

**14.8 MW small-scale grid connected wind
power project in Jaisalmer state Rajasthan,
India by RSMML**

UNFCCC registration reference number: 0243
Date of registration of project: 14th April 2006

THIRD MONITORING REPORT

From – 02/10/2007 to 01/11/2009

**Version 01
Dated: 25-11-2009**

1. Title of the project activity:

14.8 MW small-scale grid connected wind power project in Jaisalmer state Rajasthan, India by RSMML

Registered PDD Version: IV

Dated: 19/01/2006

Date of registration of project: 14th April 2006

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2. Introduction:

The 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.

These WEGs have been installed in three phases (phase I & II with 0.35 MW machines and phase III with 1.25 MW machines) at two locations namely Badabagh and Pohra in Jaisalmer district of Rajasthan.

The commissioning of machines started from August 3, 2001 with first machine of 0.35 MW (phase I) and finished with commissioning of 1.25 MW machine (phase III) on March 2003.

The project activity has sought a 10 year fixed crediting period starting from 01/08/2001.

3. Reference:

Reference:	Appendix B of the simplified M&P for small scale CDM project activities (UNFCCC, 2003b)
Project Type:	Renewable Energy Project
Project Category:	ID - Renewable electricity generation for a grid

The installed capacity of the project is 14.8 MW, which is less than the limiting capacity of 15 MW and is thus eligible to use small-scale simplified methodologies. Further, the project activity is generation of electricity for a grid system using wind potential. Hence, the type and category of the project activity matches with I.D. as specified in Appendix B of the indicative simplified baseline and monitoring methodologies for small-scale CDM project activities.

4. Abbreviations in the report

PDD – Project Design Document
GHG – Green House Gas / Gases
IPCC – Intergovernmental Panel on Climate Change
SEB – State Electricity Board
RSEB – Rajasthan State Electricity Board
RSMML – Rajasthan State Mines & Minerals Limited
JMR – Joint Meter Reading

RVPNL – Rajasthan Vidyut Prasaran Nigam Limited
WEG – Wind Electric Generator
UNFCCC – United Nations Framework Convention on Climate Change

5. General description of the project

The CDM project will generate electricity from WEGs in Jaisalmer, Rajasthan at two locations. The project activity has been essentially conceived for captive utilization by wheeling electricity through state electricity utility (RVPNL – Rajasthan Vidyut Prasaran Nigam Limited) as well as strengthening of northern grid by supplying balance electricity to the state electricity board. Due to excessive failure of grid at the utilization end, the project activity is able to meet 25% of the demand of RSMML (which otherwise would have met through the 4 MW DG set) and the balance electricity, which is fed into the regional electricity grid (through local grid substation) replaces the fossil fuel based generation supplying the electricity to the grid.

The project activity started in August 2001 will generate approximately 20 million kWh per year, contributing an estimated reduction of 133,523 tCO₂e over the ten-year crediting period of the project from 2001-2010. This reduction is the result of displacement of fossil fuel fired power plants that would otherwise have delivered the electricity to Northern Region Grid in the absence of the project activity.

6. Technical description of the project

The 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.

7. Monitoring methodology & plan

The project activity qualifies under small scale grid connected renewable energy project (AMS 1D). The monitoring plan has been established as per “Simplified Modalities & Procedures for Small Scale CDM Project Activities”

The parameter to be monitored is:

- Electricity Supplied to the Northern Regional Grid of India (As per D3 of the PDD of the registered project activity)

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?
1	Electricity supplied to the regional electricity grid	electricity	kWh	M	Monthly	100%	Electronic & Paper	Two years beyond Crediting period

8. Quality Control (QC) and Quality Assurance (QA)

ID number	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	L	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.

9. Calibration / Maintenance of measuring and analytical equipments

1. 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.
2. 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). Machines for sale to utility are connected to the feeder.
3. 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.
4. 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.
5. 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.

10. Environmental impact

1. The electricity from wind electricity generator has no negative environmental impacts.
2. As per the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 27, 1994, - 30 activities are required to undertake environmental impact assessment studies. The details of these activities are available at: <http://envfor.nic.in/divisions/iass/notif/eia.htm>
3. The project doesn't fall under the list of activities requiring EIA as it will not involve any negative environmental impacts, because the WEGs installed for generation of power use wind (cleanest possible source of renewable energy).

11. GHG calculations

Project Activity Emissions: Nil

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.

Leakage: Nil

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.

Baseline Emission Factor: 0.7678 kgCO₂e/ kWh

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.

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The total baseline emissions BE_y (tCO₂/yr) = $EG_y * EF_y$

Where

BE_y = Baseline emissions in year y (tCO₂).

EG_y (MWh/yr) = Electricity generated by the project in year y;

EF_y (tCO₂/MWh) = CO₂ emission factor of the Northern Region Grid

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 ($EF_{BM,y}$):

$$EF_y = w_{OM} EF_{OM,y} + w_{BM} EF_{BM,y}$$

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 CO₂/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:

$$EF_{OM, simple, y} = \frac{\sum F_{i, j, y} COEF_{i, j}}{\sum GEN_{j, y}}$$

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 CO₂ emission coefficient of fuel i (tCO₂ / 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 CO₂ emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i * EF_{CO_2,i} * OXID_i$$

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,

$EF_{CO_2,i}$ is the CO₂ emission factor per unit of energy of the fuel i.

The $EF_{OM,y}$ is estimated to be **0.9612 kgCO₂/kWh**. (based on three years average).

The Build Margin emission factor ($EF_{BM,y}$) is calculated as the generation weighted average emission factor (tCO₂/MWh) of a sample of power plants m, as follows:

$$EF_{BM,y} = \frac{\sum F_{i,m,y} \cdot COEF_{i,m}}{\sum GEN_{m,y}}$$

Where

$F_{i,m,y}$ = quantity of fuel i used in plant m (kt/yr) in year y

$COEF_{i,m}$ = carbon emissions factor for fuel i in plant m (tCO₂/kt), taking into account the carbon content of the fuels by power sources and the percent oxidation of the fuel

$GEN_{m,y}$ = annual generation from plant j (MWh/yr) in year y

The $EF_{BM,y}$ is estimated as **0.5744 kgCO₂/kWh** (with sample group m constituting most recent capacity additions to the grid comprising 20% of the system generation).

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.

Name of Item	GEN
Description	Electricity Quantity – Electricity fed into the northern grid
Credit Period	01/08/2001 – 31/07/2010
Method of monitoring	Measured using energy meter
Recording frequency	Continuous
Reporting frequency	Monthly (Jointly by SEB and representative of RSMML)
Background data	Joint meter reading available at the site
Archiving mode	Electronic & paper

The project was commissioned on 01/08/2001 and its crediting period starts from 01/08/2001. The third monitoring period starts from 2nd October 2007 to 1st November 2009 and the no. of CERs generated during the period are **34,781**. The monthly calculations have been shown in the table below.

Monitoring period	Phase I (4.9 MW) Electricity Exported (in kWh)	Phase II (4.9 MW) Electricity Exported (in kWh)	Phase III (5.0 MW) Electricity Exported (in kWh)	Net Electricity supplied (in kWh)	Baseline Emission Factor (tCO ₂ e/MWh)	Net Emission Reductions (tCO ₂ e)
01/10/2007 - 01/11/2007	286960	271980	219780	778720	0.7678	597.90
01/11/2007 - 01/12/2007	127320	119760	104220	351300	0.7678	269.73
01/12/2007 - 01/01/2008	243720	254580	249840	748140	0.7678	574.42
01/01/2008 - 01/02/2008	362880	373800	399101	1135781	0.7678	872.05
01/02/2008 - 01/03/2008	101645	244189	254696	600530	0.7678	461.09
01/03/2008 - 01/04/2008	644280	625380	642060	1911720	0.7678	1467.82
01/04/2008 - 01/05/2008	477180	467880	486180	1431240	0.7678	1098.91
01/05/2008 - 01/06/2008	1396740	1379820	1462840	4239400	0.7678	3255.01
01/06/2008 - 01/07/2008	947700	905220	1110060	2962980	0.7678	2274.98
01/07/2008 - 01/08/2008	1180980	1117920	1271520	3570420	0.7678	2741.37
01/08/2008 - 01/09/2008	921420	863520	1038060	2823000	0.7678	2167.50
01/09/2008 - 01/10/2008	680460	646740	713520	2040720	0.7678	1566.86
01/10/2008 - 01/11/2008	425640	415860	431280	1272780	0.7678	977.24
01/11/2008 - 01/12/2008	214380	217020	218520	649920	0.7678	499.01
01/12/2008 - 01/01/2009	223800	235380	246240	705420	0.7678	541.62
01/01/2009 - 01/02/2009	302340	321060	335453	958853	0.7678	736.21
01/02/2009 - 01/03/2009	229200	224460	255240	708900	0.7678	544.29
01/03/2009 - 01/04/2009	435360	424860	451080	1311300	0.7678	1006.82
01/04/2009 - 01/05/2009	607980	577260	610020	1795260	0.7678	1378.40
01/05/2009 - 01/06/2009	1070160	1026900	1073880	3170940	0.7678	2434.65
01/06/2009 - 01/07/2009	962760	926940	956160	2845860	0.7678	2185.05
01/07/2009 - 01/08/2009	803760	789480	740880	2334120	0.7678	1792.14
01/08/2009 - 01/09/2009	1077960	1039920	1139040	3256920	0.7678	2500.66
01/09/2009 - 01/10/2009	981900	946080	1021860	2949840	0.7678	2264.89
01/10/2009 - 01/11/2009	251700	247920	246060	745680	0.7678	572.53
TOTAL				45299744		34781

* According to the monitoring report, the monitoring period starts from 2nd October 2007 but in the CER calculation table the monitoring period starts from 1st October 2007. Also, the first day of every month has been considered twice, like 01/10/2007 to 01/11/2007 and 01/11/2007 to 01/12/2007 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.