

**MONITORING REPORT FORM (CDM-MR)**  
**Version 01-in effect as of: 28/09/2010****CONTENTS**

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**MONITORING REPORT**  
Version 1.0 and Date 4/10/2011

**Title: “ENERCON WIND FARM (HINDUSTAN) LTD IN RAJASTHAN”**  
**Project Reference No: 1168**  
**Monitoring Period - FROM 1/10/2010 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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**Purpose of the project activity and the measures taken to reduce greenhouse gas emissions:**

Enercon Wind Farm (Hindustan) Ltd in Rajasthan (“Project”) is a 60 MW project installed in the Indian state of Rajasthan. The Project provides reliable, renewable power to the Rajasthan state electricity grid. The Project leads to reduction of greenhouse gas emissions because it displaces electricity from fossil fuel based electricity generation plants. The Project harnesses renewable resources in the region, and thereby displaces non-renewable natural resources ultimately leading to sustainable economic and environmental development.

**Brief description of the installed technology and equipments**

The Project includes 75 Wind Energy Converters of 800 kW each of Enercon E-48 make. Enercon (India) Limited (“Enercon” or “EIL”) is the equipment supplier and the operations and maintenance contractor for the Project. The generated electricity will be supplied to Rajasthan Rajya Vidyut Prasaran Nigam Ltd (“RRVPN”)/ Jaipur Vidyut Vitran Nigam Limited (“Jaipur DISCOM”) for 28.80 MW and Rajasthan Rajya Vidyut Prasaran Nigam Ltd (“RRVPN”)/ Ajmer Electricity Distribution Company Ltd (“Ajmer DISCOM”) for 31.20 MW under a long-term power purchase agreement (PPA).

**Relevant dates for the project activity**

The first WEC under the project activity was commissioned on 26<sup>th</sup> November 2006 and the last WEC under the project activity was commissioned on 25<sup>th</sup> December 2006. The expected operational lifetime of the project is for 20 years.

**Total emission reductions achieved in this monitoring period**

The total emission reductions achieved under this monitoring period (1<sup>st</sup> Oct 2010 to 31<sup>st</sup> Aug 2011) is 65,767 tCO<sub>2</sub>e.

**A.2. Project Participants**

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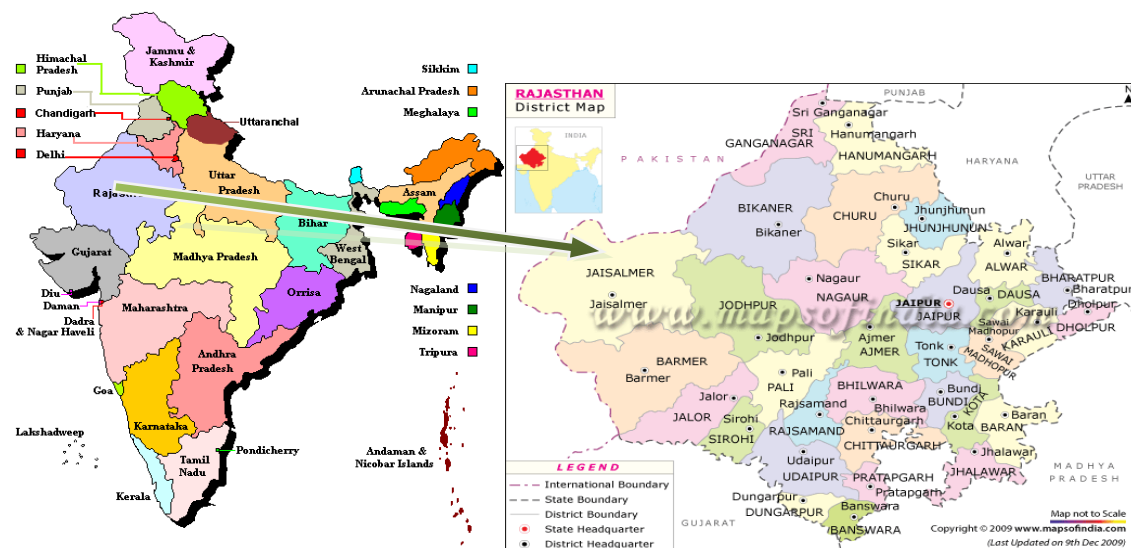
Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host)	Enercon (India) Ltd	No
Government of United Kingdom of Great Britain and Northern Ireland (Annex 1)	Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A.	No

**A.3. Location of the project activity:**

&gt;&gt;

The Project is located at Kita and Pithodai Ki Dhani village, in Jaisalmer District of Rajasthan state in India.

The project area extends between latitude 26° 40' 47.5'' & 26° 45' 48.3'' North and longitude 70° 58' 19.3'' & 71° 3' 32.5'' East. The Project is connected to 33/132/220 kV Amarsagar RRVN substation. The sites are located at a distance of 25 km from Jaisalmer by road. The nearest railway station is at Jaisalmer.



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

S. No	EWHPL UNIQUE ID	Loc No	Latitude			Longitude		
			Deg.	Minute	Second	Deg.	Minute	Second
1	EWHPL 01	322	26	40	47.5	70	58	58.2
2	EWHPL 02	323	26	40	55.3	70	58	54.6
3	EWHPL 03	145	26	41	2.5	70	58	49.5
4	EWHPL 04	146	26	41	7.7	70	58	43.9
5	EWHPL 05	147	26	41	12.8	70	58	38.4
6	EWHPL 06	148	26	41	18	70	58	32.8
7	EWHPL 07	150	26	41	27	70	58	48.3
8	EWHPL 08	151	26	41	32.1	70	58	42.7
9	EWHPL 09	152	26	41	37.3	70	58	37.2
10	EWHPL 10	153	26	41	38.5	70	59	8.6

