



## Monitoring report form (Version 03.1)

### Monitoring report

<b>Title of the project activity</b>	Vaayu India Wind Power Project In Gujarat
<b>Reference number of the project activity</b>	4700
<b>Version number of the monitoring report</b>	2
<b>Completion date of the monitoring report</b>	06/04/2013
<b>Registration date of the project activity</b>	9 May 2011
<b>Monitoring period number and duration of this monitoring period</b>	2 <sup>nd</sup> Monitoring Period, 1 Mar 2012 to 31 Dec 2012
<b>Project participant(s)</b>	Vaayu (India) Power Corporation Private Limited
<b>Host Party(ies)</b>	India
<b>Sectoral scope(s) and applied methodology(ies)</b>	1, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002 (Version 11, EB 52)
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	88648 tCO <sub>2</sub>
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	87690 tCO <sub>2</sub>

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

>>The project activity includes development, design, engineering, procurement, finance, construction, operation and maintenance of Vaayu 51.2 MW wind power project ("Project") in the Indian state of Gujarat to provide reliable, renewable power to the Gujarat state electricity grid which is part of the NEWNE regional electricity grid. The Project will lead to reduced greenhouse gas emissions because it displaces electricity from grid connected fossil fuel based electricity generation plants.

The Project involves 64 wind energy converters (WECs) of Enercon make (800 kW E-53) with internal electrical lines connecting the Project with local evacuation facility.

The total emission reductions achieved during the monitoring period is 87,690 tCO<sub>2</sub>.

The commissioning date for all the WECs included in the project activity is given in the table below.

<u>Sr. No.</u>	<u>Location No</u>	<u>WTG-ID No.</u>	<u>Commissioning Date</u>
1	3020	EIL/800/10-11/1826	12/07/2010
2	3021	EIL/800/10-11/1827	12/07/2010
3	3022	EIL/800/10-11/1828	12/07/2010
4	3072	EIL/800/09-10/1738	25/06/2010
5	3073	EIL/800/09-10/1739	25/06/2010
6	3075	EIL/800/09-10/1740	25/06/2010
7	3076	EIL/800/09-10/1741	25/06/2010
8	3088	EIL/800/09-10/1742	25/06/2010
9	62	EIL/800/09-10/1766	27/06/2011
10	63	EIL/800/09-10/1767	04/07/2011
11	64	EIL/800/09-10/1768	04/07/2011
12	539	EIL/800/09-10/1789	14/02/2011
13	540	EIL/800/09-10/1790	14/02/2011
14	541	EIL/800/09-10/1791	14/02/2011
15	543	EIL/800/09-10/1792	18/02/2011
16	544	EIL/800/09-10/1793	14/02/2011
17	545	EIL/800/09-10/1794	18/02/2011
18	546	EIL/800/09-10/1795	18/03/2011
19	547	EIL/800/09-10/1796	18/02/2011
20	548	EIL/800/09-10/1797	18/02/2011

21	903	EIL/800/09-10/1747	04/05/2011
22	904	EIL/800/09-10/1748	04/05/2011
23	905	EIL/800/09-10/1749	04/05/2011
24	906	EIL/800/09-10/1750	05/03/2011
25	907	EIL/800/09-10/1751	05/03/2011
26	908	EIL/800/09-10/1752	05/03/2011
27	909	EIL/800/09-10/1753	05/03/2011
28	910	EIL/800/09-10/1754	05/03/2011
29	912	EIL/800/09-10/1746	14/02/2011
30	926	EIL/800/09-10/1769	10/06/2011
31	927	EIL/800/09-10/1770	10/06/2011
32	928	EIL/800/09-10/1771	10/06/2011
33	929	EIL/800/09-10/1772	10/06/2011
34	931	EIL/800/10-11/1870	10/06/2011
35	932	EIL/800/09-10/1773	10/06/2011
36	933	EIL/800/09-10/1774	10/06/2011
37	934	EIL/800/09-10/1775	10/06/2011
38	935	EIL/800/09-10/1776	10/06/2011
39	936	EIL/800/09-10/1777	27/06/2011
40	937	EIL/800/09-10/1778	27/06/2011
41	938	EIL/800/09-10/1779	27/06/2011
42	939	EIL/800/09-10/1760	24/05/2011
43	941	EIL/800/09-10/1761	24/05/2011
44	942	EIL/800/09-10/1762	24/05/2011
45	943	EIL/800/09-10/1763	24/05/2011
46	944	EIL/800/09-10/1764	24/05/2011
47	945	EIL/800/09-10/1765	24/05/2011
48	947	EIL/800/09-10/1755	06/05/2011
49	948	EIL/800/09-10/1756	06/05/2011
50	950	EIL/800/09-10/1757	06/05/2011

51	951	EIL/800/09-10/1758	06/05/2011
52	952	EIL/800/09-10/1759	06/05/2011
53	958	EIL/800/09-10/1743	04/05/2011
54	959	EIL/800/09-10/1744	04/05/2011
55	960	EIL/800/09-10/1745	04/05/2011
56	992	EIL/800/09-10/1782	18/03/2011
57	993	EIL/800/09-10/1783	18/03/2011
58	994	EIL/800/09-10/1784	18/03/2011
59	995	EIL/800/09-10/1785	18/03/2011
60	996	EIL/800/09-10/1786	18/03/2011
61	997	EIL/800/09-10/1787	18/03/2011
62	1028	EIL/800/09-10/1788	04/05/2011
63	1045	EIL/800/09-10/1780	04/07/2011
64	1046	EIL/800/09-10/1781	04/07/2011

## A.2. Location of project activity

>> The project area extends between latitude 21° 55' and 22° 08' North and longitude 70° 05' and 70° 19' East.

