

Monitoring Report
Voluntary Carbon Standard 2007.1

Version 05 dated 19/10/2010

FOR THE PERIOD
12/04/2008 to 12/02/2010

"Wind based renewable energy project in Gujarat"
UNFCCC Project Reference No.: 2925

Project Location:

Samana Site
Jamnagar District
Kalavad and Jamjodhpur Taluk
Gujarat, India

Gujarat Paguthan Energy Corporation Private Limited
6th Floor, Chanakaya,
Off. Ashram Road
Ahmedabad,
Gujarat - 380009

INDEX

Project Description..... 3

Current Status of Project..... 5

Monitoring Period..... 7

Contribution to Sustainable Development 8

Monitoring Parameters..... 10

Emission Reductions..... 12

Measures to Ensure the Results/Uncertainty Analysis 15

Roles and Responsibilities 17

Project Description

The project activity undertaken by Gujarat Paguthan Energy Corporation Private Limited (GPECL) utilizes the kinetic energy present in wind to generate electrical power in the state of Gujarat. To do so, GPECL has installed 63 Wind Electric Generators (WEGs) of individual capacity 800 kW that have been supplied by Enercon India Ltd. totalling an installed capacity of 50.4 MW.

Purpose

The project activity is an initiative by GPECL to export 50.4 MW of WEG generated renewable electricity to the power deficit NEWNE regional grid in order to decrease power shortage, diversify the grid composition, and reduce greenhouse gas emissions thereby contributing to sustainable development. Out of the 63 WEGs implemented, one WEG is under a wheeling and banking agreement with Gujarat Urja Vikas Nigam Limited (GUVNL).

Technology

Enercon (India) Limited has supplied the wind energy technology to GPECL. The WEG is ingeniously devised to convert kinetic energy from the “air in motion” directly into electricity without using conventional sources like coal, oil or natural gas for power generation. The project activity employs the use of gearless Enercon E-53 WEGs with synchronous generator, pitch regulation, low cut-in speed and aerodynamic braking system.

E-53 TECHNICAL DATA

Rated capacity	: 800 kW
Rotor diameter	: 53 m
Rotor with Pitch Control	
Type	: Upwind rotor with active pitch control
Number of blades	: 3
Swept area	: 2198 m ²

Blade material	: Fiberglass (reinforced epoxy) with integral lightning protection
Rotor speed	: 12- 29 rpm
Pitch control	: Continuous variable pitching mechanism
Generator	: Synchronous - Type
Main Bearings	: Single row cylindrical roller bearings
Braking System	: 3 independent blade pitch systems with independent power back up supply
Yaw Control	: Active via adjustment gears, load dependent damping drives
Cut-out Wind Speed	: 28-34 m/s (with Storm Control)
Tower	: Concrete/steel, 72 - 74 m height

Current Status of Project

The project activity has been exporting electricity to the NEWNE regional grid continuously since commissioning. The first WEG was commissioned on 12th April 2008 and the last WEG was commissioned on 12th March 2009. The project was registered as a CDM project activity with the UNFCCC on 13th February 2010 under the methodology ACM0002 Version 08 (<http://cdm.unfccc.int/Projects/DB/RWTUV1250689673.15/view>). Voluntary emission reductions are being claimed for the period preceding the date of registration with the UNFCCC.

