

**Monitoring Report
Voluntary Carbon Standard**

VERSION 2 DATED 15/10/2009

**FOR THE PERIOD
13/03/2007 TO 14/01/2009**

**"Wind power project by HZL in Gujarat"
Reference no. UNFCCC00001856CDMP**

Project Location:
District- Jamnagar
Taluk- Kalavad, Jamjodhpur
Site-Samana

**Hindustan Zinc Limited
Yashad Bhawan
Udaipur
Rajasthan**

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Project Description

The project activity is an 88.8 MW wind power project consisting of 111 WEGs of individual capacity 0.8 MW at Samana Site in Gujarat, India. The electricity generated from the wind farm is being exported to the regional electricity grid and sold to the state electricity utility, thereby marginally contributing to reducing the energy demand supply gap in the state of Gujarat.

Purpose

The project activity is an initiative by Hindustan Zinc Limited to export Wind Electric Generator (WEG) generated renewable electricity to the power deficit western region grid in order to decrease power shortage, diversify the grid and reduce greenhouse gas emissions.

Technology

Enercon India Limited has supplied the wind energy technology to HZL. 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 implements gearless Enercon E-48 and E-48SL WEGs with synchronous generator, pitch regulation, low cut-in speed and aerodynamic braking system.

E-48 and E-48 SL TECHNICAL DATA

Rated capacity	: 800 kW
Rotor diameter	: E-48 - 48 m E-48SL – 52.9 m
Hub height	: E-48 - 56.85m E-48 SL – 75 m
Number of blades	: 3
Swept area	: E-48 - 1810 m ² E-48 SL – 2198 m ²
Blade material	: Fiberglass (reinforced epoxy) with integral lightning Protection
Rotor speed	: Variable, 16-31.5 rpm
Tip speed	: E-48 - 41 - 78 m/s E-48 SL – 33-80 m/s
Pitch control	: Continuous variable pitching mechanism
Generator	: Synchronous - Type

This is a multi-pole variable speed generator. Due to this and Power electronics, the Gear Box which steps up the speed to meet the speed of Induction Generator is eliminated resulting in reduced transmission losses, and elimination of wear and tear of the Gear Box and oil leakage associated with it.

Hub	: Casted Steel
Tower	: E-48 - Steel Tubular, 56 m height E-48 SL – Concrete, 74 m height

Current Status of Project

The project activity has been exporting electricity to the western regional grid continuously since commissioning. The first WEG (Phase-I) was commissioned on 13th March 2007 and the last WEG (Phase-II) was commissioned on 29th March 2008. The project was registered as a CDM project activity with the UNFCCC on 15th January 2009 under the methodology ACM0002 Version 06 (<http://cdm.unfccc.int/Projects/DB/BVQI1211956663.14/view>). Voluntary emission reductions are being claimed for the period preceding the date of registration with the UNFCCC.

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 13/03/2007 to 14/01/2009 (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 western regional grid through local grid, thereby improving the grid frequency and 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 Western 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 parameters were monitored on a continuous basis.

<i>1. Net Quantity of Electricity exported to GUVNL facility</i>	
Symbol	EG
Data unit	MWh
Frequency	Monthly
Source of data	Share certificate issued by GEDA
Monitoring Method	The WEGs of HZL have been installed at multiple locations at Samana Site in the district of Jamnagar. The WEGs at a particular location are connected to a meter at the Vacuum Circuit Breaker metering yard (VCB) which in turn connects to a feeder that ultimately leads to the shared main GETCO meter at the grid substation. The wind farm of HZL is connected to nineteen meters at respective VCB yards and three GETCO meters at the substation. Data monitoring has taken place both at the VCB meters and the GETCO meters at the substation. The Net electricity generated has been calculated from the readings of export and import indicated by the main meters connected to the incoming feeder of GUVNL, which has been proportionally divided among the customers connected to the meters on the basis of the pro-rata readings taken at the VCB end. This figure mentioned in the share certificate issued by GEDA on monthly basis has been used to calculate emission reductions.
QA/QC	The GETCO main meter and the meters at the respective VCB yards have been calibrated on a yearly basis.
<i>2. Quantity of Electricity exported to GUVNL facility</i>	
Symbol	EG _{Export}
Data unit	MWh
Frequency	Monthly
Source of data	Share certificate issued by GEDA monitored from the main GETCO meter
Monitoring Method	Electricity exported to GUVNL has been measured at the GETCO main meters connected to the incoming feeder of GUVNL which has been proportionally divided among the customers connected to the meters on the basis of the pro-rata readings taken at the VCB end.
QA/QC	The GETCO main meter and the meters at the respective VCB yards have been calibrated on a yearly basis.
<i>3. Quantity of Electricity imported from GUVNL</i>	
Symbol	EG _{Import}
Data unit	MWh
Frequency	Monthly
Source of data	Share certificate issued by GEDA monitored from the main GETCO meter
Monitoring	Electricity imported from GUVNL has been measured at the main meter

