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

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Appendix 1: Calibration Details

* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
Version 01
Dated 07/12/2011
Title: 14.8 MW small-scale grid connected wind power project in Jaisalmer state in Rajasthan, India by RSSML
UNFCCC Reference No. 0243
Fourth monitoring period
Monitoring Period: 02/11/2009- 31/07/2011 (first and last dates included)

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

Purpose of the project activity

The project activity was essentially conceived to meet the electricity requirements of RSMML (replacing captive installation owned by RSMML) by renewable source of electricity and supply balance electricity to the grid.

Brief description of the installed technology and equipments

The proposed project activity envisages the installation of 28 numbers of 350 kW (in equal phases of 14 machines each - phase I & II) and 4 numbers of 1.25 MW (phase III) Wind Electric Generators (WEG) of Suzlon Energy Ltd by Rajasthan State Mines & Minerals Limited (RSMML) with a cumulative power generative capacity of 14.8 MW at Jaisalmer, Rajasthan.

Relevant Dates for the project activity

The important dates related to the project activity are listed in Table1 below.

Table 1: Relevant dates of the project activity

S.NO	ACTIVITY	DATE
1.	Start date of the project activity	01/08/2001
2.	Date of registration	14/04/2006
3.	First monitoring period	01/08/2001 to 01/05/2006
4.	Second monitoring period	02/05/2006 to 01/10/2007
5.	Third monitoring period	02/10/2007 to 01/11/2009

Total emission reductions achieved in this monitoring period: Based on the actual monitored data, the emission reduction as calculated are mentioned in Table 2 below.

Table 1: Emission reduction over the monitoring period

Monitoring Period	Emission Reduction (tCO_2e)
02/11/2009 to 31/07/2011	24587

A.2. Project Participants

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 be considered as project

		participant (yes/no)
India (Host Country)	Rajasthan State Mines & Minerals Limited (RSMML)	No
United Kingdom	Grey K Environmental (Europa), Ltd.; NATIXIS Environnement & Infrastructures; Deutsche Bank AG	No
The Government of Japan	Mitsubishi Corporation	No
France	Rhodia Energy GHG	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the party (ies) involved is required.		
Note: *When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM),* at least the host Party (ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.		

A.3. Location of the project activity:

The project is located at two locations. Both the locations are discussed below:

1. Village: **Pohra**
District: **Jaisalmer**
State: **Rajasthan**
Latitude: **$27^0$02" N**
Longitude: **$70^0$57" E**
Height above MSL: **150 – 325 m**

Pohra is approximately 24 km from the Jaisalmer Railway Station, and is blessed with wind energy generation potential. The measurement of wind potential was done both by the project developer (Suzlon Energy Limited) and by the Ministry of Non Conventional Energy Sources. The details of location of WEGs on the Pohra revenue land are as follows:

Revenue Village	**Khasra Number**	**Area Alloted**	
		Bigha	**Biswa**
Pohra	456	70	08
Pohra	457	92	03
Pohra	460	37	00
Pohra	462	66	07
Pohra	448	38	13
Pohra	450	153	05
Pohra	451	65	14
Pohra	458	37	11
Total Land		561	01

2. Village: **Badabagh**
District: **Jaisalmer**
State: **Rajasthan**

Badabagh is approximately 15 km from the Jaisalmer railway station and is well accessible by road. The project is located on a revenue land, the details of the location is as under:

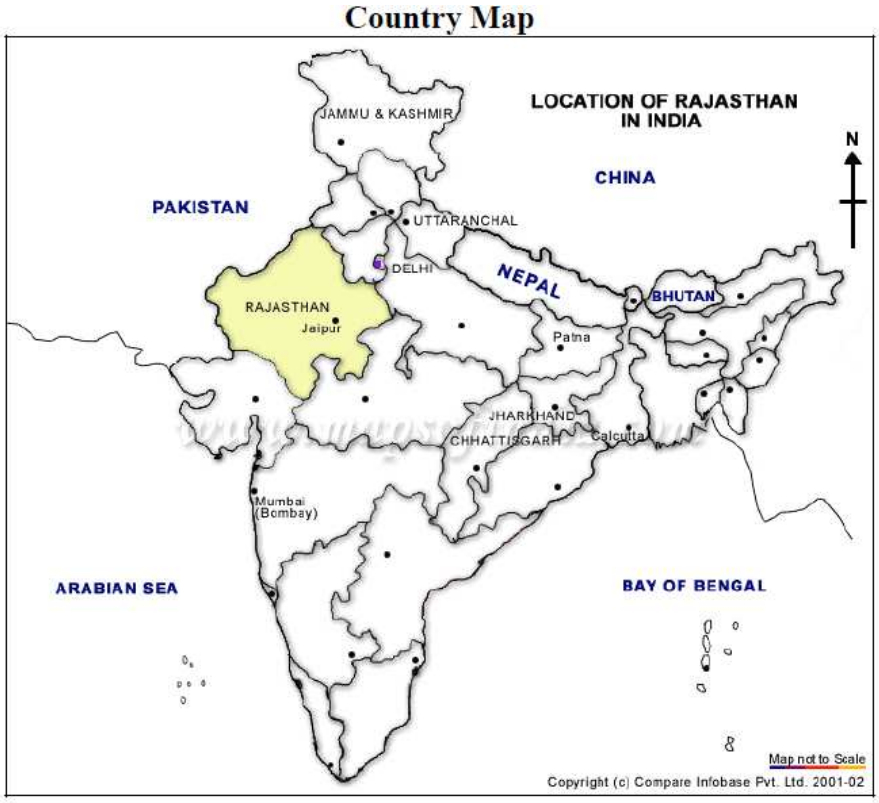
Phase I

Revenue Village	**Khasra Number**	**Area Alloted**	
		Bigha	**Biswa**
Badabagh	52	148	07
Badabagh	54	140	10
Badabagh	55	026	03
Badabagh	58	009	17
Total Land		324	17

Phase II

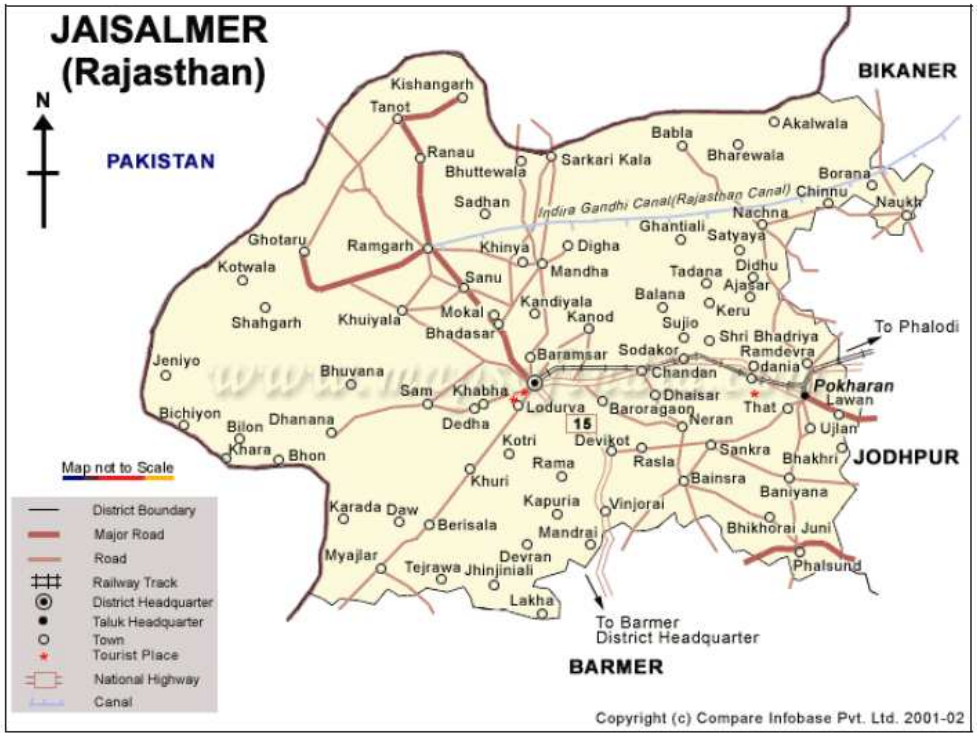
Revenue Village	**Khasra Number**	**Area Alloted**	
		Bigha	**Biswa**
Badabagh	436	50	17
Badabagh	437	62	12
Badabagh	438	49	02
Badabagh	440	74	06
Badabagh	446	58	11
Badabagh	447	85	09
Total Land		380	17