Table 1: Details of commissioning of WTGs

WTG ID No.	Details of site of installation			Date of Commissioning
	Village	Taluka	District	
EIL/800/07-08/0934	Narmana	Jam Jodhpur	Jamnagar	12-Apr-08
EIL/800/07-08/0945	Bodi	Kalavad	Jamnagar	30-May-08
EIL/800/07-08/0946	Bodi	Kalavad	Jamnagar	30-May-08
EIL/800/07-08/0947	Bodi	Kalavad	Jamnagar	30-May-08
EIL/800/07-08/0948	Bodi	Kalavad	Jamnagar	30-May-08
EIL/800/07-08/0949	Bodi	Kalavad	Jamnagar	30-May-08
EIL/800/07-08/0950	Bodi	Kalavad	Jamnagar	30-May-08
EIL/800/07-08/0935	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0936	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0937	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0938	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0939	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0940	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0941	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0942	Machharda	Kalavad	Jamnagar	11-Jun-08
EIL/800/07-08/0943	Makrani	Kalavad	Jamnagar	9-Jul-08
EIL/800/07-08/0944	Sanosara	Kalavad	Jamnagar	9-Jul-08
EIL/800/07-08/1211	Jam Ambardi	Jam Jodhpur	Jamnagar	9-Jul-08
EIL/800/07-08/1212	Jam Ambardi	Jam Jodhpur	Jamnagar	9-Jul-08
EIL/800/07-08/1213	Jam Ambardi	Jam Jodhpur	Jamnagar	9-Jul-08
EIL/800/08-09/1195	Phagas	Kalavad	Jamnagar	18-Aug-08
EIL/800/08-09/1197	Phagas	Kalavad	Jamnagar	18-Aug-08
EIL/800/08-09/1198	Makrani	Kalavad	Jamnagar	18-Aug-08
EIL/800/08-09/1199	Sanosara	Kalavad	Jamnagar	18-Aug-08
EIL/800/08-09/1200	Narmana	Jam Jodhpur	Jamnagar	18-Aug-08

EIL/800/08-09/1205	Sogthi	Jam Jodhpur	Jamnagar	18-Aug-08
EIL/800/08-09/1206	Sogthi	Jam Jodhpur	Jamnagar	18-Aug-08
EIL/800/08-09/1184	Phagas	Kalavad	Jamnagar	8-Sep-08
EIL/800/08-09/1185	Phagas	Kalavad	Jamnagar	8-Sep-08
EIL/800/08-09/1186	Phagas	Kalavad	Jamnagar	8-Sep-08
EIL/800/08-09/1191	Phagas	Kalavad	Jamnagar	23-Sep-08
EIL/800/08-09/1192	Phagas	Kalavad	Jamnagar	24-Sep-08
EIL/800/08-09/1193	Phagas	Kalavad	Jamnagar	25-Sep-08
EIL/800/08-09/1194	Phagas	Kalavad	Jamnagar	26-Sep-08
EIL/800/08-09/1196	Phagas	Kalavad	Jamnagar	27-Sep-08
EIL/800/08-09/1190	Phagas	Kalavad	Jamnagar	24-Oct-08
EIL/800/08-09/1201	Narmana	Jam Jodhpur	Jamnagar	24-Oct-08
EIL/800/08-09/1202	Narmana	Jam Jodhpur	Jamnagar	24-Oct-08
EIL/800/08-09/1204	Sogthi	Jam Jodhpur	Jamnagar	24-Oct-08
EIL/800/08-09/1345	Laloi	Jam Jodhpur	Jamnagar	24-Nov-08
EIL/800/08-09/1346	Jam Ambardi	Jam Jodhpur	Jamnagar	24-Nov-08
EIL/800/08-09/1347	Jam Ambardi	Jam Jodhpur	Jamnagar	24-Nov-08
EIL/800/08-09/1188	Phagas	Kalavad	Jamnagar	24-Nov-08
EIL/800/08-09/1349	Kalyanpur	Jam Jodhpur	Jamnagar	29-Nov-08
EIL/800/08-09/1215	Kalyanpur	Jam Jodhpur	Jamnagar	5-Dec-08
EIL/800/08-09/1216	Kalyanpur	Jam Jodhpur	Jamnagar	5-Dec-08
EIL/800/08-09/1209	Kalyanpur	Jam Jodhpur	Jamnagar	8-Dec-08
EIL/800/08-09/1187	Phagas	Jam Jodhpur	Jamnagar	11-Dec-08
EIL/800/08-09/1348	Bhupat Ambardi	Jam Jodhpur	Jamnagar	11-Dec-08
EIL/800/08-09/1189	Phagas	Kalavad	Jamnagar	16-Jan-09
EIL/800/08-09/1207	Kalyanpur	Jam Jodhpur	Jamnagar	21-Jan-09
EIL/800/08-09/1208	Kalyanpur	Jam Jodhpur	Jamnagar	21-Jan-09
EIL/800/08-09/1210	Kalyanpur	Jam Jodhpur	Jamnagar	21-Jan-09
EIL/800/08-09/1214	Kalyanpur	Jam Jodhpur	Jamnagar	21-Jan-09
EIL/800/08-09/1356	Kalyanpur	Jam Jodhpur	Jamnagar	29-Jan-09
EIL/800/08-09/1350	Kalyanpur	Jam Jodhpur	Jamnagar	10-Feb-09
EIL/800/08-09/1351	Kalyanpur	Jam Jodhpur	Jamnagar	10-Feb-09
EIL/800/08-09/1352	Kalyanpur	Jam Jodhpur	Jamnagar	10-Feb-09
EIL/800/08-09/1353	Kalyanpur	Jam Jodhpur	Jamnagar	10-Feb-09
EIL/800/08-09/1354	Kalyanpur	Jam Jodhpur	Jamnagar	10-Feb-09
EIL/800/08-09/1203	Narmana	Jam Jodhpur	Jamnagar	12-Mar-09
EIL/800/08-09/1355	Kalyanpur	Jam Jodhpur	Jamnagar	12-Mar-09
EIL/800/08-09/1357	Kalyanpur	Jam Jodhpur	Jamnagar	12-Mar-09

