV metering point), KBCWP 02 (33kV metering point) & KBCWP03 (33kV metering point) (please refer project layout Appendix 1) will be tested / calibrated for accuracy annually by either of KPTCL or BESCOM based on the availability of EB officials. KPTCL is a transmission utility and BESCOM is distribution licensee in the state of Karnataka.

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.

The schematic showing the location of meters for the project activity is given in Appendix 1:



Appendix 1: Schematic for location of meters at 33kV metering points and the bulk meter at 220 kV at Enercon sub-station.