The detailed maps of the location are as under:



State Map

District Map



A.4. Technical description of the project

Technology – 0.35 MW WEG

Suzlon S.33 - 350 kW Wind Turbine is a stall-regulated turbine with a three-bladed high efficiency rotor. The rotor is coupled to the generator through flange. This unique integrated power-train design incorporates torsionally flexible coupling to avoid problems of misalignment and vibration.
The salient features of this technology are as follows:

Rotor
Suzlon S.33 - 350 kW has 15.4 m long FRP blades aerodynamically optimized to take varying wind velocities while delivering the maximum power. Their fail-safe tip brakes operate hydraulically and can bring a Wind Turbine to a soft stop within a few seconds without putting any undue stress on the machine. The total swept area covered by the rotor is 876.13 sq. m.

Gearbox
The gearbox with its integrated design ensures precise assembly with a high level of efficiency, which requires an extremely low level of maintenance. This leads to an extensively trouble-free operational life, devoid of any alignment problems. It has the most advanced splash-type lubricating system.

Generator
The generator used in Suzlon S.33 - 350 kW is an asynchronous type with two speeds of operation. The generator has pole changing at 100 kW level of operation to go into the next range of generation capacity. The rated rotational speed is 756 RPM with 8 poles to generate up to 100 kW in low wind conditions and 1006 RPM with 6 poles from 100kW to 350 kW in the high wind conditions. IP 55 enclosure prevents any ingestion of air and moisture into the generator thus ensuring a long life of the generator.

Control System
The Control unit is microprocessor-based with an 8 x 40 digital display indicating all operating and error conditions. It also has a built-in graphical display showing average wind speeds and power output with daily, monthly and annual outputs amongst other parameters. The control unit keeps the Wind Turbine fully automated in the optimal operation state.

Yaw System
To get the maximum from the available wind resources means that the Wind Turbine is in line with the wind direction. This important task is handled by the yaw system equipped with two motors with reduction gearbox. The system employs a hydraulic braking system to keep the Wind Turbine fixed in the direction facing the wind. The system ensures exact alignment of the rotor to the wind direction. This is achieved through an intelligent network of sensors for wind direction and wind speed.

The Yaw System is incorporated with twist sensors, which direct the control unit to untwist the cables if they are twisted beyond the set levels. This ensures the safety of cables even under frequent wind direction changes in the same direction.

Safety System
The Safety System consists of four levels of independent systems:

- Electronic sensing of faults by the computer for immediate action.
- Independent electrical circuitry to act when over-speed is detected.
- Hydraulic sensing and active device to prevent over-speeding.
- Mechanical flexible couplings with shearing studs.

Soft Braking

It consists of a specially designed unique mechanism for protecting the Wind Turbine against heavy loads due to sudden loss in grid power. The aerodynamic brakes are applied first and the rotor disc brakes are applied subsequently, which protect Wind Turbine components against wear & tear and fatigue.

Lightning Protection
Lightning arrestors are provided along with earthing cables connected to earthing pits. This has been done at various levels of the Wind Turbine, thereby protecting the entire Wind Turbine against lightning

Technology – 1.25 MW WEG

A direct grid-connected high-speed generator, in combination with the multiple-stage combined spur/planetary gearbox of the Suzlon Megawatt Series, offers greater robustness and reliability than a low-speed generator connected to the electrical grid via AC-DC-AC-inverter systems. High-speed asynchronous generator with a multi-stage intelligent switching compensation system delivers power factor up to 0.99. The generated power is free from harmonics and is grid friendly.