Monitoring Period

This is the only monitoring report claiming voluntary emission reductions associated with the project activity.

The period covered in this monitoring report is from 12/04/2008 to 12/02/2010 (Both days included). This monitoring report does not cover any period of time covered by any other monitoring report.

Contribution to Sustainable Development

The project activity has contributed to sustainable development in the region as follows:

Social well being

- The project activity has led to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility.
- The infrastructure in and around the project area has also improved due to project activity. This includes development of road network and improvement of electricity quality, frequency and availability as the electricity is fed into a deficit grid.

Economic well-being

- The generated electricity is fed into the NEWNE regional grid, thereby improving the availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development.
- The project activity also leads to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

Environmental well being

- The project utilizes wind energy for generating electricity which otherwise would have been generated through alternate fossil fuel based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions.
- As wind power projects produce no end products in the form of solid waste (ash etc.), they address the problem of solid waste disposal encountered by most other sources of power.
- Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment contributing to environmental well-being.

Technological well being

- The project activity leads to the promotion of Wind Electric Generators (WEGs) into the region (demonstrating the success of wind based renewable energy generation), which is fed into the nearest sub-station (part of the NEWNE Regional Grid), thus increasing energy availability and improving quality of power under the service area of the substation. Hence the project leads to technological well being.

Monitoring Parameters

For the project, following parameter was monitored on a continuous basis:

Data / Parameter:	EGy
Data unit:	MWh/yr
Description:	Net Electricity supplied to NEWNE Grid
Source of data to be used:	Share certificate issued by GEDA
Description of measurement methods and procedures to be applied:	The WEGs of a single customer (GPECL in this case) in a particular location are connected to a Vacuum Circuit Breaker metering yard (VCB) which in turn connects to a feeder that ultimately leads to the bulk main GETCO meter of accuracy class 0.2s, at the substation maintained by Enercon India Limited. Net electricity generated by GPECL wind farm will be monitored and reported by GEDA in its share certificate on the basis of the metering done at the bulk main meter connected to the incoming feeder of GETCO and the meters installed at the VCB metering yard. Data monitoring for electricity exported and electricity imported takes place at the VCB metering yard and GETCO meter at the substation. The electricity metered at the GETCO meter is proportionally divided among the customers connected to the meter on the basis of the pro-rata readings taken at the VCB end. There are three meters at the GETCO sub-station each of accuracy class 0.2s and one dedicated meter for GPECL at each VCB metering yard (total 9 meters) of accuracy class 0.5s. The emission reduction calculations are done on the basis of the net electricity supplied as mentioned in the share certificate issued by GEDA on monthly basis.
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately.
Any comment:	The data will be archived electronically for two years after the end of the crediting period.

The data monitored for electricity exported and imported takes place at the GETCO meter at the substation which is then proportionally divided among all customers based on the pro-rata readings taken at the metering yard. Regular calibration of these meters at the metering yard is carried out and the same has been detailed in the section on *Measures to Ensure the Results / Uncertainty Analysis*.