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11	EWHPL 11	154	26	41	43.6	70	59	3.1
12	EWHPL 12	155	26	41	48	70	58	57.5
13	EWHPL 13	156	26	41	54.1	70	58	52.1
14	EWHPL 14	157	26	41	56.6	70	58	41.5
15	EWHPL 15	307	26	42	12	70	58	24.8
16	EWHPL16	306	26	42	17.2	70	58	19.3
17	EWHPL 17	300	26	42	47.4	70	58	24.4
18	EWHPL 18	301	26	42	43.9	70	58	30.7
19	EWHPL 19	304	26	42	26.8	70	58	46.6
20	EWHPL 20	305	26	42	21.7	70	58	52.2
21	EWHPL 21	161	26	42	16.5	70	58	57.7
22	EWHPL 22	160	26	42	9	70	59	2.2
23	EWHPL 23	159	26	42	1.3	70	59	6.7
24	EWHPL 24	324	26	42	5.7	70	59	23.9
25	EWHPL 25	167	26	42	38.3	70	59	0.2
26	EWHPL 26	168	26	42	42.9	70	58	56.3
27	EWHPL 27	169	26	42	49.6	70	58	54.4
28	EWHPL 28	170	26	42	56.5	70	58	52.7
29	EWHPL 29	326	26	43	22.4	70	58	50.2
30	EWHPL 30	177	26	42	54.5	70	59	29.3
31	EWHPL 31	178	26	42	49.4	70	59	34.9
32	EWHPL 32	179	26	42	44.2	70	59	40.5
33	EWHPL 33	181	26	42	32.2	70	59	50.9
34	EWHPL 34	183	26	42	59	70	59	50.6
35	EWHPL 35	184	26	43	5.8	70	59	45.8
36	EWHPL 36	186	26	43	17.8	70	59	35.4
37	EWHPL 37	190	26	43	25.1	70	59	50.1



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38	EWHPL 38	191	26	43	18.3	70	59	54.9
39	EWHPL 39	192	26	43	13.2	71	0	0.5
40	EWHPL 40	193	26	43	8	71	0	6.1
41	EWHPL 41	194	26	43	2.9	71	0	11.6
42	EWHPL 43	218	26	45	31.3	71	0	32
43	EWHPL 42	219	26	45	17.2	71	0	23.1
44	EWHPL 44	220	26	44	52.6	71	0	38.2
45	EWHPL 45	221	26	44	52.5	71	0	47.2
46	EWHPL 46	222	26	44	45.9	71	0	55.9
47	EWHPL 47	223	26	44	56.1	71	1	5.4
48	EWHPL 48	224	26	45	1.9	71	1	16.3
49	EWHPL 49	225	26	44	43.9	71	1	23
50	EWHPL 50	226	26	44	38.8	71	1	35.9
51	EWHPL 51	230	26	44	24.9	71	1	55.5
52	EWHPL 52	232	26	44	19.9	71	2	1.7
53	EWHPL 53	233	26	44	14.1	71	2	7.3
54	EWHPL 54	329	26	44	30.1	71	2	16
55	EWHPL 55	234	26	44	20.5	71	2	27.9
56	EWHPL 56	236	26	43	57.4	71	2	22.2
57	EWHPL 57	237	26	43	55.8	71	2	30.9
58	EWHPL 58	238	26	43	56.9	71	2	39.7
59	EWHPL 59	328	26	44	8.9	71	2	56.5
60	EWHPL 60	241	26	43	58.7	71	2	59.9
61	EWHPL 61	242	26	43	51.8	71	3	5.1
62	EWHPL 62	245	26	44	30.5	71	3	32.5
63	EWHPL 63	246	26	44	32.5	71	3	22.5
64	EWHPL 64	249	26	45	9.4	71	3	14.1
65	EWHP 65	302	26	44	51.4	71	2	56.1
66	EWHPL 66	250	26	44	58.1	71	2	52.3
67	EWHPL 67	251	26	45	0.4	71	2	44.6
68	EWHPL 68	252	26	45	0.8	71	2	32.4
69	EWHPL 69	253	26	45	4.3	71	2	25.6

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70	EWHPL 70	254	26	45	14.2	71	2	15.9
71	EWHPL 71	256	26	45	23.8	71	2	25.8
72	EWHPL 72	257	26	45	39.3	71	2	47.5
73	EWHPL 73	258	26	45	42.8	71	2	37.2
74	EWHPL 74	259	26	45	46.6	71	2	26.5
75	EWHPL 75	260	26	45	48.3	71	2	18.7

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

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The Project involves 75-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 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.



Enercon (India) Ltd has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH and has established a manufacturing plant at Daman in India where, along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured. The line diagram of wind farm including metering points and substations is attached as Appendix 1.

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

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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*

**A.6. Registration date of the project activity:**

&gt;&gt;

15/03/2010

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

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The length of the Crediting period of the project activity as per registered PDD is 10 years (Fixed). As per the Registered PDD, the Crediting period Start Date is estimated 01/11/2007. However, since the Project was registered on 15<sup>th</sup> March 2010, the length of crediting period is from 15/03/2010 to 14/03/2020. In first CER verification, the monitoring period considered was the period from 15-Mar-2010 to 30-Sep-2010. The second monitoring period is considered from 01-Oct-2010 to 31-August-2011.

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

&gt;&gt;

Contact Information of project proponents are 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 Tower
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 053
Country:	India
Telephone:	+91-22-2671 7176
FAX:	+91 22 66921177
E-Mail:	<a href="mailto:yogesh.mehra@enerconindia.net">yogesh.mehra@enerconindia.net</a>
URL:	<a href="http://www.enerconindia.net">www.enerconindia.net</a>
Represented by:	Yogesh Mehra
Title:	Managing Director
Salutation:	Mr.
Last Name:	Mehra
Middle Name:	
First Name:	Yogesh
Department:	Corporate
Mobile:	+91-9820040301
Direct FAX:	+91 22 66921177
Direct tel:	+91-22-6692 4848 extn. 7111
Personal E-Mail:	<a href="mailto:yogesh.mehra@enerconindia.net">yogesh.mehra@enerconindia.net</a>

**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 26<sup>th</sup> November 2006 and last WEC under the project activity was commissioned on 25<sup>th</sup> December 2006. The commissioning date for all the WECs included in the project activity is given in the table below.

