

VCS MONITORING REPORT (MR)

Date of Project Validation Approval Under VCS 2007.1: 12/11/2009

MONITORING REPORT (MR) for 1st periodic verification

Project Title:

“8.35 MW wind power project at GuddarangavanaHalli, District Chitradurga, State Karnataka in India”

Date of MR: 21/08/2011

Version: 4.0

Standard Followed: VCS 2007.1

Monitoring Period:

Start: 01stApril2006

End: 31stMarch 2009

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A. Project Description:

Having concerns towards sustainable development and offsetting its GHG emissions by generation of power by renewable sources of energy, MSPL Limited (MSPL) and Ramgad Minerals and Mining Private Limited (RMMPL) had put up 8.35 MW wind based power generation project located in the villages GuddadarangavanaHalli, ChikkappanaHalli and Gonur, in District Chitradurga in the state of Karnataka in India. Wind based power generation project has many environmental benefits including zero particulate matter emissions, no greenhouse gas emissions etc, and thereby subsequently contributes to the global efforts for the mitigation of climate change.

The project activity comprises of installation and operation of eight numbers of 950 kW Wind Electricity Generators (WEGs) and one number of 750 kW WEG having a combined wind power generation capacity of 8.35 MW. The annual estimated power generation for each of the 950 kW WEG is 22,05,330 kWh and for the 750 kW WEG, the same is 17,41,050 kWh as per 26.5% PLF recommended in the applicable Karnataka Electricity Regulatory Commission (KERC) Tariff Order dated 18th January 2005.

The WEGs which are part of the project activity are supplied by Vestas Wind Technology (Formerly NEG Micon), an ISO 9001 certified company. As per the Operation and Maintenance (O&M) Contract between MSPL, RMMPL and Vestas Wind Technology (Vestas), the monitoring of the WEG and furnishing of monthly report of electricity generation shall be the responsibility of Vestas.

Details of wind energy generators (WEGs), connected to the project activity are given in the Table below:

Details of the WEGs installed under the project activity

S. No.	Name of Investor	WEG Capacity (MW)	Unique Identification No. for WEG (Turbine ID.)	WEG Physical Locations	Date of Power Purchase Agreement	Commissioning Date
1	MSPL	0.95 (1x950 kW)	MSPL 1-67456	GuddadarangavanHalli, Chitradurgadistrict	07.08.2003	21.03.2003
2	MSPL	4.75 (5x950 kW)	MSPL 2- 67903 MSPL 3- 67910 MSPL 4- 67907 MSPL 5- 67904 MSPL 6- 67906	Guddadarangavana Halli, Chitradurgadistrict	11.02.2004	30.09.2003
3	RMMPL	1.9 (2x950 kW)	Ramgad 1- 67902 Ramgad 2- 67905	Guddadarangavana Halli&ChikkappaHalli, Chitradurgadistrict	11.02.2004	30.09.2003

4	RMMPL	0.75 (1x750 kW)	Ramgad 3- 68751	Gonurvillage, Chitradurgadistrict	05.03.2005	19.05.2004
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The project activity is supplying power to Bangalore Electricity Supply Company Limited (BESCOM) under a long term power purchase agreement (PPA).

The project activity is installed in the state of Karnataka, which is under the coverage of the Southern grid, and therefore displaces the power which would have otherwise been generated from the grid, which is heavily reliant on fossil fuels. Thus, the project activity would displace the use of fossil fuels in an amount corresponding to the generation of power produced by the wind energy generators and thus subsequently reduce the GHG emission associated with the combustion of fossil fuels for the power generated from the grid.

B. Project Location:

The project activity is located in the villages GuddadarangavanaHalli, ChikkappanaHalli and Gonur in District Chitradurga in the state of Karnataka in India. The nearest railway station is Chitradurga and there are two airports with Bangalore Airport about 400 km away and the nearest airport being at Hubli about 200 km away.