The Project is connected to Sadodar substation at Jamnagar District in Gujarat. The Project is spread across villages Chattar, Narmana, Seth Wadala, Jam Ambardi, Mevasa, Dhun Dhoraji, Sadodar, Bodi, Padavala and Machharda in Jamnagar and Rajkot Districts of Gujarat state in India. The information in regard of the Wind Energy Generators i.e. WTG-ID No., location number & latitude & longitude are defined in the table as follows:

Sr. No.	Location No	WTG-ID No.	Village	Latitude	Longitude
1	3020	EIL/800/10-11/1826	Machharda	N22° 06' 19.0"	E70° 18' 45.7"
2	3021	EIL/800/10-11/1827	Machharda	N22° 06' 23.5"	E70° 18' 43.7"
3	3022	EIL/800/10-11/1828	Machharda	N22° 06' 29.7"	E70° 18' 44.6"
4	3072	EIL/800/09-10/1738	Padavala	N21° 57' 19.6"	E70° 15' 05.0"
5	3073	EIL/800/09-10/1739	Padavala	N21° 57' 14.9"	E70° 15' 11.7"
6	3075	EIL/800/09-10/1740	Padavala	N21° 56' 43.1"	E70° 15' 20.6"
7	3076	EIL/800/09-10/1741	Padavala	N21° 55' 59.2"	E70° 15' 33.7"
8	3088	EIL/800/09-10/1742	Padavala	N21° 56' 19.3"	E70° 14' 38.0"

9	62	EIL/800/09-10/1766	Chattar	N22° 07' 40.2"	E70° 15' 10.7"
10	63	EIL/800/09-10/1767	Chattar	N22° 07' 46.6"	E70° 15' 00.6"
11	64	EIL/800/09-10/1768	Chattar	N22° 07' 53.3"	E70° 14' 57.1"
12	539	EIL/800/09-10/1789	Seth Wadala	N22° 04' 46.7"	E70° 05' 34.3"
13	540	EIL/800/09-10/1790	Seth Wadala	N22° 04' 33.3"	E70° 05' 43.1"
14	541	EIL/800/09-10/1791	Seth Wadala	N22° 04' 27.4"	E70° 05' 47.6"
15	543	EIL/800/09-10/1792	Seth Wadala	N22° 04' 17.3"	E70° 05' 53.7"
16	544	EIL/800/09-10/1793	Seth Wadala	N22° 04' 13.5"	E70° 06' 00.7"
17	545	EIL/800/09-10/1794	Seth Wadala	N22° 03' 31.5"	E70° 05' 32.6"
18	546	EIL/800/09-10/1795	Jam Ambardi	N22° 03' 40.2"	E70° 05' 31.0"
19	547	EIL/800/09-10/1796	Jam Ambardi	N22° 03' 45.3"	E70° 05' 31.9"
20	548	EIL/800/09-10/1797	Jam Ambardi	N22° 03' 50.7"	E70° 05' 34.2"
21	903	EIL/800/09-10/1747	Mevasa/Haripar	N22° 01' 23.0"	E70° 15' 35.2"
22	904	EIL/800/09-10/1748	Mevasa/Haripar	N22° 01' 30.2"	E70° 15' 41.0"
23	905	EIL/800/09-10/1749	Mevasa/Haripar	N22° 01' 36.6"	E70° 15' 27.2"
24	906	EIL/800/09-10/1750	Mevasa/Haripar	N22° 01' 30.7"	E70° 14' 55.0"
25	907	EIL/800/09-10/1751	Mevasa/Haripar	N22° 01' 37.9"	E70° 14' 56.8"
26	908	EIL/800/09-10/1752	Mevasa/Haripar	N22° 01' 44.8"	E70° 14' 54.1"
27	909	EIL/800/09-10/1753	Mevasa/Haripar	N22° 01' 51.2"	E70° 14' 51.2"
28	910	EIL/800/09-10/1754	Mevasa/Haripar	N22° 01' 57.7"	E70° 14' 55.7"
29	912	EIL/800/09-10/1746	Dhun Dhoraji	N22° 02' 09.1"	E70° 15' 04.4"
30	926	EIL/800/09-10/1769	Chattar	N22° 06' 57.6"	E70° 16' 33.0"
31	927	EIL/800/09-10/1770	Chattar	N22° 06' 59.3"	E70° 16' 23.3"
32	928	EIL/800/09-10/1771	Chattar	N22° 07' 10.0"	E70° 16' 16.5"
33	929	EIL/800/09-10/1772	Chattar	N22° 07' 15.9"	E70° 16' 11.3"
34	931	EIL/800/10-11/1870	Chattar	N22° 07' 12.7"	E70° 15' 23.5"