S.No	EWHPL UNIQUE ID	Loc No	Commissioning date
1	EWHPL 01	322	20-Dec-06
2	EWHPL 02	323	20-Dec-06
3	EWHPL 03	145	20-Dec-06
4	EWHPL 04	146	20-Dec-06
5	EWHPL 05	147	20-Dec-06
6	EWHPL 06	148	20-Dec-06
7	EWHPL 07	150	20-Dec-06
8	EWHPL 08	151	20-Dec-06
9	EWHPL 09	152	20-Dec-06
10	EWHPL 10	153	20-Dec-06
11	EWHPL 11	154	20-Dec-06
12	EWHPL 12	155	20-Dec-06
13	EWHPL 13	156	20-Dec-06
14	EWHPL 14	157	20-Dec-06
15	EWHPL 15	307	21-Dec-06
16	EWHPL16	306	21-Dec-06
17	EWHPL 17	300	20-Dec-06
18	EWHPL 18	301	20-Dec-06
19	EWHPL 19	304	21-Dec-06
20	EWHPL 20	305	21-Dec-06
21	EWHPL 21	161	20-Dec-06
22	EWHPL 22	160	20-Dec-06
23	EWHPL 23	159	20-Dec-06
24	EWHPL 24	324	21-Dec-06
25	EWHPL 25	167	20-Dec-06
26	EWHPL 26	168	26-Nov-06
27	EWHPL 27	169	26-Nov-06
28	EWHPL 28	170	26-Nov-06



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29	EWHPL 29	326	21-Dec-06
30	EWHPL 30	177	25-Dec-06
31	EWHPL 31	178	25-Dec-06
32	EWHPL 32	179	25-Dec-06
33	EWHPL 33	181	25-Dec-06
34	EWHPL 34	183	25-Dec-06
35	EWHPL 35	184	25-Dec-06
36	EWHPL 36	186	25-Dec-06
37	EWHPL 37	190	25-Dec-06
38	EWHPL 38	191	25-Dec-06
39	EWHPL 39	192	25-Dec-06
40	EWHPL 40	193	25-Dec-06
41	EWHPL 41	194	25-Dec-06
42	EWHPL 43	218	21-Dec-06
43	EWHPL 42	219	21-Dec-06
44	EWHPL 44	220	25-Dec-06
45	EWHPL 45	221	25-Dec-06
46	EWHPL 46	222	25-Dec-06
47	EWHPL 47	223	21-Dec-06
48	EWHPL 48	224	21-Dec-06
49	EWHPL 49	225	21-Dec-06
50	EWHPL 50	226	21-Dec-06
51	EWHPL 51	230	21-Dec-06
52	EWHPL 52	232	21-Dec-06
53	EWHPL 53	233	21-Dec-06
54	EWHPL 54	329	21-Dec-06
55	EWHPL 55	234	21-Dec-06
56	EWHPL 56	236	21-Dec-06
57	EWHPL 57	237	21-Dec-06
58	EWHPL 58	238	20-Dec-06
59	EWHPL 59	328	20-Dec-06
60	EWHPL 60	241	20-Dec-06
61	EWHPL 61	242	20-Dec-06
62	EWHPL 62	245	20-Dec-06
63	EWHPL 63	246	26-Nov-06
64	EWHPL 64	249	26-Nov-06
65	EWHP 65	302	21-Dec-06
66	EWHPL 66	250	26-Nov-06
67	EWHPL 67	251	21-Dec-06
68	EWHPL 68	252	21-Dec-06

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69	EWHPL 69	253	21-Dec-06
70	EWHPL 70	254	26-Nov-06
71	EWHPL 71	256	26-Nov-06
72	EWHPL 72	257	26-Nov-06
73	EWHPL 73	258	26-Nov-06
74	EWHPL 74	259	21-Dec-06
75	EWHPL 75	260	21-Dec-06

**The information regarding the actual operation of the project**

The project activity consists of 75 WECs (800 kW) of Enercon make E-48 totaling to a capacity of 60 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 Wind Farms (Hindustan) Pvt. Ltd. has appointed Enercon (India) Limited as their operation & maintenance contractor. Hence Enercon (India) limited is responsible for operation and maintenance activities for Enercon Wind Farms (Hindustan) Pvt. Ltd. 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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Revision in the monitoring plan has been requested. The same has been approved by UNFCCC on 3<sup>rd</sup> Aug 2011.

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

&gt;&gt;

Not Applicable

**B.4. Notification or request of approval of changes**

&gt;&gt;

Notification with regards to change of village name and change of DISCOM name was sent to UNFCCC. The same was accepted on 3 Aug 2011 by UNFCCC.

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

&gt;&gt;

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

This approved monitoring methodology requires monitoring of the following:

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- 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.

Enercon (India) Ltd. is managing the project operation.

EG<sub>y</sub> for the project activity is being derived as follows:-

The electricity generated from the project activity is transmitting to Bhu substation through 4 feeders. The WECs of the project activity and WECs of other power producers are connected to Bhu Substation which is further connected to Amarsagar substation. In addition to the project activity, the WECs located at Kita, Jodha, Pithoda Ki Dhani are connected to Bhu substation which are further connected to the Amarsagar substation.

An Energy meter at 220 kV (accuracy Class-0.2) at Bhu Substation is termed 'Back up meter' and Energy meter at 220 kV (accuracy Class-0.2) at Amarsagar substation is termed as 'Main Meter'. Net Electricity supplied by the WECs is being metered at a common metering/delivery point. The common metering/delivery point comprises of one main meter that is installed at 220 kV metering point at the Amarsagar substation and one backup meter installed at 220kV at Bhu substation. Consequently, the main meter reading reflects the aggregate electricity supplied by all these WECs, including the project activity. The net electricity supplied by individual WEC is being determined by following a process of allocating the total electricity recorded at the main meter to the individual WEC in proportion of the electricity generation recorded by the LCS meters at the individual WEC. The apportioning for electricity export and import is done by Enercon based on which invoices are raised for individual customers. These invoices can be cross verified by cheque copies by the DOE.