The geographical co-ordinates of all the WEGs associated to the project activity are provided in the table below:

WEG Location No.	WEG No.	North	East
MSPL-01	GR-11	14°18'04"	76° 23'39"
MSPL-02	GR-1	14°18'58"	76° 23'30"
MSPL-03	GR-2	14°18'53"	76° 23'33"
MSPL-04	GR-3	14°18'44"	76° 23'34"
MSPL-05	GR-4	14°18'42"	76° 23'34"
MSPL-06	GR-5	14°18'36"	76° 23'34"
Ramgad-01	GR-6	14°18'31"	76° 23'38"
Ramgad-02	GR-17	14°19'38"	76° 22'23"
Ramgad-03	GON-4	14°16'45"	76° 25'07"

C. Type/Category of the Project

The project activity uses one of the baseline and monitoring methodologies approved by the CDM Executive Board.

Project Title	: 8.35 MW wind power project at Guddarangavana Halli, District Chitradurga, State Karnataka in India
Project activity scale	: Small
Sectoral scope	: Sector Number 1- “Energy industries (renewable - / non-renewable sources)”
Type and Category	: Approved Small-Scale CDM Methodology Type I – Renewable Energy Projects Category I.D.– Grid connected renewable electricity generation
Approved baseline Methodology	: AMS-I.D. (Version 13)
Approved monitoring methodology	: AMS-I.D. (Version 13)

D. Monitoring Information

As per the requirements of the methodology, monitoring shall consist of metering the electricity generated by the renewable technology. The project activity leads to mitigation of GHG due to the substitution of fossil fuel generated power in the baseline with zero GHG emitting wind based power project. The monitoring of the emission reduction will be carried out by measuring the net electricity supplied to the grid by the project activity with the help of electronic tri-vector meters installed at project site for each/group of WEGs as well as at the connected substation.

The project activity has been implemented by MSPL Limited and RMMPL. The WEGs installed in the project activity have been supplied by M/s Vestas Wind Technology India Pvt. Ltd (earlier known as M/s NEG Micon India Pvt. Ltd.). The project activity is operated and managed by Vestas only. An Operations and Maintenance (O&M) Agreement has been signed with Vestas for that purpose. Vestas has adequate and technically qualified professional to ensure constant monitoring of the installed wind electricity generators.

The project activity will be looked after by the manager responsible for operation of the wind energy generating machines at the project site. Daily operations of the wind energy generating machines will be carried out by the staff responsible for the operation of the WEGs.

The meters used for recording the export and import of the electricity generated by each/group of WEGs associated to the project activity are electronic tri-vector meters. The electricity generated by the project activity is recorded on a daily basis. The data will be captured and stored electronically, wherever possible. As a separate measure, the same data will be entered in the log book on change of every shift in a day. Continuous

monitoring, hourly measurement and monthly recording of data are carried out during the monitoring period.