Method	connected to the incoming feeder of GUVNL which has been proportionally divided among the customers connected to the meters on the basis of the pro-rata readings taken at the VCB end.
QA/QC	The GETCO main meter and the meters at the respective VCB yards have been calibrated on a yearly basis.
4. Electricity generated by each WEG	
Symbol	EG_{WEG}
Data unit	kWh
Frequency	Daily
Source of data	Daily generation reports provided by Enercon India Limited
Monitoring Method	Each WEG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through communication cables (SCADA system). This data for each individual WEG has been recorded daily and has been included in the Daily Generation Reports.
QA/QC	The meters on each WEG are auto tracking type which is an auto calibration mechanism
5. Electricity generation recorded at the Vacuum Circuit Breaker (VCB)	
Symbol	EG_{VCB}
Data unit	kWh
Frequency	Daily
Source of data	Daily generation reports provided by Enercon India Limited
Monitoring Method	The individual WEGs at a particular site are connected to a meter at the VCB end, where the electricity exported and imported in the bidirectional meter has been measured and reported in the daily generation report.
QA/QC	The individual meters at each VCB has been calibrated on a yearly basis

Emission Reductions

Emission reductions are calculated based on the net electricity exported to GUVNL obtained by subtracting electricity imported from GUVNL from the electricity exported to GUVNL. The emission reductions for the monitoring period are shown below:

Month	Year	Quantity of Electricity exported by windfarm to GUVNL facility	Quantity of Electricity imported by windfarm from GUVNL facility	Net Quantity of Electricity exported by windfarm to GUVNL facility	Quantity of Electricity exported by HZL to GUVNL facility	Quantity of Electricity imported by HZL from GUVNL facility	Net Quantity of Electricity exported by HZL to GUVNL facility (EG)	Baseline Emission Factor (EF)	Baseline Emissions (BE)
		MWh	MWh	MWh	MWh	MWh	MWh	tCO ₂ /MWh	tCO ₂
13 Mar – 31 Mar	2007	3,323	1	3,322	1,433	0	1433	0.9011	1,291
01 Apr – 24 Apr	2007	10,362	4	10,358	5,080	2	5078	0.9011	4,576
25 Apr – 24 May	2007	19,075	2	19,073	7,939	1	7938	0.9011	7,153
25 May – 24 Jun	2007	17,681	11	17,670	7,411	5	7407	0.9011	6,674
25 Jun – 24 Jul	2007	20,009	6	20,003	7,648	2	7645	0.9011	6,889
25 Jul – 24 Aug	2007	23,615	6	23,609	7,495	2	7493	0.9011	6,752
25 Aug – 30 Sep	2007	10,584	35	10,549	3,924	13	3911	0.9011	3,524
01 Oct – 24 Oct	2007	7,612	8	7,604	2,901	3	2898	0.9011	2,611
25 Oct – 24 Nov	2007	10,524	11	10,513	4,383	5	4378	0.9011	3,945

25 Nov – 24 Dec	2007	25,748	4	25,744	11,283	2	11281	0.9011	10,165
25 Dec – 24 Jan	2008	27,202	3	27,199	12,031	1	12030	0.9011	10,840
25 Jan – 24 Feb	2008	24,547	11	24,536	10,990	5	10986	0.9011	9,899
25 Feb – 31 Mar	2008	28,080	8	28,072	13,045	4	13041	0.9011	11,751
01 Apr – 24 Apr	2008	20,682	7	20,675	9,255	3	9252	0.9011	8,337
25 Apr – 24 May	2008	54,667	2	54,665	25,069	1	25,068	0.9011	22,589
25 May – 24 Jun	2008	59,348	11	59,337	25,639	5	25635	0.9011	23,099
25 Jun – 24 Jul	2008	39,796	17	39,779	17,269	7	17261	0.9011	15,554
25 Jul – 24 Aug	2008	41,795	5	41,790	17,166	2	17164	0.9011	15,466
25 Aug – 30 Sep	2008	30,217	14	30,203	12,281	6	12275	0.9011	11,061
01 Oct – 24 Oct	2008	10,321	12	10,309	4,136	5	4132	0.9011	3,723
25 Oct – 24 Nov	2008	28,231	34	28,197	10,550	13	10538	0.9011	9,496
25 Nov – 24 Dec	2008	40,177	16	40,161	14,838	6	14832	0.9011	13,365
25 Dec – 14 Jan	2009	42,511 [*]	6 [*]	42,505 [*]	14,669 [*]	2 [*]	9,982 [†]	0.9011	8,995
Total	-	596,107	234	595,873	246,433	94	241,655	-	217,755