**The procedure for allocation is detailed below:**

$E_{JMR,Export}$  = Gross Electricity exported, as recorded by the main meter at the substation. This data represents the total gross electricity exported by all the WECs (project and non project) at substation point.

$E_{JMR,Import}$  = Gross Electricity imported, as recorded by the main meter at the substation. This data represents the total gross electricity imported by all the WECs (project and non project) at substation point.

$E_{Controller,Export,i}$  = Gross Electricity exported (at WEC point at the site) by a WEC (project or non project), as measured at the LCS meter. Each WEC has exclusive LCS meter that records gross electricity export from the WEC (project or non project). This gross electricity exported by the WEC (at WEC point at the site)

$E_{Controller,Export,j}$  and  $E_{Controller,Export,k}$  are subsets of  $E_{Controller,Export,i}$

where i is any value between 1 to j+k

j represents WECs of the project activity (1 to 75) connected to main meter at Amarsagar substation and backup meter at Bhu substation.

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k represents WECs of the non project (76 to 290) connected to main meter at Amarsagar substation and backup meter at Bhu substation.

$\sum E_{\text{Controller,Export},i}$  = Summation of gross electricity exported (at WEC point at the site) by all the WECs (project and non project) connected to the main meter at the substation, measured at the LCS meter of each WEC. This is summation of gross electricity exported by the WECs (at WEC point at the site) including WECs of the project and non project.

$E_{\text{WEC,Export},j}$  = Gross Electricity exported (at substation point) by an individual WEC of the project to the grid that is connected to main meter. Thus this data can be used to compute electricity export (at substation point) for individual WEC.

$E_{\text{WEC,Import},j}$  = Gross Electricity imported (at substation point) by an individual WEC of the project from the grid that is connected to main meter. Thus this data can be used to compute electricity import (at substation point) for individual WEC.

$\sum_{\text{Project}} E_{\text{WEC,export},j}$  = Summation of gross electricity exported (at substation point) by all the WECs of the project activity.

$\sum_{\text{Project}} E_{\text{WEC,import},j}$  = Summation of gross electricity imported (at substation point) by all the WECs of the project activity.

Gross Electricity exported by each WEC is apportioned on the basis of gross electricity export recorded at the LCS meter of each WEC and the gross electricity export recorded at the main meter mentioned in the JMR. The export multiplication factor is calculated as follows-

$$\text{Export Multiplication factor} = \frac{E_{\text{JMR,Export}}}{\sum E_{\text{Controller,Export},i}} \dots\dots\dots(1)$$

Thus the energy exported by an individual WEC of the project activity to the grid is given by the equation-

$$E_{\text{WEC,Export},j} = \text{Export Multiplication factor} \times E_{\text{Controller,Export},j} \dots\dots\dots(2)$$

As the LCS meter doesn't record import, the apportioning of energy import by each WEC is also done on the basis of electricity export recorded at the LCS meter of each WEC and the electricity import recorded at the main meter and mentioned in the JMR. The import multiplication factor is calculated as follows-



$$\text{Import Multiplication factor} = \frac{E_{\text{JMR,import}}}{\sum E_{\text{Controller,Export,i}}} \dots\dots\dots(3)$$

Thus the energy imported by an individual WEC of the project activity to the grid is given by the equation-

$$E_{\text{WEC,import,j}} = \text{Import Multiplication factor} \times E_{\text{Controller,Export,j}} \dots\dots\dots(4)$$

The net electricity supplied by the WECs of the project is given by the equation-

$$E_{G_y} = \sum_{\text{Project}} E_{\text{WEC,Export,j}} - \sum_{\text{Project}} E_{\text{WEC,import,j}} \dots\dots\dots(5)$$

The summation is done on the WECs belonging to the project activity.

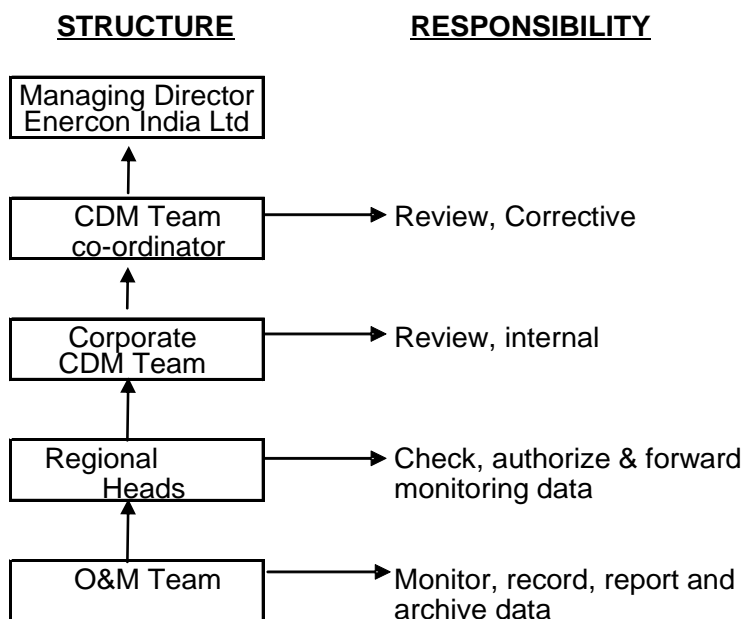
The apportioning for electricity export and import is done by Enercon based on which invoices are raised for individual customers. These invoices can be cross verified by the cheque copies by the DOE.

Joint Meter Reading is generated on 1st day of every month. Representatives of RRVPN/Ajmer & Jaipur DISCOM and Enercon jointly take the main reading and sign the meter reading on the first day of every month. Simultaneously, the joint meter reading at the 220 kV level of the backup metering system at Bhu substation is also being taken by representatives of RRVPN/Ajmer & Jaipur DISCOM and Enercon.

**Operational and Management structure implemented by Enercon:**



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## Calibration Details

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

Meter Type	Meter Sr. number	Sub-station	Accuracy class	Make	Calibration for 2009	Calibration for 2010	Calibration for 2011
Main Meter	MPB03228	Amarsagar	0.2	Secure	29/01/2009	30/03/2010	26/03/2011
Backup Meter	RJB 00050	BHU	0.2	Secure	30/01/2009	30/03/2010	27/03/2011

As refer to the table above, calibration of main and back-up meter has been conducted annually for the project activity.