Operating Data:

- Rotor Height: 64 m
- Hub Height: 65 m
- Cut in Speed: 3 m/s
- Rated Speed: 12 m/s
- Cut out speed: 25 m/s
- Survival Speed: 67 m/s

Rotor:

- Blade: 3 Blade Horizontal Axis
- Swept Area: 3217 m^2
- Rotational Speed: 13.9 to 20.8 rpm
- Regulation: Pitch Regulated

Generator:

- Type: Asynchronous 4 / 6 Poles
- Rated Output: 250 / 1250 kW
- Rotational Speed: 1006 / 1506 rpm
- Frequency: 50 Hz

Gear Box:

- Type: Integrated (1 Planetary & 2 Helical)
- Ratio: 74.971:1

Yaw System:

- Drive: 4 electrically driven planetary gearbox
- Bearings: Polyamide slide bearings

Braking System:

- Aerodynamic Brake: 3 independent systems with blade pitching
- Mechanical Brake: Hydraulic fail safe disc braking system

Control Unit:
Type: Programmable microprocessor based; high speed data communication, active multilevel security, sophisticated operating software, advance data collection remote monitoring & control option, UPS backup, Real time operating indication.

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

Table 2: Methodological details

Type	I - Renewable Energy Projects
Category	I D Renewable electricity generation for a grid.
Version	07
Sectoral scope	1
Reference	Appendix B of the simplified M&P for small scale CDM project activities (UNFCCC, 2003b)

A.6. Registration date of the project activity:

Registration date of the project activity: 14/04/2006

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

Crediting period start date: 01/08/2001
Choice of crediting period: Fixed (10 years with no renewal)

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

Date of completing the Monitoring Report: 11/11/2011

Contact:

Priyanka Abbi*
ITP Senergy Limited*
10th Floor, Tower
Building No. 8 Cyber City, DLF Phase 2
Gurgaon – 122002
INDIA
Off: +91 (124) 430-5541
Ph. No.: +91 9999 437 123

*The above person/entity is not the project participant.

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

1. **The starting date of operation of the project activity**

   The start date of the project activity is 01/08/2001

2. **Information regarding the actual operation of the project activity during this monitoring period, including information on special events, for example overhaul times, downtimes of equipment, exchange of equipment, etc.**

The operators record monthly energy output of each WEG and prepare reports on the performance of wind farm indicating turbine wise production.

In the current monitoring period, there has been only one instance where the meter in phase II has been replaced in 19/04/2010. The details are given below:

S.No.	Old Meter Number	Reason for replacement	New Meter Number
1.	RJU00335	Display failure	RJB01118

3. **A brief description of: (i) events or situations that occurred during the monitoring period, which may impact the applicability of the methodology, and (ii) how the issues resulting from these events or situations are being addressed.**

   There has been no such event or situation in the current monitoring period due to which the applicability of the methodology is affected.

B.2. Revision of the monitoring plan

Not Applicable

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

Not Applicable

B.4. Notification or request of approval of changes

Not Applicable

SECTION C. Description of the monitoring system

The name of the methodology applied for the project activity is I.D **"Renewable electricity generation for a grid".** This is in accordance with the Appendix B of simplified modalities and procedures for small-scale CDM project activities. The reference to the proposed monitoring methodology is Appendix B of simplified modalities and procedures for small-scale CDM project activities.

Data collection procedures
The monitoring of the everyday operations includes monitoring of electricity supplied to the northern grid. This data is collected on monthly basis and can be archived both in electronic as well as printed (paper) form.

The generated electricity is purchased by the state electricity utility of Rajasthan. The meters are therefore calibrated, sealed and managed by the state electricity utility. The error for the delay in the calibration is adjusted in the CER calculation.

Primary Data Recording
The primary recording of the electricity fed to the state utility grid is carried out jointly at the incoming feeder of the state power utility (RVPNL). The machines for sale to utility are connected to the feeder. The joint measurement is being carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties sign the recorded reading.

The payment of electricity is made against the electricity meter at Grid Interconnection point. RVPNL makes payment against lowest meter reading among the two check meters. In case if the Grid

Interconnection Meter records higher generation against the check meter, the Grid Interconnection Meter is replaced by RVPNL.