35	932	EIL/800/09-10/1773	Chattar	N22° 07' 05.5"	E70° 15' 27.2"
36	933	EIL/800/09-10/1774	Chattar	N22° 06' 59.3"	E70° 15' 31.5"
37	934	EIL/800/09-10/1775	Chattar	N22° 06' 53.9"	E70° 15' 27.9"
38	935	EIL/800/09-10/1776	Chattar	N22° 06' 46.0"	E70° 15' 22.7"
39	936	EIL/800/09-10/1777	Chattar	N22° 06' 40.3"	E70° 15' 25.7"
40	937	EIL/800/09-10/1778	Chattar	N22° 06' 32.0"	E70° 15' 23.4"
41	938	EIL/800/09-10/1779	Chattar	N22° 06' 25.7"	E70° 15' 22.1"
42	939	EIL/800/09-10/1760	Jamvadi	N22° 08' 19.5"	E70° 19' 02.3"
43	941	EIL/800/09-10/1761	Jamvadi	N22° 08' 07.2"	E70° 18' 57.8"
44	942	EIL/800/09-10/1762	Jamvadi	N22° 08' 08.6"	E70° 19' 30.2"
45	943	EIL/800/09-10/1763	Jamvadi	N22° 08' 00.9"	E70° 19' 25.4"
46	944	EIL/800/09-10/1764	Jamvadi	N22° 07' 53.9"	E70° 19' 26.0"
47	945	EIL/800/09-10/1765	Jamvadi	N22° 07' 49.5"	E70° 19' 31.4"
48	947	EIL/800/09-10/1755	Moti Vavdi	N22° 06' 04.0"	E70° 18' 16.9"
49	948	EIL/800/09-10/1756	Moti Vavdi	N22° 05' 57.0"	E70° 18' 17.8"
50	950	EIL/800/09-10/1757	Moti Vavdi	N22° 05' 45.7"	E70° 18' 21.5"
51	951	EIL/800/09-10/1758	Moti Vavdi	N22° 05' 38.3"	E70° 18' 18.4"
52	952	EIL/800/09-10/1759	Moti Vavdi	N22° 05' 31.6"	E70° 18' 16.9"
53	958	EIL/800/09-10/1743	Dhun Dhoraji	N22° 02' 32.4"	E70° 16' 42.8"
54	959	EIL/800/09-10/1744	Dhun Dhoraji	N22° 02' 26.2"	E70° 16' 44.6"
55	960	EIL/800/09-10/1745	Dhun Dhoraji	N22° 02' 19.0"	E70° 16' 44.4"
56	992	EIL/800/09-10/1782	Sadodar	N22° 03' 13.6"	E70° 10' 37.3"
57	993	EIL/800/09-10/1783	Sadodar	N22° 03' 09.5"	E70° 10' 40.0"
58	994	EIL/800/09-10/1784	Sadodar	N22° 02' 59.6"	E70° 10' 36.4"
59	995	EIL/800/09-10/1785	Sadodar	N22° 02' 54.2"	E70° 10' 33.5"
60	996	EIL/800/09-10/1786	Sadodar	N22° 02' 47.4"	E70° 10' 22.2"
61	997	EIL/800/09-10/1787	Sadodar	N22° 02' 41.3"	E70° 10' 32.4"
62	1028	EIL/800/09-	Seth	N22° 03' 06.0"	E70° 08'

		10/1788	Wadala		36.9"
63	1045	EIL/800/09-10/1780	Bodi	N22° 08' 43.4"	E70° 15' 11.4"
64	1046	EIL/800/09-10/1781	Bodi	N22° 08' 48.8"	E70° 15' 08.5"

### A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (host): India	Private entity A: Vaayu (India) Power Corporation Private Limited  Public entity A	No
Party B	Private entity B  Public entity B	
...	...	

### A.4. Reference of applied methodology

>> **Title:** "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

**Reference:** Approved consolidated baseline methodology ACM0002 (Version 11, EB 52)

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

- Tool to calculate the emission factor for an electricity system – Version 02
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology / tools can be obtained at <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

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

>> Crediting period of the project activity as per registered PDD is from 1<sup>st</sup> June 2011 to 31<sup>st</sup> May 2021 (10 years, Fixed). The first monitoring period was from 1 Jun 2011 to 29 Feb 2012. The monitoring period considered under this monitoring report is from 1<sup>st</sup> Mar 2012 to 31<sup>st</sup> Dec 2012.

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

>> The project area extends between latitude 21° 55' and 22° 08' North and longitude 70° 05' and 70° 19' East.

The Project is connected to Sadodar substation at Jamnagar District in Gujarat. The Project is spread across villages Chattar, Narmana, Seth Wadala, Jam Ambardi, Mevasa, Dhun Dhoraji, Sadodar, Bodi, Padavala and Machharda in Jamnagar and Rajkot Districts of Gujarat state in India. The information in regard of the Wind Energy Generators i.e. WTG-ID No., location number & latitude & longitude are defined in the table as follows:

Sr. No.	Location No	WTG-ID No.	Village	Latitude	Longitude
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3	3022	EIL/800/10-11/1828	Machharda	N22° 06' 29.7"	E70° 18' 44.6"
4	3072	EIL/800/09-10/1738	Padavala	N21° 57' 19.6"	E70° 15' 05.0"
5	3073	EIL/800/09-10/1739	Padavala	N21° 57' 14.9"	E70° 15' 11.7"
6	3075	EIL/800/09-10/1740	Padavala	N21° 56' 43.1"	E70° 15' 20.6"
7	3076	EIL/800/09-10/1741	Padavala	N21° 55' 59.2"	E70° 15' 33.7"
8	3088	EIL/800/09-10/1742	Padavala	N21° 56' 19.3"	E70° 14' 38.0"
9	62	EIL/800/09-10/1766	Chattar	N22° 07' 40.2"	E70° 15' 10.7"
10	63	EIL/800/09-10/1767	Chattar	N22° 07' 46.6"	E70° 15' 00.6"
11	64	EIL/800/09-10/1768	Chattar	N22° 07' 53.3"	E70° 14' 57.1"
12	539	EIL/800/09-10/1789	Seth Wadala	N22° 04' 46.7"	E70° 05' 34.3"
13	540	EIL/800/09-10/1790	Seth Wadala	N22° 04' 33.3"	E70° 05' 43.1"
14	541	EIL/800/09-10/1791	Seth Wadala	N22° 04' 27.4"	E70° 05' 47.6"
15	543	EIL/800/09-10/1792	Seth Wadala	N22° 04' 17.3"	E70° 05' 53.7"
16	544	EIL/800/09-10/1793	Seth Wadala	N22° 04' 13.5"	E70° 06' 00.7"
17	545	EIL/800/09-10/1794	Seth Wadala	N22° 03' 31.5"	E70° 05' 32.6"
18	546	EIL/800/09-10/1795	Jam Ambardi	N22° 03' 40.2"	E70° 05' 31.0"
19	547	EIL/800/09-10/1796	Jam Ambardi	N22° 03' 45.3"	E70° 05' 31.9"
20	548	EIL/800/09-10/1797	Jam Ambardi	N22° 03' 50.7"	E70° 05' 34.2"



21	903	EIL/800/09-10/1747	Mevasa/Haripar	N22° 01' 23.0"	E70° 15' 35.2"
22	904	EIL/800/09-10/1748	Mevasa/Haripar	N22° 01' 30.2"	E70° 15' 41.0"
23	905	EIL/800/09-10/1749	Mevasa/Haripar	N22° 01' 36.6"	E70° 15' 27.2"
24	906	EIL/800/09-10/1750	Mevasa/Haripar	N22° 01' 30.7"	E70° 14' 55.0"
25	907	EIL/800/09-10/1751	Mevasa/Haripar	N22° 01' 37.9"	E70° 14' 56.8"
26	908	EIL/800/09-10/1752	Mevasa/Haripar	N22° 01' 44.8"	E70° 14' 54.1"
27	909	EIL/800/09-10/1753	Mevasa/Haripar	N22° 01' 51.2"	E70° 14' 51.2"
28	910	EIL/800/09-10/1754	Mevasa/Haripar	N22° 01' 57.7"	E70° 14' 55.7"
29	912	EIL/800/09-10/1746	Dhun Dhoraji	N22° 02' 09.1"	E70° 15' 04.4"
30	926	EIL/800/09-10/1769	Chattar	N22° 06' 57.6"	E70° 16' 33.0"
31	927	EIL/800/09-10/1770	Chattar	N22° 06' 59.3"	E70° 16' 23.3"
32	928	EIL/800/09-10/1771	Chattar	N22° 07' 10.0"	E70° 16' 16.5"
33	929	EIL/800/09-10/1772	Chattar	N22° 07' 15.9"	E70° 16' 11.3"
34	931	EIL/800/10-11/1870	Chattar	N22° 07' 12.7"	E70° 15' 23.5"
35	932	EIL/800/09-10/1773	Chattar	N22° 07' 05.5"	E70° 15' 27.2"
36	933	EIL/800/09-10/1774	Chattar	N22° 06' 59.3"	E70° 15' 31.5"
37	934	EIL/800/09-10/1775	Chattar	N22° 06' 53.9"	E70° 15' 27.9"
38	935	EIL/800/09-10/1776	Chattar	N22° 06' 46.0"	E70° 15' 22.7"
39	936	EIL/800/09-10/1777	Chattar	N22° 06' 40.3"	E70° 15' 25.7"
40	937	EIL/800/09-10/1778	Chattar	N22° 06' 32.0"	E70° 15' 23.4"
41	938	EIL/800/09-10/1779	Chattar	N22° 06' 25.7"	E70° 15' 22.1"
42	939	EIL/800/09-10/1760	Jamvadi	N22° 08' 19.5"	E70° 19' 02.3"
43	941	EIL/800/09-10/1761	Jamvadi	N22° 08' 7.2"	E70° 18' 57.8"
44	942	EIL/800/09-10/1762	Jamvadi	N22° 08' 08.6"	E70° 19' 30.2"
45	943	EIL/800/09-10/1763	Jamvadi	N22° 08' 00.9"	E70° 19' 25.4"
46	944	EIL/800/09-10/1764	Jamvadi	N22° 07' 53.9"	E70° 19' 26.0"