## SECTION D. Data and parameters

&gt;&gt;

## 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 <sub>2</sub> e/MWh



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Description:	Simple Operating Margin Emission Factor of Northern Regional Electricity Grid version 1.1 dated 21 <sup>st</sup> December 2006.		
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 <a href="http://www.cea.nic.in">www.cea.nic.in</a></p>		
Value(s) :	2002 – 03	0.9993	
	2003 – 04	0.9869	
	2004 – 05	0.9756	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission Calculations		
Additional comment:	None		

<b>Data / Parameter:</b>	<b><math>EF_{BM,y}</math></b>		
Data unit:	tCO <sub>2</sub> e/MWh		
Description:	Build Margin Emission Factor of Northern 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 <a href="http://www.cea.nic.in">www.cea.nic.in</a></p>		
Value(s) :	0.5335		
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission Calculations		
Additional comment:	None		

<b>Data / Parameter:</b>	<b><math>EF_{CM,y}</math></b>		
Data unit:	tCO <sub>2</sub> e/MWh		
Description:	Combined Margin Emission Factor of Northern Regional Electricity Grid version 1.1 dated 21 <sup>st</sup> December 2006.		
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 <a href="http://www.cea.nic.in">www.cea.nic.in</a></p>		
Value(s) :	0.87387		
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission Calculations		
Additional comment:	None		

**D.2. Data and parameters monitored**

<b>Data / Parameter:</b>	<b>EG<sub>y</sub></b>
Data unit:	MWh (Mega-Watt hour)
Description:	Net electricity supplied to the grid by the Project
Measured /Calculated /Default:	Calculated by applying apportioning procedure better described in C.
Source of data:	Electricity supplied to the grid as per the tariff invoices raised on RRVPNL/Ajmer & Jaipur DISCOM (State Utility). These invoices can be cross verified by cheque copies.
Value(s) of monitored parameter:	Annual electricity supplied to the grid by the Project 75,259 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: The apportioning is done as per the procedure described in section C.
Calculation method (if applicable):	The WECs of the project activity and WECs of other power producers are connected to Bhu Substation which is further connected to Amarsagar substation. In addition to the project activity, the WECs located at Kita, Jodha, Pithoda ki Dhani are also connected to Bhu substation which are further connected to the Amarsagar substation. Net Electricity supplied by all these WECs is metered at a common metering/delivery point. The common metering/delivery point comprises one main meter that is installed at 220 kV metering/delivery point at the Amarsagar substation. Consequently, the main meter reading reflects the aggregate electricity supplied by all these WECs, including the project activity. The net electricity supplied by individual WEC is determined by a process of allocating the total electricity recorded at the main meter to the individual WEC in proportion to the electricity generation recorded by the LCS meters at the individual WEC. Allocation plan for calculating net electricity supplied to the grid is explained in section C above.
QA/QC procedures applied:	Meters are found to be under the permissible limit as the result of annual calibration. Therefore no correction factor has been applied.

<b>Data / Parameter:</b>	<b>E<sub>JMR</sub>Export</b>
Data unit:	MWh (Mega-Watt hour)
Description:	Gross Electricity exported (at substation point), as recorded by the main meter at the Amarsagar substation. This data represents the total gross electricity exported by all the WECs (project and non project) at substation point.
Measured /Calculated /Default:	Measured: The Export reading is jointly noted from the main meter installed at the Amarsagar substation.





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Source of data:	Export value from Joint meter reading taken at Amarsagar Substation in the presence of representatives of Enercon and state utility.
Value(s) of monitored parameter:	304027.523 MWh  This value will not be directly used for estimation of emission reduction. Please refer Appendix 3 for month wise details.
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)	Type- Tri-vector Meter Accuracy Class-0.2 Serial Number of Main Meter: MPB03228 Serial Number of Backup Meter: RJB 00050 Calibration Frequency: Annually Calibration date for 2009: 29/01/2009 for Main Meter & 30/01/2009 for Backup meter Calibration date for 2010: 30/03/2010 for Main Meter & 30/03/2010 for Backup meter Calibration date for 2011: 26/03/2011 for Main Meter & 27/03/2011 for Backup meter
Measuring/ Reading/ Recording frequency:	Monthly: The reading is jointly noted by the representatives of state utility and Enercon.
Calculation method (if applicable):	NA
QA/QC procedures applied:	Meters are found to be under the permissible limit as the result of annual calibration. Therefore no correction factor has been applied.

<b>Data / Parameter:</b>	<b>E<sub>JMR,Import</sub></b>
Data unit:	MWh (Mega-Watt hour)
Description:	Gross Electricity imported (at substation point), as recorded by the main meter at the Amarsagar Substation. This data represents the total gross electricity imported by all the WECs (project and non project) at substation point
Measured /Calculated /Default:	Measured: The import reading is jointly noted from the main meter installed at the Amarsagar substation.
Source of data:	Import value from Joint meter reading taken at Amarsagar Substation in the presence of representatives of Enercon and state utility
Value(s) of monitored parameter:	322.042 MWh  This value will not be directly used for estimation of emission reduction. Please refer Appendix 3 for month wise detail.
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	Type- Tri-vector Meter Accuracy Class-0.2 Serial Number of Main Meter: MPB03228 Serial Number of Backup Meter: RJB 00050



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calibration, validity)	Calibration Frequency: Annually Calibration date for 2009: 29/01/2009 for Main Meter & 30/01/2009 for Backup meter Calibration date for 2010: 30/03/2010 for Main Meter & 30/03/2010 for Backup meter Calibration date for 2011: 26/03/2011 for Main Meter & 27/03/2011 for Backup meter
Measuring/ Reading/ Recording frequency:	Monthly: The reading is jointly noted by the representatives of state utility and Enercon.
Calculation method (if applicable):	NA
QA/QC procedures applied:	Meters are found to be under the permissible limit as the result of annual calibration. Therefore no correction factor has been applied.