Emergency Preparedness/Secondary data
The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WEGs. 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 a wireless Radio Frequency (RF) network (SCADA). The generation data of individual machine can be monitored as a real time entity at CMS. The snapshot of generation on the last day of every calendar month will be kept as a record both in electronic as well as printed (paper) form.

Organizational Structure
The project proponent has undertaken an operation and maintenance agreement with the supplier of the wind turbines i.e. Suzlon for a period of 20 years. The performance of the mills, safety in operation and scheduled /breakdown maintenances are organized and monitored by the contractor. Suzlon has appointed a Senior Manager (Mr Rajiv) at the main office who is the incharge of both Operation and Maintenance team which are separate. The maintenance team is headed by the Deputy Manager and under him is the Assistant Manager. Two Senior Engineers have been appointed on the wind mill site to look after the WEGs and they report to the Assistant Manager about the various activities undertaken on a daily basis. The operations team consists of Senior Engineers, Engineers and Technicians who take the readings and prepare a daily generation report of all the WEGs.

The monitoring personnel i.e. the engineers when appointed undergo one week training at the Suzlon WEG manufacturing facility at Daman.

The project registration responsibility has been given to:
Mr. C. L. Jain
Group General Manager
Rajasthan State Mines & Minerals Limited

Roles and Responsibilities
The Various activities carried out by the Operations and Maintenance staff is as follows:

1. Routine Maintenance Services
Routine Maintenance Labour Work involves making available suitable manpower for operation and maintenance of the Equipment and covers periodic preventive maintenance, cleaning and upkeep of the Equipment including -

- Tower Torquing
- Blade Cleaning
- Nacelle Torquing and Cleaning
- Transformer Oil Filtration
- Control Panel & LT Panel Maintenance
- Site and Transformer Yard Maintenance

2. Security Services
This service includes watch and ward and Security of the Wind Farm and the Equipment.

3. Management Services

- Data logging in for power generation, grid availability, machine availability.
- Preparation and submission of monthly performance report in agreed format.
- Taking monthly meter reading jointly with SEB, of power generated at ABC's Wind Farm and supplied to SEB Grid from the meter/s maintained by SEB for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

4. Technical Services

- Visual inspection of the WTG and all parts thereof.
- Technical Assistance including checking of various technical, safety and operational parameters of the Equipment, trouble shooting and relevant technical services.

SECTION D. Data and parameters

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

Data / Parameter:	**EFy** (Combined Margin)
Data unit:	kg CO_2/MWh
Description:	CO2 emission factor of the Northern Region Grid
Source of data used:	Calculated as weighted sum of the OM and BM emission factors. The formulae for this are as per ACM0002, version 06
Value(s) :	0.7678
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Used for calculating Project Emissions
Additional comment:	The EFy is fixed over the project's crediting period and is calculated as the weighted average of the Operating Margin emission factor and the Build Margin emission factor.

D.2. Data and parameters monitored

Data / Parameter:	EGy
Data unit:	MWh
Description:	Electricity generated by the project
Measured /Calculated /Default:	Measured using the meters installed on sub stations (grid interconnection point) on a continuous basis
Source of data:	Measured using energy meter (Joint meter reading available at the site)
Value(s) of monitored parameter:	32023
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Used for calculation of Baseline emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The calibration dates for this monitoring period are provided in appendix 1. The meter numbers for each phase is given below:

	<table><tr><th>Main Meter</th><th>Back up Meter</th></tr><tr><td colspan="2">Phase I</td></tr><tr><td>RJU02187</td><td>RJU00331</td></tr><tr><td colspan="2">Phase II</td></tr><tr><td>RJB01118[1]</td><td>GJB00109</td></tr><tr><td colspan="2">Phase III</td></tr><tr><td>RJU02416</td><td>RJU00722</td></tr></table> **Accuracy class of meters:** 0.2 **Calibration Frequency:** Annual
Measuring/ Reading/ Recording frequency:	These meter readings will be recorded daily by plant personnel, these records will be archived for crosschecking monthly figures.
Calculation method (if applicable):	-
QA/QC procedures applied:	✓ The data can be very accurately measured. The meters installed on sub stations (grid interconnection point) will be used to measure mentioned variables on a continuous basis. ✓ Every month these meter readings will be recorded by plant personnel, these records will be archived for crosschecking yearly figures. The meters at the sub-station will be two-way meters and will be in custody of State Electricity Utility. ✓ SEB officials will take the readings in these meters and the same reading may be used to determine the net power wheeled to the user and determine the extent of mitigation of GHG over a period of time.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