47	945	EIL/800/09-10/1765	Jamvadi	N22° 07' 49.5"	E70° 19' 31.4"
48	947	EIL/800/09-10/1755	Moti Vavdi	N22° 06' 04.0"	E70° 18' 16.9"
49	948	EIL/800/09-10/1756	Moti Vavdi	N22° 05' 57.0"	E70° 18' 17.8"
50	950	EIL/800/09-10/1757	Moti Vavdi	N22° 05' 45.7"	E70° 18' 21.5"
51	951	EIL/800/09-10/1758	Moti Vavdi	N22° 05' 38.3"	E70° 18' 18.4"
52	952	EIL/800/09-10/1759	Moti Vavdi	N22° 05' 31.6"	E70° 18' 16.9"
53	958	EIL/800/09-10/1743	Dhun Dhoraji	N22° 02' 32.4"	E70° 16' 42.8"
54	959	EIL/800/09-10/1744	Dhun Dhoraji	N22° 02' 26.2"	E70° 16' 44.6"
55	960	EIL/800/09-10/1745	Dhun Dhoraji	N22° 02' 19.0"	E70° 16' 44.4"
56	992	EIL/800/09-10/1782	Sadodar	N22° 03' 13.6"	E70° 10' 37.3"
57	993	EIL/800/09-10/1783	Sadodar	N22° 03' 09.5"	E70° 10' 40.0"
58	994	EIL/800/09-10/1784	Sadodar	N22° 02' 59.6"	E70° 10' 36.4"
59	995	EIL/800/09-10/1785	Sadodar	N22° 02' 54.2"	E70° 10' 33.5"
60	996	EIL/800/09-10/1786	Sadodar	N22° 02' 47.4"	E70° 10' 22.2"
61	997	EIL/800/09-10/1787	Sadodar	N22° 02' 41.3"	E70° 10' 32.4"
62	1028	EIL/800/09-10/1788	Seth Wadala	N22° 03' 06.0"	E70° 08' 36.9"
63	1045	EIL/800/09-10/1780	Bodi	N22° 08' 43.4"	E70° 15' 11.4"
64	1046	EIL/800/09-10/1781	Bodi	N22° 08' 48.8"	E70° 15' 08.5"

The project activity involves 64 numbers wind energy converters (WECs) of Enercon make (800 kW, E-53) with internal electrical lines connecting the project activity with local evacuation facility. The WECs generate 3-phase power at 400V, which is stepped up to 33 kV. The E-53 WECs can operate in the frequency range of 46–54 Hz. As per the specification of WEC the output voltage of WEC is 400V as specified by manufacture. The average life time of the WEC is around 20 years as per the equipment supplier specifications. The technology employed is environmentally safe and sound since project activity doesn't uses fossil fuel for electricity generation though project activity uses wind as source of energy and there is no project emission or leakage into the environment. Enercon (India) Limited wind turbines are equipped with state-of-the-art microelectronic control technology produced in-house at our Daman plant (<http://www.enerconindia.net/electricals.jsp>).

The other salient features of the state-of-art-technology are mentioned below:

#### **E 53 Specifications**

Parameter	Value
Turbine model	Enercon E- 53

Rated power	800 kW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.
Cut in wind speed	2.5 m/s
Rated wind speed	12 m/s
Cut out Wind speed	28-34 m/s
Extreme Wind Speed	59.5 m/s
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fibre Glass Epoxy reinforced with integral lightning protection
Gear box type	Gear less
Generator type	Synchronous generator
Braking	Aerodynamic
Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete

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

#### **Description of maintenance intervals:**

There is a pre-defined maintenance schedule for annual maintenance for all the WECs at project site. There are four types of maintenance activity have been executed for all the WECs. During maintenance, WEC needs to stop for defined time period which are as follows:

- 1) Visual maintenance : Average 3 to 4 hr stoppage of WEC
- 2) Grease maintenance : Average 3 to 4 hr stoppage of WEC
- 3) Electrical maintenance : Average 16 to 20 hr stoppage of WEC
- 4) Mechanical maintenance: Average 16 to 20 hr stop of WEC

Other than the above mentioned maintenance activity, WEC were generating electricity continuously without any technical fault. Hence no break down has been noted during the monitoring period.

#### **B.2. Post registration changes**

##### **B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

>>

Not applicable

#### **B.2.2. Corrections**

>>

1. Change in coordinates for 3 WECs
2. Change in monitoring and organization structure

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

>> Change in calibration frequency from 1 year to 3 years

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

>> Not applicable

#### **B.2.5. Changes to start date of crediting period**

>> Not applicable

#### **B.2.6. Types of changes specific to afforestation or reforestation project activity**

>> Not applicable

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

>> Approved monitoring methodology ACM0002 Version 11 Sectoral Scope: 1, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

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

The 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. Further, wind based electricity generation is not associated with any kind of leakages.

The project activity have various clusters and each cluster has exclusive metering arrangement and the meter readings taken at these metering points have been provided by the representatives of Enercon to GEDA.

Enercon substation at Sadodar has main meter(s) also known as revenue meter which is connected to wind turbines installed by the project proponent and wind turbines installed by other project owners. Gujarat Electricity Development Authority (GEDA) apportion the net electricity supplied to the grid at the Enercon substation to all the project owners after adjusting transmission loss to the meter readings taken at dedicated cluster meters of different project owners. The meter reading is being taken jointly by the representatives of Enercon and GEDA/GETCO in the form of JMR. The electricity from Enercon's substation has been finally supplied to the utility's substation at Moti Paneli. The net electricity generated by the project owners is being provided by GETCO in the share certificate of electricity generated. The value of the net electricity generated by the project activity has been taken directly by the project proponent from the share certificate provided by GETCO for calculation of emission reductions.