<b>Data / Parameter:</b>	<b>E<sub>Controller.Export.i</sub></b>
Data unit:	MWh (Mega-Watt hour)
Description:	Gross Electricity export (at WEC point at the site) by a WEC (project or non project), as measured at the LCS meter. Each WEC has exclusive LCS meter that records gross electricity export from the WEC (project or non project). This represents gross electricity export by individual WEC (at WEC point at the site)  where i is any WEC between 1 to j+k  j is any WEC between 1 to 75 of the project activity connected to main meter at Amarsagar substation and backup meter at Bhu substation.  k is any WEC between 76 to 290 of the non project connected to main meter at Amarsagar substation and backup meter at Bhu substation.
Measured /Calculated /Default:	Measured: The value is recorded continuously by the online monitoring station. This value can also be checked from the electronic panel installed inside the WEC tower.
Source of data:	This 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 meters of all WECs is retrieved) at the project site.
Value(s) of monitored parameter:	This value will not be directly used for estimation of emission reduction. Please refer ER sheet for the individual WEC panel generation
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)	Meter Type: ITZR Meter Serial No: Refer Appendix 2 The LCS meters are 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 WECs. 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 WEC will stop working and generate the error report. Therefore there is no data



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	uncertainty.
Measuring/ Reading/ Recording frequency:	Monthly: The value is recorded continuously by the online monitoring station. This value can also be checked from the electronic panel installed inside the WEC tower.
Calculation method (if applicable):	NA
QA/QC procedures applied:	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 WECs. During the monitoring period there is no mismatch found in the electricity generated at the LCS meter & the inverting system. Therefore there is no data uncertainty.

<b>Data / Parameter:</b>	$\sum E_{\text{Controller.Export.i}}$
Data unit:	MWh (Mega-Watt hour)
Description:	<p>Summation of gross electricity exported (at WEC point at the site) by all the WECs (project and non project) connected to the main meter at the substation, measured at the LCS meter of each WEC. This is summation of gross electricity exported by the WECs (at WEC point at the site) including WECs of the project and non project.</p> <p>where i is any WEC between 1 to j+k</p> <p>j is any WEC between 1 to 75 of the project activity connected to main meter at Amarsagar substation and backup meter at Bhu substation.</p> <p>k is any WEC between 76 to 290 of the non project connected to main meter at Amarsagar substation and backup meter at Bhu substation.</p>
Measured /Calculated /Default:	Monthly: The value is recorded continuously by the online monitoring station. This value can also be checked from the electronic panel
Source of data:	This 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 meters of all WECs is retrieved) at the project site.
Value(s) of monitored parameter:	<p>310969.394 MWh</p> <p>This value will not be directly used for estimation of emission reduction.</p>
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Meter Type: ITZR</p> <p>Meter Serial No: Refer Appendix 2</p> <p>The LCS meters are 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 WECs. 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 WEC will stop working and generate the error report. Therefore there is no data uncertainty.</p>
Measuring/ Reading/ Recording frequency:	Monthly: The value is recorded continuously by the online monitoring station. This value can also be checked from the electronic panel



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Calculation method (if applicable):	NA
QA/QC procedures applied:	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 WECs. During the monitoring period there is no mismatch found in the electricity generated at the LCS meter & the inverting system. Therefore there is no data uncertainty.

<b>Data / Parameter:</b>	<b><math>E_{WEC,Exportj}</math></b>
Data unit:	MWh (Mega-Watt hour)
Description:	Gross Electricity exported (at substation point) by an individual WEC (j of the project activity) to the grid that is connected to main meter at Amarsagar substation.  Where j is any WEC between 1 to 75 of the project activity connected to main meter at Amarsagar substation and backup meter at Bhu substation.
Measured /Calculated /Default:	$E_{WEC,Exportj}$ denotes the electricity exported by individual WEC of the project activity to the grid. The value is calculated based on the formula mentioned in Section C
Source of data:	Calculated using formula mentioned in Section C
Value(s) of monitored parameter:	This value will not be directly used for estimation of emission reduction. Please refer ER sheet for the individual WEC export value.
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 using the formulas better described under section C.
Measuring/ Reading/ Recording frequency:	Calculated using the formulas better described under section C.
Calculation method (if applicable):	Refer to Section C for details and description of the above variables.
QA/QC procedures applied:	Meters are found to be under the permissible limit as the result of annual calibration. Therefore no correction factor has been applied.

<b>Data / Parameter:</b>	<b><math>E_{WEC,Importj}</math></b>
Data unit:	MWh (Mega-Watt hour)
Description:	Gross Electricity imported (at substation point) by an individual WEC of the project activity to the grid that is connected to main meter at Amarsagar substation.  Where j is any WEC between 1 to 75 of the project activity connected to main meter at Amarsagar substation and backup meter at Bhu substation.
Measured /Calculated /Default:	$E_{WEC,Importj}$ denotes the gross electricity imported by individual WEC of the project activity from the grid. The value is calculated based on



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	the formula mentioned in section C.
Source of data:	Calculated using formula mentioned in Section C.
Value(s) of monitored parameter:	This value will not be directly used for estimation of emission reduction. Please refer ER sheet for the individual WEC import value.
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 using the formulas better described under section C.
Measuring/ Reading/ Recording frequency:	Calculated using the formulas better described under section C.
Calculation method (if applicable):	Refer to Section C for details and description of the above variables.
QA/QC procedures applied:	Meters are found to be under the permissible limit as the result of annual calibration. Therefore no correction factor has been applied.

<b>Data / Parameter:</b>	$\sum_{\text{Project}} E_{\text{WEC.Export},j}$
Data unit:	MWh (Mega-Watt hour)
Description:	<p>Summation of gross electricity exported (at substation point) by all the WECs of the project activity.</p> <p>Where j is any WEC between 1 to 75 of the project activity connected to main meter at Amarsagar substation and backup meter at Bhu substation.</p>
Measured /Calculated /Default:	$\sum_{\text{Project}} E_{\text{WEC.Export},j}$ <p>denotes summation of the gross electricity exported (at substation point) to the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section C.</p>
Source of data:	Summation of data values of $E_{\text{WEC.Export},j}$ for all the WECs included in the project activity.
Value(s) of monitored parameter:	<p>75342.929 MWh</p> <p>This value will not be directly used for estimation of emission reduction.</p>
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 using the formulas better described under section C.