Emission Reductions

Emission reductions are calculated based on the net electricity exported to GUVNL obtained from the Certificate for share of electricity generated by windfarms issued by GEDA. The emission reductions for the monitoring period are shown below:

Table 2: Baseline Emission calculations

Month	Net Electricity supplied to NEWNE Grid (EG _y)	Baseline Emission Factor (EF _y)	Baseline Emissions (BE _y)
	kWh	tCO ₂ /MWh	tCO ₂
12 Apr 08 – 24 Apr 08	21,056	0.9008	19
25 Apr 08 – 25 May 08	201,256	0.9008	181
26 May 08 – 25 Jun 08	1,595,281	0.9008	1,437
26 Jun 08 – 24 Jul 08	1,982,858	0.9008	1,786
25 Jul 08 – 24 Aug 08	3,120,729	0.9008	2,811
25 Aug 08 – 30 Sep 08	3,147,887	0.9008	2,836
01 Oct 08 – 25 Oct 08	1,301,769	0.9008	1,173
26 Oct 08– 25 Nov 08	3,935,219	0.9008	3,545
26 Nov 08– 25 Dec 08	6,322,200	0.9008	5,695
26 Dec 08– 25 Jan 09	7,306,474	0.9008	6,582
26 Jan 09 – 25 Feb 09	7,212,634	0.9008	6,497
26 Feb 09 – 31 Mar 09	8,002,918	0.9008	7,209
01 Apr 09 – 25 Apr 09	7,784,747	0.9008	7,013
26 Apr 09 – 25 May 09	10,154,374	0.9008	9,147
26 May 09 – 25 Jun 09	12,548,698	0.9008	11,304
26 Jun 09 – 25 Jul 09	7,911,528	0.9008	7,127
26 Jul 09 – 25 Aug 09	12,249,861	0.9008	11,035
26 Aug 09 – 30 Sep 09	5,871,165	0.9008	5,289
01 Oct 09 – 25 Oct 09	4,672,364	0.9008	4,209
26 Oct 09 – 25 Nov 09	5,801,101	0.9008	5,226
26 Nov 09 – 25 Dec 09	8,177,731	0.9008	7,367
26 Dec 09 – 25 Jan 10	8,698,013	0.9008	7,835
26 Jan 10 – 12 Feb 10	3,522,833	0.9008	3,173
Total	131,542,696	-	118,494

Calculations involving determination of net electricity exported by GPECL from 26th Jan 2010 to 12th Feb 2010 are iterated below:

- (a) The Net Electricity Generation by GPECL for the period from 26.01.10 to 26.02.10 (entire billing month) has been calculated by GEDA as 121,409 (GPEC – I) + 7,335,393 (GPEC – II) = 7,456,802 kWh.
- (b) The daily electricity generation recorded for the period from 26.01.10 to 12.02.10 (period under consideration) for the 63 WEGs was 3,605,276 kWh.
- (c) The daily electricity generation recorded for the period from 26.01.10 to 26.02.10 (entire billing month) for the 63 WEGs was 3,605,276 (26.01.10 to 12.02.10) + 4,026,033 (13.02.10 to 26.02.10) = 7,631,309 kWh

The value obtained in step (a) is multiplied by the ratio (b)/(c) to obtain the net electricity exported by the 63 WEGs of GPECL from 26.01.10 to 12.02.10 (period under consideration) i.e.

$$\left(7,456,802 \times \frac{3,605,276}{7,631,309} \right) = 3,522,833 \text{ kWh}$$

Baseline Emissions:

CO ₂ Emission Factor as per the baseline adopted (tCO ₂ /MWh)	= 0.9008
Net Electricity exported by GPECL to grid (kWh)	= 131,542,696
Baseline emissions (tonnes CO ₂)	= 118,494

Leakage: 0**Emission Reductions:**

Baseline emissions – Project emissions – Leakage emissions
= 118,494 – 0 – 0 t CO₂
= 118,494 tCO₂

The emission reductions estimated in the registered PDD are 107,173 tCO₂ per annum. Since the current monitoring period covers a period of 1 year 10 months (672 days), emission reductions have been extrapolated for the current monitoring period, i.e. 12 April 2008 to 12 Feb 2010 (672 days). The emission reductions estimated in the registered PDD for this period works out to be

$$197,316 \text{ tCO}_2 \left(\frac{672}{365} \times 107,173 \right).$$

The emission reductions actually achieved in the monitoring period are 118,494 tCO₂. Thus, it can be observed that the emission reductions for the current monitoring period have decreased as compared to the figure estimated in the registered PDD. This is because the registered PDD estimated emission reductions per annum assuming all the WEGs to be commissioned whereas in the current monitoring period, the WEGs were commissioned in a phased manner with the first WEG being commissioned on 12th April 2008 and the last WEG being commissioned on 12th March 2009.