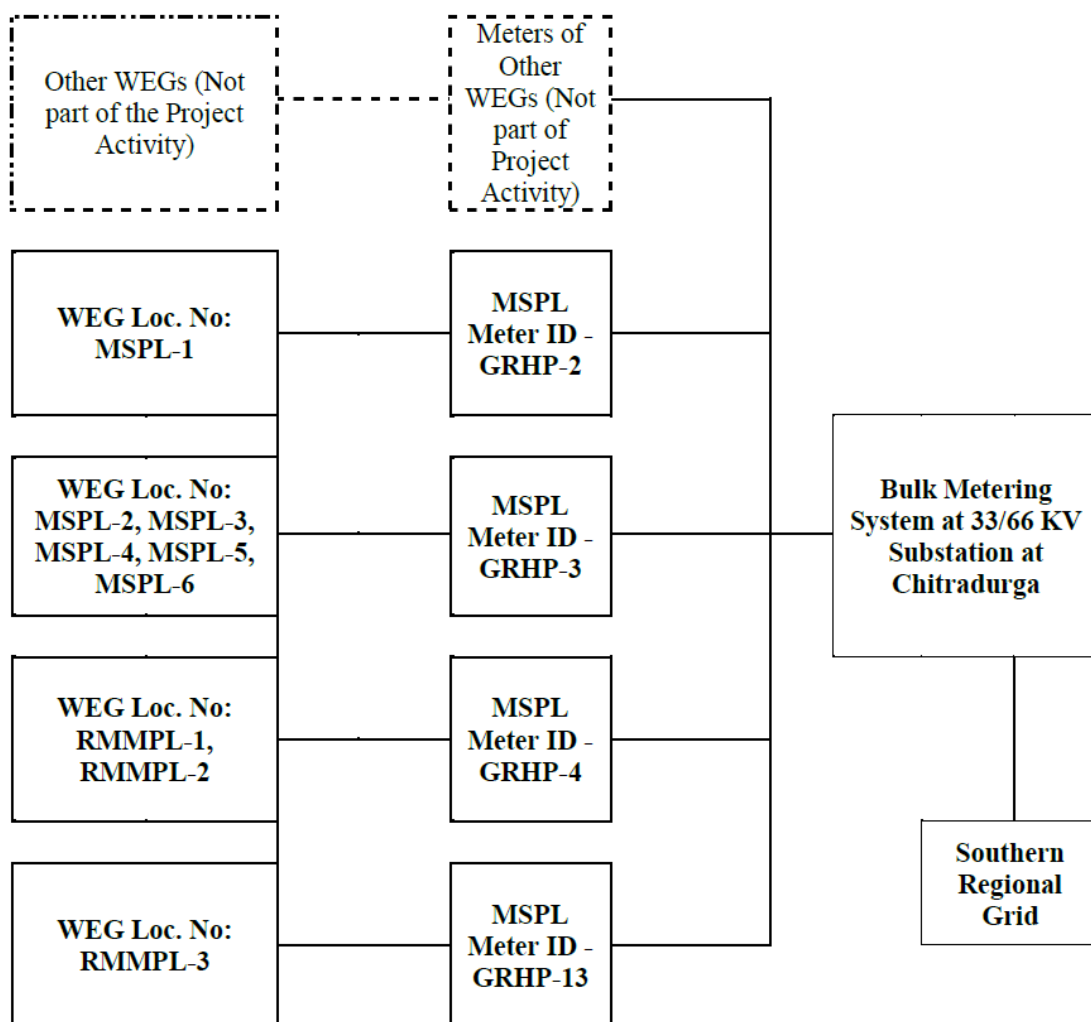
The electricity generation from the project activity would be monitored at four metering points with meter IDs: GRHP-02, GRHP-03, GRHP-04, and GRHP-13. Each of the four metering points consists of a main energy meter and a check energy meter. Metering equipments are electronic tri-vector meters with accuracy class of 0.2. The individual WEGs are connected to the metering points as follows:

Project Promoter	Meter ID / RR No.	WEG Number(s)	Location
MSPL Limited (Phase 1)	GRHP-02	MSPL-1	
MSPL Limited (Phase 2)	GRHP-03	MSPL-2, MSPL-3, MSPL-4, MSPL-5 & MSPL-6	
RMMP Limited (Phase 1)	GRHP-04	RMMPL-1 & RMMPL-2	
RMMP Limited (Phase 2)	GRHP-13	RMMPL-3	

The net electricity supplied to grid will be calculated based on the measured values of “export” and “import” on the meter at the delivery point (i.e. at the project site), where joint reading is taken by project proponent representative and BESCOM/KPTCL officials. The meter at the final uploading point to grid (at the connected substation) is common to the project activity and other wind turbines in the wind farm that are not under this project activity. The meters at the connected substation records the electricity exported and imported by all wind turbines which are part and also not part of the project activity. The joint meter reading at the connected substation is used to estimate the transmission losses from the WEGs. Based on the joint meter reading taken at the project site and the connected substation, BESCOM prepares the Share Certificate, which indicates the net electricity supplied by the project activity. It is to be noted that the apportioning procedure for arriving at the net electricity supplied by the project activity to the grid (as indicated in the Share Certificate issued by BESCOM) are under the control of BESCOM/KPTCL. The reading (i.e. net electricity supplied to grid) recorded in the said share certificate, issued by BESCOM, will be used to calculate actual GHG emission reductions by the project activity.