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Measuring/ Reading/ Recording frequency:	Monthly: Calculated using the formulas better described under section C.
Calculation method (if applicable):	$\sum_{\text{Project}} E_{\text{WEC.Export},j}$ denotes summation of the gross electricity exported (at substation point) to the grid by a WECs included in the project activity. Refer to Section C for details and description.
QA/QC procedures applied:	The value is calculated and can be cross checked from the invoices raised on the state utility.

<b>Data / Parameter:</b>	$\sum_{\text{Project}} E_{\text{WEC.Import},j}$
Data unit:	MWh (Mega-Watt hour)
Description:	Summation of electricity imported (at substation point) by all the WECs of the project activity.  Where, j is any value between 1 to 75 representing WECs of the project activity connected to main meter at Amarsagar substation and backup meter at Bhu substation.
Measured /Calculated /Default:	$\sum_{\text{Project}} E_{\text{WEC.Import},j}$ denotes summation of the gross electricity imported (at substation point) to the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section C.
Source of data:	Summation of data values of $E_{\text{WEC.Import},j}$ for all the WECs included in the project activity.
Value(s) of monitored parameter:	833.48 MWh  This value will not be directly used for estimation of emission reduction.
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 using the formulas better described under section C.
Measuring/ Reading/ Recording frequency:	Monthly: Calculated using the formulas better described under section C.
Calculation method (if applicable):	$\sum_{\text{Project}} E_{\text{WEC.Import},j}$ denotes summation of the gross electricity imported (at substation point) to the grid by a WECs included in the project activity. Refer to Section C for details and description.
QA/QC procedures applied:	The value is calculated and can be cross checked from the invoices raised on the state utility.

**SECTION E. Emission reductions calculation****E.1. Baseline emissions calculation**

&gt;&gt;

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

$$BE_y = EG_y * EF_y$$

Where,

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

**EG<sub>y</sub>** is the net electricity supplied to the grid in year y and is applied directly from the invoice certified by state utility. This value can also be cross checked from the invoice.

**EF<sub>y</sub>** is the CO<sub>2</sub> emission factor of the grid (873.87 tCO<sub>2</sub>e/GWh fixed ex-ante).

Emission reduction calculation for the period 01 Oct 2010 to 31 August 2011:

$$\begin{aligned} \text{Emission Reductions (ER)} &= 75,259 \text{ (MWh)} * 0.87387 \text{ (tCO}_2\text{e /MWh)} \\ &= \mathbf{65,767 \text{ tCO}_2\text{e}} \end{aligned}$$

**E.2. Project emissions calculation**

&gt;&gt;

Since the project activity is a renewable energy project which generates electricity using wind power therefore there are no resulting project emissions.

**E.3. Leakage calculation**

&gt;&gt;

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

**E.4. Emission reductions calculation / table**

&gt;&gt;

The total emission reductions achieved during the monitoring period is **65,767 tCO<sub>2</sub>e**.

Total baseline emissions: **65,767 tCO<sub>2</sub>e**

Total project emissions: Zero

Total leakage: Zero

$$\begin{aligned} \text{Total Emission reductions, ER} &= BE_y - PE_y \\ &= \mathbf{65,767 \text{ tCO}_2\text{e}} \end{aligned}$$

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

&gt;&gt;

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO <sub>2</sub> e)	92,626 (Eleven months equivalent of annually 101,047 emission reductions estimated in the registered PDD)	65,767

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

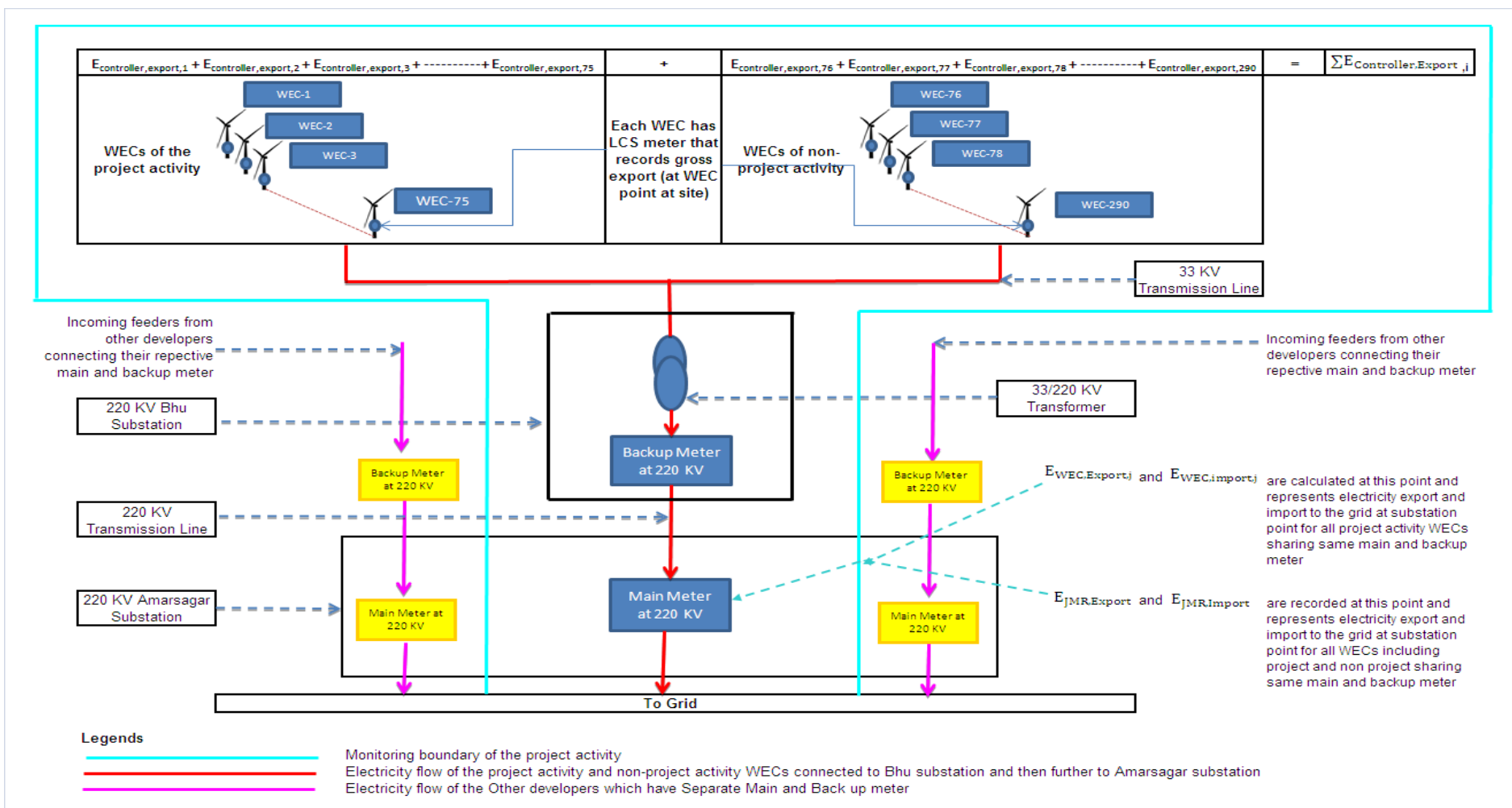
&gt;&gt;