The RSMML wind power project uses the Combined Margin methodology as suggested in the Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The wind power project uses the Combined Margin methodology as suggested in the Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

The total baseline emissions $\mathbf{BE_y\ (tCO_2/yr) = EG_y * EF_y}$ ----------(1)

Where
BE_y = Baseline emissions in year y (tCO_2).
EG_y (MWh/yr) = Electricity generated by the project in year y;
EF_y (tCO_2/MWh) = CO_2 emission factor of the Northern Region Grid

Monitored Data

Phase: I
Number of WTGs: 14
Capacity: 350 kW each
Main Meter Serial Number: RJU02187

[1] The meter failure details are provided in section B.1.

Month / year	Billing Period		Units Exported, kWh	Units Imported, kWh	Monthly gross dispatch to grid (kWh)	Monthly gross dispatch to grid (MWh)
	Initial reading	*Final Reading*				
Nov-09	01.11.2009[2]	01.12.2009	244980	5100	239880	239.88
Dec-09	01.12.2009	01.01.2010	221940	3660	218280	218.28
Jan-10	01.01.2010	01.02.2010	220538	3427	217111	217.11
Feb-10	01.02.2010	02.03.2010	300717	3367	297351	297.35
Mar-10	02.03.2010	01.04.2010	426465	3968	422497	422.50
Apr-10	01.04.2010	01.05.2010	593531	2946	590585	590.58
May-10	01.05.2010	01.06.2010	962100	1440	960660	960.66
Jun-10	01.06.2010	02.07.2010	996960	1200	995760	995.76
Jul-10	02.07.2010	02.08.2010	623520	2700	620820	620.82
Aug-10	02.08.2010	01.09.2010	456360	3900	452460	452.46
Sep-10	01.09.2010	01.10.2010	286080	3540	282540	282.54
Oct-10	01.10.2010	01.11.2010	358140	4020	354120	354.12
Nov-10	01.11.2010	01.12.2010	163140	4800	158340	158.34
Dec-10	01.12.2010	01.01.2011	258420	4380	254040	254.04
Jan-11	01.01.2011	01.02.2011	271860	6060	265800	265.80
Feb-11	01.02.2011	01.03.2011	289020	3840	285180	285.18
Mar-11	01.03.2011	02.04.2011	357240	3660	353580	353.58
Apr-11	02.04.2011	01.05.2011	498660	3060	495600	495.60
May-11	02.05.2011	02.06.2011	1164660	780	1163880	1163.88
Jun-11	02.06.2011	01.07.2011	1283280	960	1282320	1282.32
Jul-11	01.07.2011	31.07.2011	1241884	929	1240955	1240.95
		Total	**11219005**	**67736**	**11151269**	**11151**

Phase: II
Number of WTGs: 14
Capacity: 350 kW each
Main Meter Serial Number: RJB01118

Month / year	Billing Period		Units Exported, kWh	Units Imported, kWh	Monthly gross dispatch to grid (kWh)	Monthly gross dispatch to grid (MWh)
	Initial reading	*Final Reading*				

[2]According to the monitoring report, the monitoring period starts from 02/11/2009 but in the CER calculation table the monitoring period starts from 01/11/2009. Also, the first day of every month has been considered twice, like 01/11/2009 to 01/12/2009 and 01/12/2009 to 01/01/2010 and so on. This is according to the dates mentioned in the joint meter reading sheet generated by the SEB. However, no double counting or overlapping in the values is possible as the initial and final readings for both the months are clearly mentioned in the JMR sheets.