Metering Arrangement:

Schematic diagram of the metering arrangement at the project site as well as at the connected substation is provided below:



Details of meters installed at project site as well as at the substation are set out in the table below:

S. No.	Name of Investor	Capacity (MW)	Turbine ID. No.	Serial Number of Main Meter at Project Site	Serial Number of Check Meter at Project Site	Date of Calibration of Meters at Project Site	Serial Number of Main Meter at Substation	Serial Number of Check Meter at Substation	Date of Calibration of Meters at Substation
1	MSPL	0.95	MSPL 1 - 67456	02260379	02307545	01.03.2007, 04.01.2008 & 02.07.2008	02307391	02374009	07.01.2008 & 02.07.2008
2	MSPL	4.75	MSPL 2 - 67903, MSPL 3, - 67910 MSPL 4, -	02312419	02312420	01.03.2007, 04.01.2008 & 02.07.2008			

			67907,M SPL 5 - 67904,M SPL 6 - 67906						
3	RMM PL	1.9	Ramgad 1 - 67902,Ra mgad 2 - 67905	02312418	02312417	01.03.2007, 04.01.2008 & 02.07.2008			
4	RMM PL	0.75	Ramgad 3 - 68751 (118751)	04186295	04186298	01.03.2007, 04.01.2008 & 02.07.2008			

Quality control and Quality Assurance procedures / Calibration Procedures:

Four numbers of main meters and check meters are installed for monitoring the energy exported and imported by the project activity. Each meter is jointly inspected and sealed by both parties (project proponent or its authorized representative and BESCOM/KPTCL) and are not interfered with by either of the party except in the presence of the other party or its accredited representatives. The main and check meters shall be tested for accuracy every calendar year with reference to a portable standard meter. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2% accuracy class. The data registered by the main meter alone will be adopted for the purpose of calculation as long as the error in the main meter is within permissible limits. If during the annual accuracy tests, the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the limits, the main meter reading shall be considered as usual. However, the check meter shall be calibrated immediately. If the main meter is found to be beyond the permissible limits of error, but corresponding check meter is within limits, then the check meter reading shall be adopted for that period. The main meter shall be calibrated immediately.

The monitoring, measurement, reporting and training of monitoring personnel shall be conducted by Vestas Wind Technology as defined in the Operation and Maintenance agreement between MSPL & Vestas and RMMPL & Vestas and the metering records shall also be maintained by personnel of MSPL Limited and BESCOM as defined in the PPAs.

E. Monitoring Parameters

Data / Parameter:	EGy
Data unit:	kWh
Description:	Net Electricity supplied to the grid by the project
Source of data to be used:	Share Certificate from BESCOM providing the monthly net electricity generated from project activity and uploaded to Southern grid.
Value of data applied for the purpose of calculating expected emission reductions	64,931,801kWh
Description of measurement methods and procedures to be	Net electricity supplied to grid will be calculated based on the measured values of “export” and “import” on the

applied:	meter at the delivery point (at the project site), where joint reading is taken by project proponent representative and BESCO/KPTCL officials. The meter at the final uploading point to grid (at the connected substation) is common to the project activity and other wind turbines in the wind farm that are not under this project activity. The meters at the connected substation records the electricity exported and imported by all wind turbines which are part and also not part of the project activity. The joint meter reading at the connected substation is used to estimate the transmission losses from the WEGs. Based on the joint meter reading taken at the project site and the connected substation, BESCO prepares the Share Certificate, which indicates the net electricity supplied by the project activity. The reading recorded in this share certificate, issued by BESCO, will be used to calculate actual GHG emission reductions by the project activity. The data relevant to establishing the net electricity generated from the project activity including the share certificate from BESCO and the invoice to BESCO shall be archived for entire crediting period plus two years.
QA/QC procedures to be applied:	The measurement of the electricity generated using an electronic meter as installed at the project site (i.e. nearby the WEG) and at the connected substation is considered to be a reliable method for measurement of electricity generated. The additional meters installed at the substation (i.e. grid interconnection point) will be used to measure the mentioned variable on a continuous basis and shall act as a cross check. Every month these meter readings will be recorded by site in-charge and the state utility personnel and the records will be archived for crosschecking yearly figures. The meters at the project site as well as at the connected substation will be tri-vector meters. The readings in these meters may be used to determine the net electricity supplied to the grid by the project activity and determine the extent of mitigation of GHG over a period of time. Calibration of the energy meters being used will be carried out annually as per the standard practice. Data archiving shall be carried out in electronic format during the crediting period and for a time period of two years greater than the total duration of the crediting period of the project activity to enable monitoring of the net electricity supplied to the grid. All these activities shall be carried out by trained personnel of Vestas Wind Technology that is an ISO 9001