There is change of 29% 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.





## Appendix 1: Line Diagram Showing Relevant Metering Points





## Appendix 2: Controller Meter Details

Equipment Name	Meter Number
EWHPLPD-01	475500
EWHPLPD-02	475330
EWHPLPD-03	475293
EWHPLPD-04	475488
EWHPLPD-05	475077
EWHPLPD-06	475557
EWHPLPD-07	1215614
EWHPLPD-08	475490
EWHPLPD-09	475512
EWHPLPD-10	475703
EWHPLPD-11	475725
EWHPLPD-12	475548
EWHPLPD-13	475483
EWHPLPD-14	475498
EWHPLPD-15	475075
EWHPLPD-16	475550
EWHPLPD-17	475292
EWHPLPD-18	475112
EWHPLPD-19	475356
EWHPLPD-20	475102
EWHPLPD-21	474937
EWHPLPD-22	475682
EWHPLPD-23	475735
EWHPLPD-24	475358
EWHPLPD-25	475024
EWHPLPD-26	474943
EWHPLPD-27	474951
EWHPLPD-28	466271
EWHPLPD-29	475099
EWHPLPD-30	475511
EWHPLPD-31	475086
EWHPLPD-32	475495
EWHPLPD-33	475496
EWHPLPD-34	475492
EWHPLPD-35	475479
EWHPLPD-36	475503
EWHPLPD-37	475738
EWHPLPD-38	475486
EWHPLPD-39	466298
EWHPLPD-40	466256
EWHPLPD-41	475513
EWHPLPD-42	475510
EWHPLPD-43	475113
EWHPLPD-44	475497
EWHPLPD-45	475518
EWHPLPD-46	475350
EWHPLPD-47	475485
EWHPLPD-48	475061

Equipment Name	Meter Number
EWHPLPD-49	475114
EWHPLPD-50	475059
EWHPLPD-51	475290
EWHPLPD-52	475329
EWHPLPD-53	475502
EWHPLPD-54	475076
EWHPLPD-55	475296
EWHPLPD-56	475332
EWHPLPD-57	475347
EWHPLPD-58	475326
EWHPLPD-59	475501
EWHPLPD-60	475593
EWHPLPD-61	475070
EWHPLPD-62	475651
EWHPLPD-63	475091
EWHPLPD-64	475621
EWHPLPD-65	475517
EWHPLPD-66	475100
EWHPLPD-67	475335
EWHPLPD-68	475064
EWHPLPD-69	475062
EWHPLPD-70	475087
EWHPLPD-71	475289
EWHPLPD-72	475321
EWHPLPD-73	475499
EWHPLPD-74	475352
EWHPLPD-75	475481



## Appendix 3: Net Electricity Exported to Grid (EGy)

Month	Export Multiplication Factor	Import Multiplication Factor	$E_{\text{Controller, Export},i}$ (kWh)	$E_{\text{WEG, Export},j}$ (kWh)	$E_{\text{WEG, Import},j}$ (kWh)	$E_{\text{JMR, Export}}$ (kWh)	$E_{\text{JMR, Import}}$ (kWh)	$\sum_{\text{Project}} E_{\text{WEC, Export},j}$ (kWh)	$\sum_{\text{Project}} E_{\text{WEC, Import},j}$ (kWh)	EGy in kWh
Oct-10	0.9688	0.0040	4551003	4408845	18294	14058328	58333	4408845	18294	43905 51
Nov-10	0.9716	0.0035	3059561	2972527	10793	11474995	41667	2972527	10793	29617 34
Dec-10	0.9770	0.0024	4240429	4142867	10373	16641660	41667	4142868	10373	41324 95
Jan-11	0.9704	0.0009	4561176	4426254	4037	18266659	16667	4426254	4040	44222 14
Feb-11	0.9766	0.0019	4240569	4141408	8242	16749993	33333	4141408	8241	41331 67
Mar-11	0.9739	0.0008	4991475	4861277	4121	20104772	17042	4861279	4120	48571 59
Apr-11	0.9793	0.0010	5182151	5075091	5380	23583324	25000	5075091	5379	50697 12
May-11	0.9801	0.0002	7870710	7714438	1952	32941653	8333	7714437	1951	77124 86
Jun-11	0.9862	0.0002	20332069	20051163	3983	80542182	16000	20051162	3983	20047 179
Jul-11	0.9764	0.0006	10959643	10701018	6675	42746640	26667	10701018	6675	10694 343
Aug-11	0.9663	0.0013	7086710	6848041	9498	26917317	37333	6848041	9498	68385 43