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

2nd MONITORING REPORT

From – 02/05/2006 to 01/10/2007

Version 01
Dated: 10-10-2007

1. Title of the project activity:

14.8 MW small-scale grid connected wind power project in Jaisalmer state Rajasthan, India by RSMML
Version: IV
Date: 19/01/2006

Date of registration of project: 14th April 2006
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2. Introduction:

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.

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 candidate 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 tCO_2e 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 will be carried out jointly at the incoming feeder of the state power utility (RVPNL). Machines for sale to utility will be connected to the feeder.
3. The joint measurement will be carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties will 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 proposed 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 kgCO_2e/ 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 (tCO_2/yr) = EG_y * EF_y

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

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 ($EF_{BM,y}$):

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

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 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:

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

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

$$\mathbf{COEF_i = NCV_i * EF_{CO2,\ i} * OXID_i}$$

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,
$EF_{CO2,i}$ 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:

$$\mathbf{EF_{BM,y} = \frac{\Sigma F_{i,\ m,\ y} . COEF_{i,m}}{\Sigma GEN_{m,y}}}$$

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 (tCO_2/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 kgCO_2/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.

Electricity Supplied to the Northern Regional Grid

The 1st phase of the project was commissioned on 01/08/2001 and the first JMR was carried out from 09/08/2001. The no. of CERs generated in the first monitoring period were 57,004.

The second monitoring period starts from 2nd May 2006 and continues till 1st October 2007 and the no. of CERs generated during the period are 27,491. The calculations of no. of CERs for the second monitoring period are shown in the table below.

Monitoring period	Phase I (4.9 MW) Electricity Supplied (in kWh)	Phase II (4.9 MW) Electricity Supplied (in kWh)	Phase III (5.0 MW) Electricity Supplied (in kWh)	Gross Electricity supplied (in kWh)	Baseline Emission Factor (tCO_2e/MWh)	Net Emission Reductions (tCO_2e)
01/05/2006* - 01/06/2006	1197300	1182540	1319220	3699060	0.7678	2840.14
01/06/2006 – 01/07/2006	990360	971340	1055160	3016860	0.7678	2316.35
01/07/2006 – 01/08/2006	1263000	1205940	1375200	3844140	0.7678	2951.53
01/08/2006 – 01/09/2006	576180	581700	628740	1786620	0.7678	1371.77
01/09/2006 – 01/10/2006	468300	444180	499320	1411800	0.7678	1083.98
01/10/2006 – 01/11/2006	504480	550980	468300	1523760	0.7678	1169.94
01/11/2006 – 01/12/2006	191160	185940	179640	556740	0.7678	427.46
01/12/2006 – 01/01/2007	248100	250620	263880	762600	0.7678	585.52
01/01/2007 – 01/02/2007	226860	241440	244260	712560	0.7678	547.10
01/02/2007 – 01/03/2007	388740	374760	400860	1164360	0.7678	894.00
01/03/2007 – 01/04/2007	449767	431115	465994	1346876	0.7678	1034.13
01/04/2007 – 01/05/2007	589260	563340	610920	1763520	0.7678	1354.03
01/05/2007 – 01/06/2007	891120	869400	946260	2706780	0.7678	2078.27
01/06/2007 – 01/07/2007	1180440	1168560	1356660	3705660	0.7678	2845.21
01/07/2007 – 01/08/2007	1031040	1006320	1179180	3216540	0.7678	2469.66
01/08/2007 - 01/09/2007	935100	916080	1063800	2914980	0.7678	2238.12
01/09/2007 - 01/10/2007	542760	538320	591840	1672920	0.7678	1284.47
Total						**27,491**

***** The monitoring period starts from 2nd May 2006; however, the JMR shows the reading from 1st May 2006 to 1st June 2006. But it is ensured that there is no double counting for the amount of electricity generated.