Nov-09	01.11.2009[2]	01.12.2009	260040	5040	255000	255.00
Dec-09	01.12.2009	01.01.2010	250680	3900	246780	246.78
Jan-10	01.01.2010	01.02.2010	251077	3547	247530	247.53
Feb-10	01.02.2010	02.03.2010	321496	3727	317768	317.77
Mar-10	02.03.2010	01.04.2010	411915	4329	407586	407.59
Apr-10	01.04.2010	01.05.2010	597203	3206	593997	594.00
May-10	01.05.2010	01.06.2010	946320	1500	944820	944.82
Jun-10	01.06.2010	01.07.2010	1004760	1380	1003380	1003.38
Jul-10	01.07.2010	02.08.2010	624900	3000	621900	621.90
Aug-10	02.08.2010	01.09.2010	439380	4440	434940	434.94
Sep-10	01.09.2010	01.10.2010	338400	4740	333660	333.66
Oct-10	01.10.2010	01.11.2010	338400	4740	333660	333.66
Nov-10	01.11.2010	01.12.2010	168720	5520	163200	163.20
Dec-10	01.12.2010	01.01.2011	261480	4620	256860	256.86
Jan-11	01.01.2011	01.02.2011	274320	2880	271440	271.44
Feb-11	01.02.2011	01.03.2011	278940	3420	275520	275.52
Mar-11	01.03.2011	02.04.2011	352140	3840	348300	348.30
Apr-11	02.04.2011	01.05.2011	458640	3180	455460	455.46
May-11	01.05.2011	02.06.2011	1110660	780	1109880	1109.88
Jun-11	02.06.2011	01.07.2011	1134300	1380	1132920	1132.92
Jul-11	01.07.2011	31.07.2011	794439	1394	793045	793.045
		Total	**10618209**	**70563**	**10547646**	**10548**

Phase: III
Number of WTGs: 4
Capacity: 1.25 MW each
Main Meter Serial Number: RJU02416

Month / year	Billing Period		Units Exported, kWh	Units Imported, kWh	Monthly gross dispatch to grid (kWh)	Monthly gross dispatch to grid (MWh)
	Initial reading	*Final Reading*				
Nov-09	01.11.2009 [2]	01.12.2009	253440	7020	246420	246.42
Dec-09	01.12.2009	01.01.2010	273240	5220	268020	268.02
Jan-10	01.01.2010	01.02.2010	283831	4329	280080	280.08
Feb-10	01.02.2010	02.03.2010	298202	4870	293940	293.94
Mar-10	02.03.2010	01.04.2010	384070	7755	377100	377.10
Apr-10	01.04.2010	02.05.2010	553641	7214	547550	547.55
May-10	02.05.2010	01.06.2010	997560	3960	993600	993.60
Jun-10	01.06.2010	01.07.2010	1076040	4320	1071720	1071.72
Jul-10	01.07.2010	02.08.2010	557280	6300	550980	550.98
Aug-10	02.08.2010	01.09.2010	472320	7200	465120	465.12
Sep-10	01.09.2010	01.10.2010	270000	8100	261900	261.90
Oct-10	01.10.2010	01.11.2010	336780	8460	328320	328.32
Nov-10	01.11.2010	01.12.2010	178020	7020	171000	171.00
Dec-10	01.12.2010	01.01.2011	262620	5940	256680	256.68
Jan-11	01.01.2011	01.02.2011	273240	4500	268740	268.74
Feb-11	01.02.2011	01.03.2011	276840	4860	271980	271.98
Mar-11	01.03.2011	01.04.2011	361980	5940	356040	356.04
Apr-11	01.04.2011	01.05.2011	453240	7020	446220	446.22
May-11	01.05.2011	01.06.2011	1085760	1800	1083960	1083.96
Jun-11	01.06.2011	01.07.2011	992520	3240	989280	989.28
Jul-11	01.07.2011	31.07.2011	802335	3484	798852	798.85
		Total	**10442960**	**118552**	**10324408**	**10324**

Summary

PHASE	UNITS EXPORTED (MWH)	UNITS IMPORTED (MWH)	TOTAL NET ELECTRICITY SUPPLIED TO THE GRID (MWH)
I	11219.005	67.736	11151
II	10618.209	70.563	10548
III	10442.960	118.552	10324
Total	**32280.174**	**256.851**	**32023**

The emission factor EF_y of the Northern Region Grid is a fixed value over the projects crediting period and is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$\mathbf{EFy = w_{OM}\ EF_{OM,y} + w_{BM}\ .EF_{BM,y}}$$

Where, the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$), and $EF_{OM,y}$ and $EF_{BM,y}$ are the Operating Margin and Build Margin emission factors respectively calculated in the following paragraph.