The allocation plan for the project activity is given below:-

$EG_{GETCO, Export}$	= Electricity exported, as recorded by the main meter at Enercon substation
$EG_{GETCO, Import}$	= Electricity imported, as recorded by the main meter at Enercon substation
$EG_{Cluster, Export}$	= Electricity exported by the project activity, as measured at Cluster Meter
$EG_{Cluster, Import}$	= Electricity imported by the project activity, as measured at Cluster Meter
$EG_{Cluster, WF, Export}$	= Electricity exported by all the project owners connected to Enercon substation, as measured at Cluster Meter
$EG_{Cluster, WF, Import}$	= Electricity imported by all the project owners connected to Enercon substation, as measured at Cluster Meter
$EGPJ, export, y$	= Electricity exported by the project activity to the grid, calculated
$EGPJ, import, y$	= Electricity imported from the project activity to the grid, calculated
$EGPJ, y$	= Net Electricity exported by the project activity to the grid, calculated

#### **Electricity Exported to the Grid by the project activity**

$$EGPJ, export, y = EG_{GETCO, Export} \times EG_{Cluster, Export} / EG_{Cluster, WF, Export}$$

#### **Electricity Imported from the Grid by the project activity**

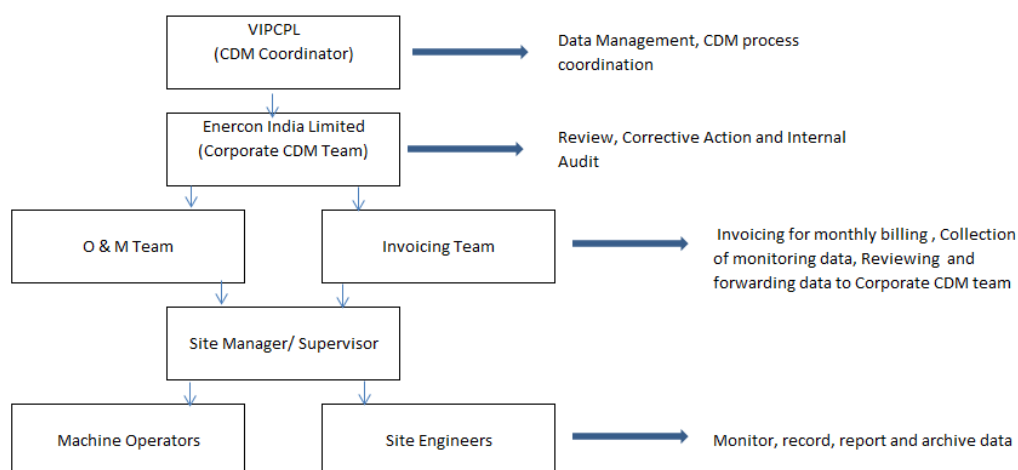
$$EGPJ, Import, y = EG_{GETCO, Import} \times EG_{Cluster, Import} / EG_{Cluster, WF, Import}$$

#### **Net Electricity Exported to the grid by the project activity**

$$EGPJ, y = EGPJ, export, y - EGPJ, Import, y$$

The apportioning procedure for the project activity is done by GEDA (Gujarat Energy Development Agency) based on the meters that are connected to the cluster meter of various project owners connected to substation of Enercon based on meter reading noted at Enercon substation connecting all the machines of the project activity and other project developers. The meter reading at cluster meter and the Enercon substation are directly monitored and hence the apportioning of the electricity is based on the meter reading that are directly measured.

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



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

### Training imparted to the Personnel

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon's service staffs is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The Enercon Training Academy provides need-based training to meet the training requirements of Enercon projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

### Calibration Details

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

Name of EIL Substation	(Main Meter/GETCO Meter) Meter Serial No	Type/ Make	Accuracy Class (%)	Frequency of Calibration	Calibration Dates		
					Previous Calibration 2010	Present Calibration 2012	Calibration Due on
Sadodar S/s	GJB01470	Secure	0.2	Once in a three year	22/01/2010	17/01/2012	16/01/2015
	GJU04175	Secure	0.2	Once in a three year	22/01/2010	17/01/2012	16/01/2015
	GJU04176	Secure	0.2	Once in a three year	22/01/2010	17/01/2012	16/01/2015
	KAB11082	Secure	0.2	Once in a three year	29/05/2010	17/01/2012	16/01/2015

## Meter Details of Cluster Meters:

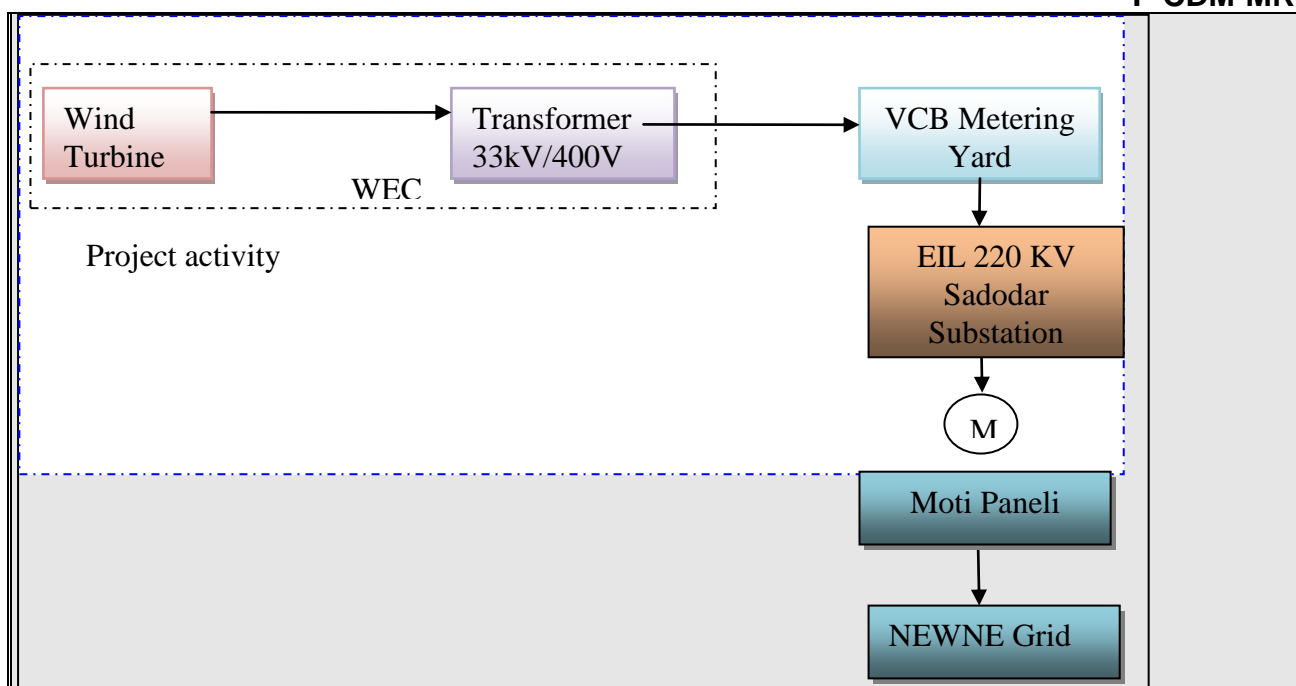
Meter Serial No	Make	Accuracy Class (%)	Calibration Dates	Validity
10059208	L&T	0.2	24/08/2010	23/08/2013
10059203	L&T	0.2	24/08/2010	23/08/2013
GJU60947	Secure	0.2	03/09/2010	02/09/2013
GJU61707	Secure	0.2	29/01/2011	28/01/2014
GJU61698	Secure	0.2	29/01/2011	28/01/2014
GJU61321	Secure	0.2	05/02/2011	04/02/2014
GJU61313	Secure	0.2	18/12/2010	17/12/2013
GJU61690	Secure	0.2	29/01/2011	28/01/2014
GJU61699	Secure	0.2	29/01/2011	28/01/2014
GJU61322	Secure	0.2	09/12/2010	08/12/2013
GJU61696	Secure	0.2	29/01/2011	28/01/2014
GJU61310	Secure	0.2	18/12/2010	17/12/2013
GJU61701	Secure	0.2	29/01/2011	28/01/2014
GJU61693	Secure	0.2	29/01/2011	28/01/2014
GJU61692	Secure	0.2	29/01/2011	28/01/2014
GJU61696	Secure	0.2	29/01/2011	28/01/2014
GJU60943	Secure	0.2	03/09/2010	02/09/2013

As per the PPA and the guideline by GETCO, the calibration frequency of the meters which under the jurisdiction of GEDA/GETCO is once in three years.

**Emergency procedure:**

If during meter testing the main meter at the Enercon substation is found beyond the permissible limit of error, the meter reading will be taken from the meter located at the utility substation at Moti Panelli after addition of average historical transmission losses.

The line diagrams showing all relevant monitoring points is attached.



M = Electricity export and import meter

#### SECTION D. Data and parameters

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

(Copy this table for each piece of data and parameter.)

<b>Data / Parameter:</b>	<b><math>EF_{grid,OM,y}</math></b>
Unit:	tCO <sub>2</sub> e/MWh
Description:	Operating Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data:	“CO <sub>2</sub> Baseline Database for Indian Power Sector”, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.  The “CO <sub>2</sub> Baseline Database for Indian Power Sector” is available at <a href="http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm">http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</a>
Value(s) applied:	1.00498
Purpose of data:	This data is used for baseline emission calculation.
Additional comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

<b>Data / Parameter:</b>	<b><math>EF_{grid,BM,y}</math></b>
Unit:	tCO <sub>2</sub> e/MWh
Description:	Build Margin Emission Factor of NEWNE Regional Electricity Grid



Source of data:	<p>“CO<sub>2</sub> Baseline Database for Indian Power Sector”, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO<sub>2</sub> Baseline Database for Indian Power Sector” is available at <a href="http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm">http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</a></p>
Value(s) applied:	0.67518
Purpose of data:	This data is used for baseline emission calculation.
Additional comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

<b>Data / Parameter:</b>	<b><math>EF_{grid,CM,y}</math></b>
Unit:	tCO <sub>2</sub> e/MWh
Description:	Combined Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data:	<p>“CO<sub>2</sub> Baseline Database for Indian Power Sector”, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO<sub>2</sub> Baseline Database for Indian Power Sector” is available at <a href="http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm">http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</a></p>
Value(s) applied:	0.92252
Purpose of data:	This data is used for baseline emission calculation.
Additional comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

## D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

<b>Data / Parameter:</b>	<b><math>EG_{PJ,y}</math></b>
Unit:	MWh
Description:	Net Quantity of Electricity exported to the grid
Measured/ Calculated / Default:	The net electricity supplied to the grid by the wind farm is calculated by GEDA on the basis of GETCO main meter reading and the meter readings taken at individual cluster meters after adjusting transmission loss.
Source of data:	Share certificate issued by GETCO
Value(s) of monitored parameter:	95055.869 <sup>1</sup> MWh
Monitoring equipment:	Calculated as per formulas described under section C.

<sup>1</sup> Considering Annex 60 of EB 52

Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	<p>The procedures for metering have been as per the provisions of the power purchase agreement. The WECs of a single customer (VIPCP in this case) has been divided into clusters and each cluster has dedicated metering system. Different clusters are connected to different Vacuum Circuit Breaker metering yards (VCB) which ultimately lead to the shared main GETCO meter (also known as revenue meter) at the Sadodar substation maintained by Enercon (India) Limited. Data monitoring takes place at the cluster metering points and GETCO main meter at the EIL substation.</p> <p>The net electricity supplied to the grid by the wind farm has been calculated by GEDA on the basis of GETCO main meter reading and the meter readings taken at individual cluster meters after adjusting transmission loss. For adjustment of transmission loss, the electricity metered at the GETCO meter has been proportionally divided by GEDA among the customers connected to the revenue meter on the basis of the pro rata readings taken at the cluster meters metering point .</p> <p>The net electricity generated by the project activity has been taken directly from the share certificate issued by GETCO on monthly basis.</p>
QA/QC procedures:	Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data:	This data is directly used for baseline estimation
Additional comment:	The data will be archived for the entire crediting period plus two years.

<b>Data / Parameter:</b>	EG <sub>GETCO, Export</sub>
Unit:	kWh
Description:	Net Electricity export recorded at Enercon Substation
Measured/ Calculated / Default:	Measured at Main Meter
Source of data:	Joint Meter Reading (JMR)
Value(s) of monitored parameter:	777,551,300 <sup>2</sup> kWh
Monitoring equipment:	Please refer section C under heading calibration details of the MR
Measuring/ Reading/ Recording frequency:	Monthly

<sup>2</sup> This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions

Calculation method (if applicable):	Monitoring: Electricity export to the grid is recorded by the main meter at Enercon Substation.  Frequency of recording data: Monthly  Recording: The values of electricity exports to the grid are sourced from JMR.  Responsibility: Joint responsibility of Enercon and state utility
QA/QC procedures:	Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data:	Baseline Emissions
Additional comment:	The data will be archived for the entire crediting period plus two years.

<b>Data / Parameter:</b>	EG <sub>GETCO, Import</sub>
Unit:	kWh
Description:	Net Electricity import recorded at Enercon Substation
Measured/ Calculated / Default:	Measured at Main Meter
Source of data:	Joint Meter Reading (JMR)
Value(s) of monitored parameter:	112000 <sup>3</sup> kWh(Month wise details mentioned in Annex-1)
Monitoring equipment:	Please refer section C under heading calibration details of the MR
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Monitoring: Electricity import to the grid is recorded by the main meter at Enercon Substation. Refer section C & D.2 for an illustration of the provisions for QA/QC procedures.  Frequency of recording data: Monthly  Recording: The values of electricity exports to the grid are sourced from JMR.  Responsibility: Joint responsibility of Enercon and state utility
QA/QC procedures:	Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data:	Baseline Emissions
Additional comment:	The data will be archived for the entire crediting period plus two years.

<sup>3</sup> This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions

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

### D.3. Implementation of sampling plan

>> Not applicable

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>“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** 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 GEDA sharing 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 (0.92252 tCO<sub>2</sub>e/MWh fixed ex-ante)

#### Month-wise Net Electricity Export Details

Period	Net Quantity of Electricity Exported to the Grid (MWh)	Baseline Emission Factor (tCO <sub>2</sub> /MWh)	Baseline Emissions (tCO <sub>2</sub> e)
Mar-12	8587.093	0.9225	7922
Apr-12	9029.007	0.9225	8329
May-12	11100.800	0.9225	10241
Jun-12	14896.351	0.9225	13742
Jul-12	15307.088	0.9225	14121
Aug-12	11394.909	0.9225	10512
Sep-12	5544.514	0.9225	5115
Oct-12	4414.059	0.9225	4072
Nov-12	5413.390	0.9225	4994
Dec-12	9368.658	0.9225	8643
<b>Total</b>	<b>95055.869</b>	<b>-</b>	<b>87,690</b>

The total emission reductions achieved during the monitoring period is 87,690 tCO<sub>2</sub>.

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

>> Since the project activity is a renewable energy project which generates electricity using wind power and also electricity import is already considered in the net export estimation, hence does not result in project emissions.

$$PE_y = 0$$

## E.3. Calculation of leakage

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

## E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO <sub>2</sub> e)
<b>Total</b>	87,690	0	0	87,690

## E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
<b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b>	88,648	87,690

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

>> There is minor negative change of 1.08% in the expected and annual emission reductions. The difference in the total CERs is due to low wind availability leading to low plant load factor.

**E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards**

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO <sub>2</sub> e)	87,690	

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**Document information**

Version	Date	Description
03.1	2 January 2013	Editorial revision to correct table in section E.5
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

Decision Class: Regulatory  
Document Type: Form  
Business Function: issuance  
Keywords: monitoring report, performance monitoring