

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

- 1. Title of the project activity:** 14.8 MW small-scale grid connected wind power project in Jaisalmer state Rajasthan, India by RSMML
Version: I
Date: 21/06/2006
- 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:**

Appendix B of the simplified M&P for small scale CDM project activities (UNFCCC, 2003b)

Renewable Energy Project
ID - Renewable electricity generation for a grid

Project Type
Project Category

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. Definitions 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
- 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 133523 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

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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.

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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

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(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 kgCO₂eq/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 ($EF_{BM,y}$):

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

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 (see page 1.29 in the 1996 Revised IPCC Guidelines for default

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values),

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

The EF_{OM,y} is estimated to be **0.9351 kg CO₂/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 kg CO₂/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.

S.	Period of Measurement	Phase I	Phase II	Phase III	Gross	Baseline	Net
1.	09/08/2001 – 01/09/2001	724.560			724.560	0.7678	556.32
2.	01/09/2001 – 01/10/2001	619.020			619.020	0.7678	475.28

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2.	01/09/2001 – 01/10/2001	619.020			619.020	0.7678	475.28
3.	01/10/2001 – 01/11/2001	311.760			311.760	0.7678	239.37
4.	01/11/2001 – 01/12/2001	306.060			306.060	0.7678	234.99
5.	01/12/2001 – 01/01/2002	288.540			288.540	0.7678	221.54
6.	01/01/2002 – 01/02/2002	282.300			282.300	0.7678	216.75
7.	01/02/2002 – 01/03/2002	428.700			428.700	0.7678	329.16
8.	01/03/2002 – 01/04/2002	454.260			454.260	0.7678	348.78
9.	01/04/2002 – 01/05/2002	814.380			814.380	0.7678	625.28
10.	01/05/2002 – 01/06/2002	1571.16	570.900		2142.06	0.7678	1644.67
11.	01/06/2002 – 01/07/2002	1395.60	710.400		2106.00	0.7678	1616.99
12.	01/07/2002 – 01/08/2002	1723.20	1695.00		3418.20	0.7678	2624.49
13.	01/08/2002 – 01/09/2002	1120.98	1076.20		2197.18	0.7678	1686.99
14.	01/09/2002 – 01/10/2002	821.760	774.800		1596.56	0.7678	1225.84
15.	01/10/2002 – 01/11/2002	210.540	212.800		423.340	0.7678	325.04
16.	01/11/2002 – 01/12/2002	215.520	213.600		429.120	0.7678	329.48
17.	01/12/2002 – 01/01/2003	270.240	277.200		547.440	0.7678	420.32
18.	01/01/2003 – 01/02/2003	249.720	255.000		504.720	0.7678	387.52
19.	01/02/2003 – 01/03/2003	365.220	350.600		715.820	0.7678	549.61
20.	01/03/2003 – 01/04/2003	427.620	420.400		848.020	0.7678	651.11
21.	01/04/2003 – 01/05/2003	515.942	497.800		1013.74	0.7678	778.35
22.	01/05/2003 – 01/06/2003	823.258	831.400		1654.66	0.7678	1270.45
23.	01/06/2003 – 01/07/2003	1563.18	1499.00		3062.18	0.7678	2351.14
24.	01/07/2003 – 01/08/2003	858.180	827.600		1685.78	0.7678	1294.34
25.	01/08/2003 – 01/09/2003	852.240	826.000		1678.24	0.7678	1288.55
26.	01/09/2003 – 01/10/2003	775.021	744.400		1519.42	0.7678	1166.61
27.	01/10/2003 – 01/11/2003	167.596	153.400		320.996	0.7678	246.46
28.	01/11/2003 – 01/12/2003	249.161	258.400		507.561	0.7678	389.71
29.	01/12/2003 – 01/01/2004	209.547	221.000		430.547	0.7678	330.57
30.	01/01/2004 – 01/02/2004	279.995	280.400		560.395	0.7678	430.27
31.	01/02/2004 – 01/03/2004	322.000	322.600		644.600	0.7678	494.92
32.	01/03/2004 – 01/04/2004	247.200	234.200	034.440	515.840	0.7678	396.06
33.	01/04/2004 – 01/05/2004	076.500	558.200	477.600	1112.30	0.7678	854.02
34.	01/05/2004 – 01/06/2004	725.880	749.200	851.760	2326.84	0.7678	1786.55
35.	01/06/2004 – 01/07/2004	724.740	673.600	716.280	2114.62	0.7678	1623.61

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36.	01/07/2004 – 01/08/2004	1115.58	1083.60	1082.52	3281.70	0.7678	2519.69
37.	01/08/2004 – 01/09/2004	760.920	741.600	807.600	2310.12	0.7678	1773.71
38.	01/09/2004 – 01/10/2004	607.440	597.600	654.360	1859.40	0.7678	1427.65
39.	01/10/2004 – 01/11/2004	364.620	354.600	479.880	1199.10	0.7678	920.67
40.	01/11/2004 – 01/12/2004	208.020	203.400	229.320	640.740	0.7678	491.96
41.	01/12/2004 – 01/01/2005	240.660	255.200	338.400	834.260	0.7678	640.54
42.	01/01/2005 – 01/02/2005	367.360	276.200	364.920	1008.48	0.7678	774.31
43.	01/02/2005 – 01/03/2005	310.140	306.800	451.440	1068.38	0.7678	820.30
44.	01/03/2005 – 01/04/2005	391.140	379.000	368.640	1138.78	0.7678	874.36
45.	01/04/2005 – 01/05/2005	408.120	433.000	558.120	1399.24	0.7678	1074.34
46.	01/05/2005 – 01/06/2005	630.900	637.600	782.880	2051.38	0.7678	1575.05
47.	01/06/2005 – 01/07/2005	977.940	483.200	1174.44	2635.58	0.7678	2023.60
48.	01/07/2005 – 01/08/2005	1173.40	1125.42	1195.20	3494.02	0.7678	2682.71
49.	01/08/2005 – 01/09/2005	1332.60	1282.98	1125.96	3741.54	0.7678	2872.75
50.	01/09/2005 – 01/10/2005	530.760	520.020	594.780	1645.56	0.7678	1263.46
51.	01/10/2005 – 01/11/2005	472.740	456.120	438.480	1367.34	0.7678	1049.84
52.	01/11/2005 – 01/12/2005	224.820	225.180	225.000	675.000	0.7678	518.27
53.	01/12/2005 – 01/01/2006	201.180	212.400	204.840	618.42	0.7678	474.82
54.	01/01/2006 – 01/02/2006	300.240	302.640	293.040	895.920	0.7678	687.86
55.	01/02/2006 – 01/03/2006	342.910	334.645	293.890	971.445	0.7678	745.88
56.	01/03/2006 – 01/04/2006	371.460	363.480	380.520	1115.46	0.7678	856.45
57.	01/04/2006 – 01/05/2006	657.120	624.660	704.640	1986.42	0.7678	1525.17
	Total						57004.53

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