Measures to Ensure the Results/Uncertainty Analysis

The uncertainty level associated with the monitored data used for calculating emission reductions is low as the electricity generation at each metering yard has been recorded in daily generation reports provided by Enercon India Limited for cross checking purposes. The calibration of all monitoring equipment is being carried out annually.

It is to be noted that no meter has been replaced in the current monitoring period. The following table indicates the details of meters including their accuracy levels and calibration dates:

Table 3: GETCO Main Meters Details

Meter Serial No.	GJU04175	
Meter Type	E3MO21	
Meter Make	Secure	
Accuracy Class	0.2s	
Dates of Calibration	13.03.07	03.03.2009
Error observed in calibration	Nil	Nil

Meter Serial No.	GJU04176	
Meter Type	E3MO21	
Meter Make	Secure	
Accuracy Class	0.2s	
Dates of Calibration	27.06.2007	03.03.2009
Error observed in calibration	Nil	Nil

Meter Serial No.	GJB01470	
Meter Type	E3MO21	
Meter Make	Secure	
Accuracy Class	0.2s	
Dates of Calibration	10.04.2008	03.03.2009
Error observed in calibration	Nil	Nil

Table 4:Meters installed at the metering yard

Location	Meter Serial No.	Meter Type	Meter Make	Accuracy Class	No. of WEGs connected to meter	Year of Installation	Operational since	Date of Calibration of meter		Error observed during Calibration
Sogati	GJB01567	E3M055	Secure	0.5s	1	2008	12.04.2008	28.02.2008	12.10.2009	Nil
Bodi	GJB01561	E3M055	Secure	0.5s	6	2008	28.05.2008	28.02.2008	26.08.2009	Nil
Jamamvadi	GJB01560	E3M055	Secure	0.5s	5	2008	09.07.2008	28.02.2008	26.08.2009	Nil
Machharada	GJB01562	E3M055	Secure	0.5s	8	2008	11.06.2008	28.02.2008	12.10.2009	Nil
Phagas	GJB01565	E3M055	Secure	0.5s	18	2008	09.07.2008	28.02.2008	12.10.2009	Nil
Kalyanpur / Sagothi*	GJU03936	E3M055	Secure	0.5s	-	2008	18.07.2008	19.06.2006 (No longer in use)		Nil
Kalyanpur / Sagothi	GJB01740	E3M055	Secure	0.5s	7	2008	24.10.2008	19.08.2008	22.01.2010	Nil
Kalyanpur / Sagothi	07025779	ER300P	L&T	0.5s	16	2007	29.11.2008	17.05.2007	26.08.2009	Nil
Laloi	GJB01726	E3M055	Secure	0.5s	1	2008	24.11.2008	11.06.2008	26.08.2009	Nil
Bhoopatmavadi	GJB01600	E3M055	Secure	0.5s	1	2008	11.12.2008	19.05.2008	12.10.2009	Nil

* Earlier meter no. GJU03936 was installed at the Kalyanpur / Sagothi location. On 24.10.08 it was replaced with meter no. GJB01740.

Roles and Responsibilities

To ensure trouble free operations and efficient generations through all the wind turbines, GPECL has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines for a period of 10 years, which is extendable at renegotiated terms. The contractor EIL, under the O&M contract with GPECL is responsible for the operation and maintenance of the project activity for the entire crediting period. The O&M personnel are qualified engineers trained at the WEG manufacturing facility of EIL at Daman for operating and ensuring best performance of the WEGs. The data measurement and recording procedures are as per quality management system - ISO 9001:2000.

The authority and responsibility of project management as well as registration, monitoring, measurement and reporting of data lies with the project proponent. GPECL has formulated a Project and Operations Team to ensure proper and continuous monitoring of the performance of turbines and generation of power. The structure of the operation and management structure implemented by the project proponent for the purpose of the project activity is illustrated below:

Figure 1: Roles and Responsibilities