The emission factor EF_y is estimated to be **0.7678 kg CO_2/kWh**.

The Operating Margin is the weighted average emissions of all generating sources serving the Northern Grid excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. It is derived from the following equation:

$$\mathbf{EF_{OM,\ simple,\ y} = \Sigma F_{i,\ j,\ y}\ COEF_{i,\ j}\ \ / \Sigma GEN_{j,\ y}}$$

Where,
$F_{i,\ j,\ y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

$COEF_{i,j\ y}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and $GEN_{j,\ y}$ is the electricity (MWh) delivered to the grid by source j.

The CO_2 emission coefficient $COEF_i$ is obtained as $\mathbf{COEF_i = NCV_i * EFCO_{2,\ i} * OXID_i}$

Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i,
$OXID_i$ is the oxidation factor of the fuel,
$EFCO_{2,i}$ is the CO_2 emission factor per unit of energy of the fuel i.
The $EF_{OM,Y}$ is estimated to be 0.9612 $kgCO_2$/kWh. (based on three years average).

The Build Margin emission factor ($EF_{BM,y}$) is calculated as the generation weighted average emission factor (tCO_2/MWh) of a sample of power plants m, as follows:
$\mathbf{EF_{BM,y} = \Sigma F_{i,\ m,\ y}.COEF_{i,m} / \Sigma GEN_{m,y}}$

The baseline emissions are estimated as the product of the electricity generated by the project activity and the Emission factor of the regional electricity grid as calculated above.

$\mathbf{BE_y\ (tCO_2/yr) = EG_y * EF_y}$
$= 32023\ MWh * 0.7678\ tCO_2e/MWh$
$= 24587.51\ tCO_2e$
$= 24587\ tCO_2e$

E.2. Project emissions calculation

Emissions by sources of GHGs due to the project activity within the project boundary are zero since wind power is a GHG emission free source of energy.

E.3. Leakage calculation

This is not applicable as the renewable energy technology used is not equipment transferred from another activity. Therefore, as per the simplified procedures for SSC project activities, no leakage calculation is required. There is no alternate fuel which can generate electricity from the installed plant and machinery in absence of wind.

E.4. Emission reductions calculation / table

As per Equation 1 in section E.1,

$ERy = BEy – PEy – Ly$

$= 24587 – 0 – 0$

$= 24587\ tCO_2e$

The emission reduction calculation is summarised below.

Table 3: Summary of emission reduction

BASELINE EMISSIONS (TCO_2E)	PROJECT EMISSIONS (TCO_2E)	LEAKAGE (TCO_2E)	EMISSION REDUCTION (TCO_2E)
24587	0	0	24587

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

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	28145	24587

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

ER PDD: 15356 tCO_2e for one year or 28145 tCO_2e for 22 months
ER monitoring period: 24587 tCO_2e for 22 months (period 02/11/2009- 31/07/2011)
That is, ER PDD > ER monitoring period

There was no increase in the actual emission reductions achieved during the monitoring period compared to the registered CDM-PDD.

The emission reductions for the period 02/11/2009- 31/07/2011 are 24587 tCO_2e. A difference in the emission reduction has been observed between the emission reduction estimated in the registered PDD and emission reduction calculated in the monitoring report. This difference between estimated and actual CERs was due to the variability in the wind pattern during the monitoring period.

Appendix 1

Calibration details

Phase I			
Main Meter	28/01/2009	19/04/2010	07/03/2011
Back up Meter	28/01/2009	19/04/2010	07/03/2011
Phase II			
Main Meter	28/01/2009	23/04/2010	08/03/2011
Back up Meter	28/01/2009	19/04/2010	08/03/2011
Phase III			
Main Meter	28/01/2009	18/04/2010	07/03/2011
Back up Meter	28/01/2009	18/04/2010	07/03/2011

History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Guideline, Form **Business Function**: Issuance		