	certified company. Thus, all QA / QC procedures applicable shall be followed. The data records shall also be maintained as specified in the quality standard.
Any comment:	The accuracy class of the metering equipment shall be 0.2% (both main and check meters) as also mentioned in the Power Purchase Agreement.

F. Emission Reduction Calculations

As per the applicable methodology AMS I.D. (Version 13), the emission in the baseline scenario for the project activity will be determined using the following formula:

$$BE_y = EG_y \times EF_y$$

Where

BE_y = Baseline emissions (in tCO₂e)

EF_y = Baseline Emissions Factor in tCO₂/MWh

EG_y = Net electricity supplied to grid by the project activity in MWh

Net electricity supplied to the grid by the project activity is set out in the table below.

The emission reduction (ER_y) by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y), and emissions due to leakage (LE_y), as follows:

$$\text{Emission Reductions } (ER_y) = BE_y - PE_y - LE_y$$

where

PE_y = Zero (being a renewable and clean energy project, the project emissions (PE_y) during operation are considered zero)

LE_y = Zero

As there are no project emissions and leakages in the project case, the baseline emission (BE_y) is equivalent to the emission reduction (ER_y). Therefore the emission reductions are calculated as:

$$ER_y = BE_y = EG_y \times EF_y$$

Baseline emission factor (EF_y):

The emission factor for the Southern grid has been calculated *ex ante* as **0.927**tCO₂/MWh and does not require monitoring.

Net electricity supplied to the grid by the project activity (EG_y):

The value of net electricity supplied to grid by the project activity is taken from the monthly Share Certificate issued by BESCOM and is used to calculate actual GHG emission reductions by the project activity during the monitoring period. However the emission reductions are adjusted by 0.2% to ensure the conservativeness of emission reductions. This is applied as the calibration of energy meters has been delayed and not conducted at the frequency (i.e. annually) as specified in the monitoring plan. The maximum permissible error of 0.2% has been applied for all the values (i.e. 'Electricity Export', 'Electricity Import' and 'Transmission Losses' in the project case) in a conservative manner. The error is applied during the period between the scheduled date of calibration and the actual date of calibration. The adjustment, in all the measured values, due to delayed calibration is in line with Annex 60 of EB 52.

As per the monitoring plan mentioned in the VCS PD, the main and check meters would be calibrated/tested for accuracy annually. However, the calibration of main and check meters has not been conducted as per schedule. There is gap in the calibration process as set out in the table below:

Meter ID / RR No. (Main and Check Meter)	Monitoring Period	Actual Calibration Date	Period for Calibration not Conducted	Period for Adjustment Applied
GRHP-02	01 April 2006 – 31 March 2009	01 March 2007	01 Apr 2006 – 28 Feb 2007	01 Apr 2006 – 28 Feb 2007 (11 Months)
GRHP-03	01 April 2006 – 31 March 2009	01 March 2007	01 Apr 2006 – 28 Feb 2007	01 Apr 2006 – 28 Feb 2007 (11 Months)
GRHP-04	01 April 2006 – 31 March 2009	01 March 2007	01 Apr 2006 – 28 Feb 2007	01 Apr 2006 – 28 Feb 2007 (11 Months)
GRHP-13	01 April 2006 – 31 March 2009	01 March 2007	01 Apr 2006 – 28 Feb 2007	01 Apr 2006 – 28 Feb 2007 (11 Months)

It can be seen from the above table, the first calibration, pertaining to the selected monitoring period, of the main and check meters is conducted on 01st March 2007 and there is no calibration certificate available for the period from 01st April 2006 to 28th Feb 2007. Hence the maximum permissible error of 0.2% has been applied for all the values (i.e. 'Electricity Export', 'Electricity Import' and 'Transmission Losses') during this period of 11 months i.e. from 01st April 2006 to 28th Feb 2007.

Accordingly the value for net electricity supplied to grid by the project activity has been calculated by reducing 0.2% of the total electricity export from the project activity, by increasing 0.2% of the total electricity import to the project activity and by increasing 0.2% of transmission losses, resulting in a total reduction in emission reductions of 42 tCO₂e. The final quantity of emission reductions claimed for the monitoring period after

adjustments due to delayed calibration is **60,149** tCO₂e. The calculation of emission reductions is summarized in the table below:

Summary of Emission Reduction Calculations			
	Parameter	Value (Before adjustments due to delayed calibration)	Value (After adjustments due to delayed calibration)
A	<u>Total gross electricity export from the project activity (in kWh)</u> <i>(This is calculated as sum of units exported for all months in the monitoring period from all meters as per Share Certificate issued by BESCO)</i>	65,807,730	65,762,499
B	<u>Total electricity import to the project activity (in kWh)</u> <i>(This is calculated as sum of units imported for all months in the monitoring period from all meters as per Share Certificate issued by BESCO)</i>	111,366	111,419
C	<u>Transmission Losses (in kWh)</u> <i>(This is calculated as sum of transmission losses for all months in the monitoring period from all meters as per Share Certificate issued by BESCO)</i>	764,563	765,400
D	<u>Net electricity supplied to grid by the project activity (EGy) (in kWh)</u> <i>For each month in the monitoring period and for all 4 metering points, the net electricity supplied to grid by the project activity is determined as: = (Units exported)– (Units imported) – (Transmission losses) = A – B – C</i>	64,931,801	64,885,680
E	<u>Baseline Emission Factor(EFy) (in tCO₂/MWh)</u> <i>(This was determined ex-ante as the combined margin grid emission factor)</i>	0.927	0.927
F	<u>Emission Reductions (ERy) (in tCO₂e)</u> $F = (D/1000)*E$	60,191	60,149

The quantity of emission reductions claimed for the monitoring period from 01st April 2006 to 31st March 2009 is **60,149** tCO₂e.

The calendar year wise vintage of emission reductions during 1st monitoring period are set out in the table below:

<u>Vintage Period</u>	<u>Net Electricity Supplied to the Grid by the Project Activity (EGy)</u>	<u>Baseline Emission Factor (EFy)</u>	<u>Emission Reductions (ERy)</u>
<u>2006 (01/04/2006 - 31/12/2006)</u>	<u>19,824,776</u>	<u>0.927</u>	<u>18,377</u>
<u>2007 (01/01/2007 - 31/12/2007)</u>	<u>21,485,051</u>	<u>0.927</u>	<u>19,917</u>
<u>2008 (01/01/2008 - 31/12/2008)</u>	<u>20,201,585</u>	<u>0.927</u>	<u>18,727</u>
<u>2009 (01/01/2009 - 31/03/2009)</u>	<u>3,374,269</u>	<u>0.927</u>	<u>3,128</u>

A spreadsheet showing summary of emission reductions, calendar year wise estimation of emission reductions, project details, energy meters details, calibration details, month-wise gross electricity export data before and after adjustment in kWh for each of the energy meters in the project activity, month-wise electricity import data before and after adjustment in kWh for each of the energy meters in the project activity, month wise transmission loss data before and after adjustment in kWh for each of the energy meters in the project activity, calculation of month-wise net electricity supplied to grid before and after adjustment in kWh for each of the energy meters in the project activity, and calculation of emission reductions before and after adjustment, have been submitted to the DOE.

[Note: The amount of emission reductions by the project activity for the selected monitoring period was estimated as 51,204 tCO₂e (or 17,068 tCO₂e annually) in the VCS PD which is less than the actual amount of emission reductions achieved by the project activity during the same monitoring period. This is because of the PLF (29.59%) achieved by the project activity during this period which is more than the PLF (26.5%) considered in the VCS PD. The PLF achieved by the project activity is due to the high availability of wind during this period which is infirm in nature.]

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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