^{*} For the period from 25 December 2008 to 24 January 2009

[†] Calculated by apportioning the net electricity exported by HZL from 25 December 2008 to 24 January 2009 on the basis of VCB readings

Baseline Emissions:

CO₂ Emission Factor as per the baseline adopted (tCO₂/MWh) = 0.9011

Net Electricity exported by HZL to GUVNL (MWh) = 241,655

Baseline emissions (tonnes CO₂) = 217,755

Project Emissions: 0

Leakage: 0

Emission Reductions:

Baseline emissions – Project emissions

= 217,755 t CO₂ – 0 t CO₂

= **217,755 tCO₂**

Measures to Ensure the Results/Uncertainty Analysis

The uncertainty level associated with the monitored data used for calculating emission reductions is low as the following additional parameters are being monitored for cross checking purposes:

- The electricity generation data for each WEG has been recorded in daily generation reports provided by Enercon India Limited.
- The electricity generation at each VCB has been recorded in daily generation reports provided by Enercon India Limited.

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:

1. GETCO Main Meters Details

Meter Serial No.	Meter Type	Meter Make	Accuracy Class	Dates of Calibration		Error observed in calibration
GJU04175	E3MO21	Secure	0.2s	04.02.2008	03.03.2009	Nil
GJU04176	E3MO21	Secure	0.2s	27.06.2007	03.03.2009	Nil
GJB01470	E3MO21	Secure	0.2s	10.04.2008	03.03.2009	Nil

2. Meters installed at the VCB end

Location	Meter Serial No.	Meter Type	Meter Make	Accuracy Class	Date of Commissioning of VCB meter	Dates of Calibration of VCB meter		Error observed during Calibration
Sadodar-I	6769820	ER300P	L&T	0.5s	13.03.07	10.11.06	20.07.08	Nil
Sadodar-II	7022874	ER300P	L&T	0.2s for active 0.5s for reactive	28.06.07	29.03.07	20.07.08	Nil
Fulnath	6769824	ER300P	L&T	0.5s	13.03.07	16.01.07	20.07.08	Nil
Methan-1	MPB04018	E3MO21	Secure Meters	0.2s	24.03.07	10.01.07	20.07.08	Nil
Methan-2(A)	MPB04021	E3MO21	Secure Meters	0.2s	24.03.07	10.01.07	20.07.08	Nil
Methan-2(B)	MPB04020	E3MO21	Secure Meters	0.2s	24.03.07	10.01.07	20.07.08	Nil
Mevasa	6758350	ER300P	L&T	0.5s	21.03.07	16.01.07	20.07.08	Nil
Sadodar-III	GJU03941	E3MO55	Secure Meters	0.5s	01.09.07	19.06.06	28.04.09	Nil
Fulnath-I	GJU04576	E3MO55	Secure Meters	0.5s	28.09.07	09.03.07	28.04.09	Nil
Dhun-Dhoraji	GJU03939	E3MO55	Secure Meters	0.5s	28.09.07	19.06.06	28.04.09	Nil
Narmana	7041657	ER300P	L&T	0.2s for active 0.5s for reactive	01.02.08	31.10.07	24.06.09	Nil
Jamwadi-01	7041600	ER300P	L&T	0.2s for active 0.5s for reactive	16.02.08	10.10.07	28.04.09	Nil
Jamwadi-02	7041601	ER300P	L&T	0.2s for active 0.5s for reactive	16.02.08	10.10.07	28.04.09	Nil
Jamwadi-03	GJU03938	E3MO55	Secure Meters	0.5s	16.02.08	19.06.06	28.04.09	Nil
Narmana-02	7044533	ER300P	L&T	0.5s	16.02.08	20.07.07	28.04.09	Nil
Laloi	7044588	ER300P	L&T	0.5s	29.03.08	20.07.07	28.04.09	Nil

Roles and Responsibilities

To ensure trouble free operations and efficient generations through all the wind turbines, HZL has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines. The contractor EIL, under the O&M contract with HZL is responsible for the operation and maintenance of the project activity for the entire crediting period.

The project team formulated by HZL ensures proper and continuous monitoring of the performance of turbines and generation of power. The same has been outlined as follows:

