Monitoring Report

Project Title – 2.5 MW Bundled Wind Power Project in Maharashtra (India)

Crediting Period
25.04.2007 to 31.05.2009
(Both days are inclusive)
UNFCCC Registration No. 2543

Submitted by
Raj Infrastructure Development (India) Pvt. Ltd. (Pune)
Senapati Bapat Road,
410, Pride Silicon Plaza, Pune,
Maharashtra State, India

(Version 04)

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Annexures

1. Introduction

This is a bundled project activity consisting of two WTG belonging to two different project promoters. Both Raj Promoters & Civil Engineers Pvt. Ltd. and Raj Infrastructure Development (India) Pvt. Ltd. are a part of Raj Group of companies, Pune. Raj Infrastructure Development (India) Pvt. Ltd. is specialized in civil infrastructure development projects like construction of canals, dams, roads, bridges etc. Promoters have required financial and technical resources to execute the project on fast track and maintain it also. Raj Infrastructure Development (India) Pvt. Ltd. and Raj Promoters & Civil Engineers Pvt. Ltd. have set up 2 WEGs of total installed capacity of 2.5 MW in Dhule district of Maharashtra, India. The individual capacities of each SUZLON S-70 make WEG is 1.25 MW.

Table 1: Ownership Details of WTGs

Name of Company	No of WTGs	Capacity (in MW)
Raj Infrastructure Development (India) Pvt. Ltd.	1	1.25
Raj Promoters & Civil Engineers. Pvt. Ltd.	1	1.25

The project was registered at United Nation Framework Convention on Climate Change (UNFCCC) (Ref Number 2543) on June 12th, 2009 and the details of the same can be viewed on http://cdm.unfccc.int/Projects/DB/SGS-UKL1240582489.26/view

This is the first Monitoring Report of project titled '2.5 MW Bundled Wind Power Project in Maharashtra (India)' under VCS 2007.1. The document reports, the Emission Reduction (ERs) achieved by this VER (Voluntary Emission Reduction) project, for producing renewable energy, covering the monitoring period from 25.04.2007 to 31.05.2009.

Table 1.2: Summary of Achieved Emission Reductions

Period	Project Activity Emission (tonnes CO_2e)	Total Baseline Emissions (tonnes CO_2e)	Estimation of Leakage (tonnes CO_2e)	Emission Reduction (tonnes CO_2e)
01.05.2007 to 31.12.2007	0.00	2015.00	0.00	2015.00
01.01.2008 to 31.12.2008	0.00	3274.00	0.00	3274.00
01.01.2009 to 31.05.2009	0.00	1291.00	0.00	1291.00
Total	0.00	6580.00	0.00	6580.00

Year	Estimated Net Electricity Supplied to grid by Project (MWh)	Estimated PLF	Actual Net Electricity Supplied to grid by Project (MWh)	Actual PLF	Estimated Emission Reductions (tCO_2e)	Actual Emission Reductions (tCO_2e)
01.05.2007 to 31.05. 2009	**9125.000**	**20.000%**	**7305.141**	**16.011%**	**8220**	**6580**

Note: Estimated Net electricity supplied to grid by project was 9125 MWh on the basis of 20% PLF, amounting to estimated emission reduction of 8220 tCO_2e, while Actual Net Electricity supplied to grid by the project during the whole monitoring period is 7305.141 (MWh)on the basis of actual PLF 16.011%, amounting to actual emission reductions 6580 tCO_2e only.

Table 1.3: Summary of Generation

Electricity Generation	GWh
01.05.2007 to 31.12.2007	2.237
01.01.2008 to 31.12.2008	3.634
01.01.2009 to 31.05.2009	1.434
Total Generation	7.305

The project operation has been monitored in accordance with the requirements of the applicable Monitoring Methodology as described in its Project Design Document (PDD), and the Project Monitoring Plan (MP).

The implemented project activity, sells electricity generated from its WTGs to the Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) which falls under North East West North-east (Hereafter NEWNE) Region electricity grid network of India. This avoids generation of same amount of energy in fossil fuel dominated thermal plants. Thus the project activity avoids CO_2 and other GHG emissions that would have happened in the absence of the project activity. The project activity also contributes to the regional sustainable development.
The bundled project activity consists of two sub-bundles described in the table below:

Table 1.4: Details of Sub – bundles

Sub-Bundles	No. x Capacity	Name of Promoter	Date of Commissioning	Location
I	1 no. x 1.25 MW	Raj Infrastructure Development (India) Pvt. Ltd.	13 August, 2006	WTG No. – J 129 Gut No. – 90 Compartment No. – 141 Sr. No. –64039789 (Siemens Ltd. Generator) Village – Chhadvel Taluka – Sakri District – Dhule
II	1 no. x 1.25 MW	Raj Promoters & Civil Engineers. Pvt. Ltd.	30 September, 2006	WTG No. – J 116 Gut No. – 16 Compartment No. – 442 Sr. No. –64039585 (Siemens Ltd. Generator) Village – Isharde Taluka – Sakri District – Dhule

Project also complies with the VCS Project Description template clauses 1.12, 1.13,1.14, 8.1 and 8.2 as, PP owns the WTGs and the project activity is not implemented to create GHG emissions primarily

for the purpose of its subsequent removal or destruction. This monitoring report for the project activity is prepared to verify voluntary emission reductions under VCS 2007.1 only and have not created another form of environmental credit. Further, the emission reduction generated from the project activity are generated voluntarily and would not be use to comply with the emission reduction targets or any legal /regulatory compliance or to participate in emission trading program.

2. Description of the Project Activity

The Wind Power Project of 2.5 MW installed capacity enabling generation of electricity by state-of-art 1.25 MW (Model no. S70) Wind Turbine Generators (WTGs) in the State of Maharashtra was installed by Raj Infrastructure Development (India) Pvt. Ltd. (Pune) and Raj Promoters & Civil Engineers. Pvt. Ltd, Pune. However, the bundled project activity has been proposed by Raj Infrastructure Development (India) Pvt. Ltd. The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resource, to utilize the generated output for selling it to the state electricity utility i.e. Maharashtra State Electricity Distribution Company Limited (MSEDCL) and to contribute to climate change mitigation efforts.

Table 2.1: Details of WTG Location

Sub- bundles	WTG Location No[1].	Installed Capacity	Village, District	Sub-station
I	J 129	1.25 MW	Chhadvel, Dhule	Jamde
II	J 116	1.25 MW	Isharde, Dhule	Jamde

The WTGs were procured from M/s. Suzlon Energy Ltd. by the Project Promoters. In total the project activity consists of two WTGs of 1.25 MW capacity each.

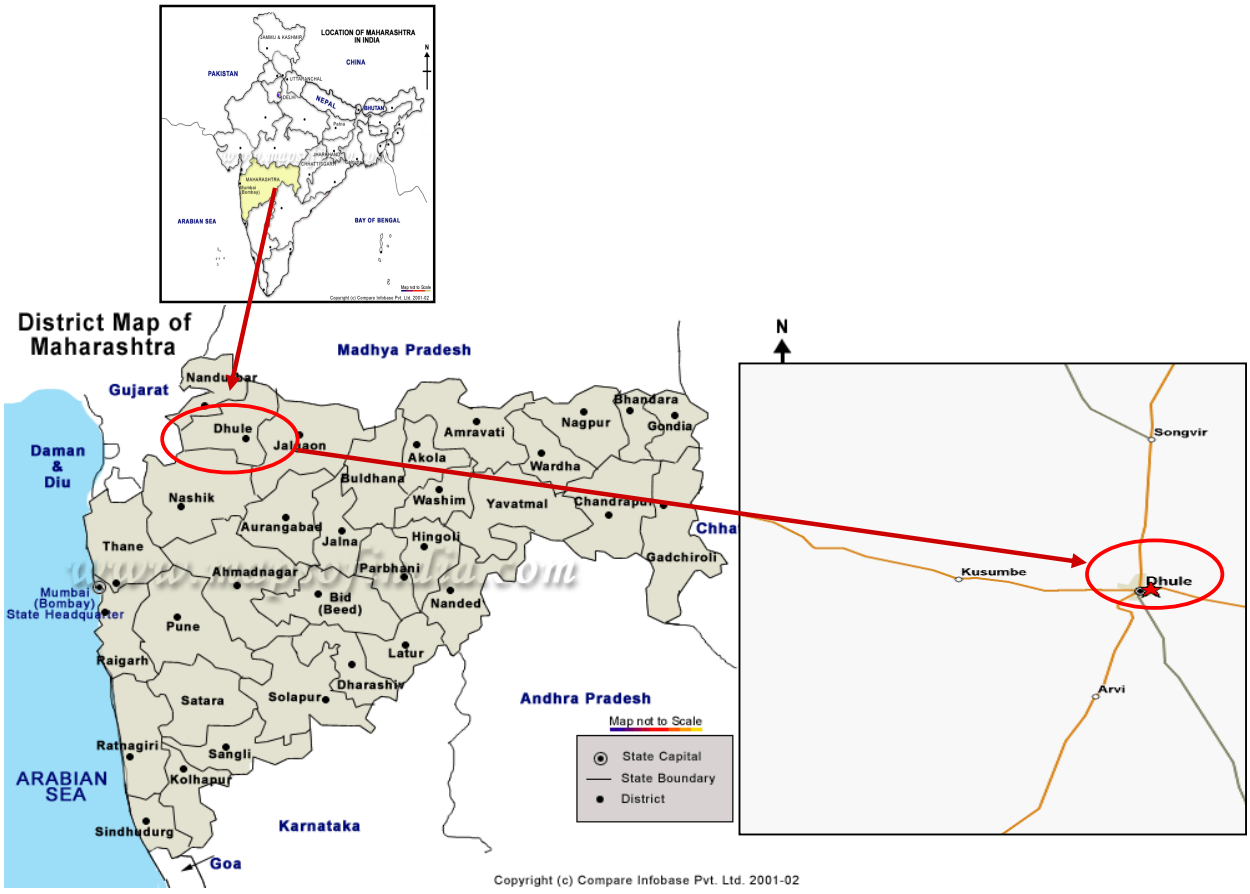
2.1. Project Location

The location detail of each site is mentioned in table below.

Sub-bundles	WTG Location No.	Addresses	Latitude	Longitude
I	J 129	Gut No. – 90, Compartment No. – 141 Sr. No. –64039789 (Siemens Ltd. Generator) Village – Chhadvel Taluka – Sakri District – Dhule	17.6167, (DMS)- 17°37'0" N	77.9500, (DMS)- 77°57'0" E
II	J 116	Gut No. – 16 Compartment No.– 442 Sr. No. –64039585 (Siemens Ltd. Generator) Village – Isharde Taluka – Sakri District – Dhule	17.6167, (DMS)- 17°37'0" N	77.9500, (DMS)- 77°57'0" E

[1] This number is the unique identification number of the WTG given by the O & M contractor and cannot be duplicated for any other WTG. The number can be verified from the micro-siting drawings and various nodal agency clearances. Copy of the micro-siting drawing have been submitted to the DOE

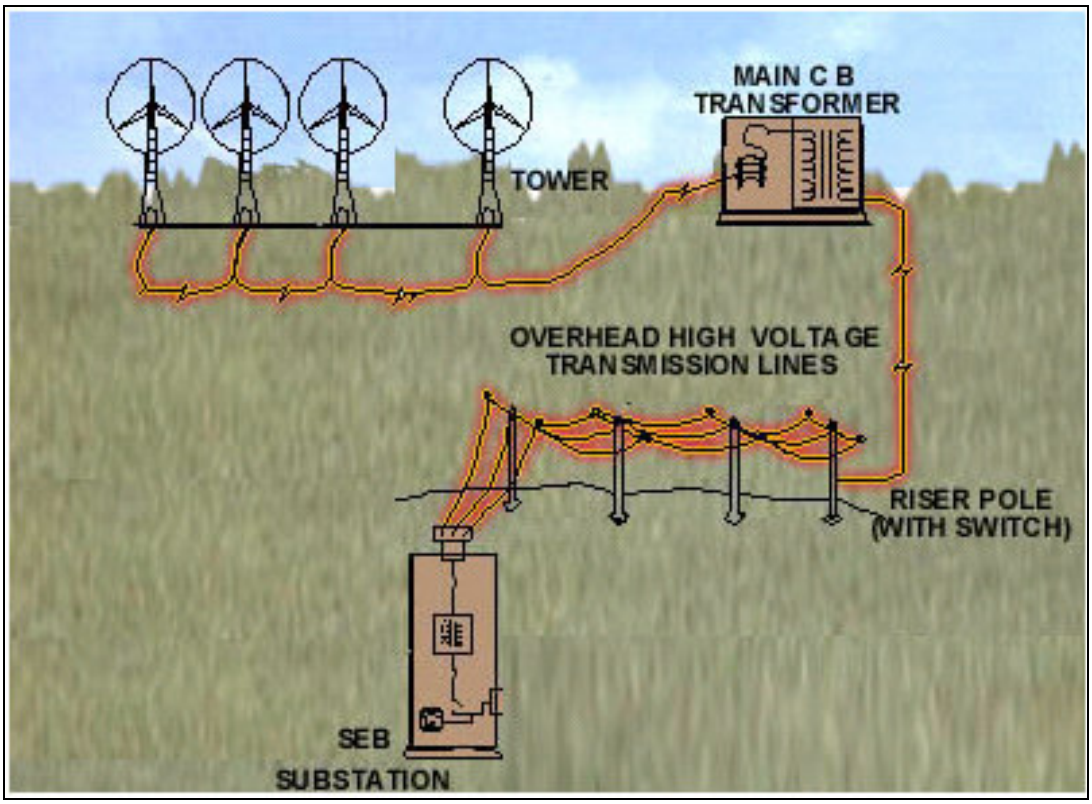
Figure 2.1: Location Map



2.2. Project Boundary

Project boundary specified in the Appendix B of simplified modalities and procedures is that encompasses the physical, geographical site of the renewable generation source. This includes the wind turbine installation, pooling and sub-stations. The proposed project activity evacuates the power to the Western Regional Grid. Therefore, all the power plants contributing electricity to the Western Regional Grid are taken in the connected (project) electricity system for the purpose of baseline estimation.

Figure 2.2: Project Boundary



Details of Meters and Feeders connected to WEGs J-116 & J-129 of Jamde sub-station During Monitoring Period (25.04.2007 to 31.05.2009)

Monitoring Period (25.04.2007 to 31.05.2009)	WEGs	Main Energy Meter Sr. No.	Check Energy Meter Sr. No.	Make	Calibration Frequency	Feeder no.
25.04.2007 to 31.10.2007	J-116	04725795	04725796	Elster	Annual	Jamde-3
01.11.2007 to 31.03.2008	J-116	04862465	04725796	Elster	Annual	Jamde-3
01.04.2008 to 31.05.2009	J-116	04862465	04725796	Elster	Annual	Jamde-3
25.04.2007 to 31.03.2008	J-129	04725791	04763795	Elster	Annual	Jamde-9
01.04.2008 to 31.05.2009	J-129	04725791	04763795	Elster	Annual	Jamde-9

Note:

1) J-116 previously connected to Feeder no. 03 is now shifted in feeder no. 10 (Meter no. 04863433) of Jamde substation according to letter issued by MSEDCL O & M Circle Dhule Reference no. SE/DHL/ESTMT/No. 5461 dated 16 May 2009.
2) Energy meter connected to feeder no. 10 has been replaced according to letter issued by MSETCL Testing division Dhule. Reference no. EE/TDD/TF-24/442 dated 13.10.2008,

because the previous meter was burnt during the line fault. Old Meter No. 04863433 and New Meter No. is 04890562.

3) Energy meter connected to feeder no. 03 has been replaced according to letter issued by MSETCL Testing division Dhule. Reference no. EE/TDD/TECH-24/212 dated 18.04.2007, because the previous meter got short after bursting of 'Y' ph main metering at CTs'. Old Meter No. 04725795 and New Meter No. is 04862465.

3. Details of Project Proponent

The contact detail of the Project Proponent is given the table below.

Table 3.1: Contact Details of Project Proponents

Organization:	Raj Infrastructure Development (India) Pvt. Ltd.
Street/P.O.Box:	Senapati Bapat Road
Building:	410, Pride Silicon Plaza
City:	Pune
State/Region:	Maharashtra
Postfix/ZIP:	411 016
Country:	India
Telephone:	(020) 25635050, 25636060
FAX:	(020) 25633030
E-Mail:	rajgrouppune@reddiffmail.com
URL:	--
Represented by:	
Title:	Dr. Rajendra G. Hiremath
Salutation:	Mr.
Last Name:	Hiremath
Middle Name:	Gurupadya
First Name:	Rajendra
Department:	Finance
Mobile:	+91-98220 46604
Direct Fax:	--
Direct Tel:	--
Personal E-Mail:	--

4. Monitoring Methodology and monitoring Plan

As per the Voluntary Carbon standards, methodologies and guidelines that have been approved by CDM executive board should be referred for emission reduction calculation. Hence the same has been referred.

4.1 Monitoring Methodology:

As defined under Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project activity proposes to apply following project types and categories:

- **Type : I – Renewable Energy Projects**
- **Project Category : I.D. – Grid connected renewable electricity generation (Version 13: EB 36)**

The applied small-scale methodology, AMS-I-D, requires monitoring of the electricity supplied to the grid.

4.2 Monitoring Plan:

Being a small-scale project activity of Type I.D. category, the monitoring methodology and plan has been developed in line with the guidance provided in paragraph 13 of category I.D. of Appendix B.

As required in the methodology following data needs to be monitored.

Data / Parameter:	EGy
Data unit:	MWh
Description:	Net electricity supplied to the grid by the Project
Source of data to be used:	As available in the project proponent records
Value of data	7305.141
Description of measurement methods and procedures to be applied:	Net electricity supplied to grid is calculated based on the measured values of "export" and "import" on the MSEDCL meter, where joint reading is taken by SEL representative and MSEDCL officials. Since this meter is common to project activity and other wind turbines that are not under this project activity, the apportioning of net electricity would be done based on electricity generated from individual wind turbines. Refer Section B.7.2 of registered Project Design Document with CDM, Executive Board on 12th June, 2009(http://cdm.unfccc.int/Projects/DB/SGS-UKL1240582489.26/view)for the details of apportioning methodology followed by SEL and accepted by MSEDCL.
QA/QC procedures to be applied:	The quantity of net electricity supplied will be cross-verified from the invoice raised on MSEDCL by the project proponent. The total amount of invoices raised to MSEDCL during the monitoring period is Rs. 2,66,29,362/-
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$\sum_{0}^{n} EG_{n,y}$
Data unit:	MWh
Description:	Total Electricity Generated from two wind turbines of Raj group
Source of data to be used:	Metered at windmill site metering station. $EG_{n,y}$ will be a summation of values taken from individual meters of the two wind turbines
Value of data	7634.284
Description of measurement methods and procedures to be applied:	This value will be used for apportioning of the net electricity supplied to the Western Regional Grid by the CDM project activity, as metered in "joint meter" of MSEDCL.
QA/QC	The project revenue is based on the net units displaced as

procedures to be applied:	measured by main metering system installed at the interconnection point. Other than main meter, the project proponent has check meter so that the accuracy of main meter can be verified. The calibration of the meters will be done annually by state utility. Other than periodic calibration of the meters the reading of both meters, will be matched every month.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$\sum_{0}^{n} EG_{m,y}$
Data unit:	MWh
Description:	Total Electricity Generated from the other wind turbines attached to the common MSEDCL meter at the sub-station
Source of data to be used:	From Suzlon Energy Limited
Value of data	171201.975
Description of measurement methods and procedures to be applied:	This value will be used for apportioning of the net electricity supplied to the Western Regional Grid by the CDM project activity, as metered in "joint meter" of MSEDCL.
QA/QC procedures to be applied:	The project revenue is based on the net units displaced as measured by main metering system installed at the interconnection point. Other than main meter, the project proponent has check meter so that the accuracy of main meter can be verified. The calibration of the meters will be done annually by state utility. Other than periodic calibration of the meters the reading of both meters, will be matched every month.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{JMR,export}$
Data unit:	MWh
Description:	Electricity supplied to the grid from SEL wind farm from all wind turbines (including project activity) attached to the common MSEDCL meter at the substation and metered jointly by SEL representative and MSEDCL
Source of data to be used:	Metered as "export" value from MSEDCL meter and presented in the Joint Meter Reading (JMR) report.
Value of data	171955.962
Description of measurement methods and procedures to be applied:	This value will be apportioned to the project activity based on the values of $\sum_{0}^{n} EG_{n,y}$ and $\sum_{0}^{n} EG_{m,y}$
QA/QC procedures to be applied:	The project revenue is based on the net units displaced as measured by main metering system installed at the interconnection point. Other than main meter, the project proponent has check meter so that the accuracy of main meter can be verified. The calibration of the meters will be done annually by state utility. Other than periodic calibration of the meters the reading of both meters, will be matched every month.

Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{JMR,import}$
Data unit:	MWh
Description:	Electricity drawn from the grid by SEL wind farm for all wind turbines (including project activity) attached to the common MSEDCL meter at the substation and metered jointly by SEL representative and MSEDCL
Source of data to be used:	Metered as "import" value from MSEDCL meter and presented in the Joint Meter Reading (JMR) report
Value of data	856.102
Description of measurement methods and procedures to be applied:	This value will be apportioned to the project activity based on the values of $\sum_{0}^{n} EG_{n,y}$ and $\sum_{0}^{n} EG_{m,y}$
QA/QC procedures to be applied:	The project revenue is based on the net units displaced as measured by main metering system installed at the interconnection point. Other than main meter, the project proponent has check meter so that the accuracy of main meter can be verified. The calibration of the meters will be done annually by state utility. Other than periodic calibration of the meters the reading of both meters, will be matched every month.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{JMR, Raj, export}$
Data unit:	MWh
Description:	Electricity supplied to the grid from the project activity
Source of data to be used:	Calculated from $EG_{JMR,export}$ which is a metered value
Value of data	7340.648
Description of measurement methods and procedures to be applied:	This value will be apportioned to the project activity based on the values of $\sum_{0}^{n} EG_{n,y}$ and $\sum_{0}^{n} EG_{m,y}$
QA/QC procedures to be applied:	The project revenue is based on the net units displaced as measured by main metering system installed at the interconnection point. Other than main meter, the project proponent has check meter so that the accuracy of main meter can be verified. The calibration of the meters will be done annually by state utility. Other than periodic calibration of the meters the reading of both meters, will be matched every month.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{JMR, Raj, import}$
Data unit:	MWh
Description:	Electricity drawn from the grid by the project activity

Source of data to be used:	Calculated from $EG_{JMR,import}$ which is a metered value
Value of data	35.484
Description of measurement methods and procedures to be applied:	This value will be apportioned to the project activity based on the values of $\sum_{0}^{n} EG_{n,y}$ and $\sum_{0}^{n} EG_{m,y}$
QA/QC procedures to be applied:	The project revenue is based on the net units displaced as measured by main metering system installed at the interconnection point. Other than main meter, the project proponent has check meter so that the accuracy of main meter can be verified. The calibration of the meters will be done annually by state utility. Other than periodic calibration of the meters the reading of both meters, will be matched every month.
Any comment:	The data will be archived for crediting period + 2 years.

Operation and Maintenance of WTGs

Project proponent has signed an 'Operation and Maintenance' contract with the supplier, Suzlon Energy Ltd. to operate the wind mills for a period of ten years from the date of commissioning of each Wind Turbine Generator. The details are given in the table below.

Table 4.1: Details of O& M Agreement

Sub-Bundles	No. x Capacity	Name of Promoter	Period of O & M Agreement
I	1 no. x 1.25 MW	Raj Infrastructure Development (India) Pvt. Ltd.	13.08.2006 to 13.08.2016
II	1 no. x 1.25 MW	Raj Promoters & Civil Engineers. Pvt. Ltd.	30.09.2006 to 30.09.2016

The performance of the mills, safety in operation and scheduled/breakdown maintenances are organized and monitored by the contractor. SEL will monitor the generation of the WTG daily on a regular basis and will maintain a log book recording daily generation details for each WTG comprising the project, as metered at the wind farm. SEL will also provide daily generation data through website.

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

Security Services:

This service includes watch and ward and security of the wind turbines and the equipment.

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 utility of power generated at promoter's wind turbines and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

- Visual inspection of the WTGs and all parts thereof.
- Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.
- Maintenance is done every quarter and annually and a checklist is maintained manually for the same.

A power purchase agreement has been signed with MSEDCL. Raj Group installed Real Time TOD Meters with online reading features at the Metering Point (the Main Meter). The metering equipment is duly approved, tested and sealed by MSEDCL. The metering equipment (consisting of the Main Meter and the Check Meter) is identical in make and technical standards and is of 0.2% accuracy class and calibration. They comply with the requirements of the Electricity Rules. The meter readings at the Metering Point are undertaken jointly by the representatives of the State Grid/ MSEDCL and the representative of SEL in the first week of every month. The meter readings are jointly certified by representatives of the State Grid/ MSEDCL and SEL. However, it is the reading of the Main meter that is considered for billing purpose. In case of error/failure in the main meter, the check meter reading is taken and the main meter is immediately calibrated /replaced by MSEDCL.

The MSEDCL carries out the calibration, periodical testing, sealing and maintenance of meters in the presence of SEL representative. The frequency of meter testing is annual. All meters are tested only at the Metering Point. The technicality involved in the operation of the Panel Meter i.e. the meter that is located at the base of the WTG is mentioned below.

The controller used for the WTG is SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. In case of any problem related to the panel meter, the WTG will automatically get shut down and the meter will be replaced by a new meter immediately.

The generated electricity is measured through a two step procedure wherein the first metering is carried out at the controller of the machine with on-board meter. The monitoring of all these wind turbines is done from a common monitoring station as a part of central monitoring system. The system consists of a state- of- the- art controlling and monitoring and well trained staff personnel of O&M contractor, Suzlon Energy Ltd, are always present on site to monitor various parameters of power generation and deal with any problems related to generation, transmission or maintenance. $EG_{n,y}$ is the

electricity generated from an individual wind turbine measured through its controller meter. The summation of total Electricity Generated from two wind turbines of the project proponent from individual wind turbine meters in MWh is presented as $\sum_{0}^{n} EG_{n,y}$, and the summation of total Electricity Generated from the other wind turbines attached to the common MSEDCL meter at the sub-station in MWh is presented as $\sum_{0}^{n} EG_{m,y}$
A ratio based on these two set of measured values would used for apportioning the net electricity supplied to the Western Regional Grid by the project activity.

The second metering is carried out at grid interconnection point (sub station) wherein the Joint Meter Reading (JMR) is carried out on first week of every month in presence of the representatives of the project proponent & the state electricity utility (MSEDCL). This JMR is used for calculation of the amount of electricity supplied to the grid against which the utility makes the payment to the project proponent. The JMR gives both the "export" ($EG_{JMR,export}$) and "import" ($EG_{JMR,import}$) of the electricity to/ from the Western Regional Grid. There is a single meter which gives both the export and import values, this metered reading would give value net of line losses and auxiliary consumption.

Further, as there is a common MSEDCL joint meter for multiple project proponents, the joint meter reading (JMR) is taken every month by MSEDCL personnel reflects the cumulative monthly generation for all wind turbines connected to this MSEDCL meter. The apportioning of electricity generated from the various wind turbines is done by the EPC contractor, SEL, based on the power generation from the individual wind turbines connected to this MSEDCL meter. SEL O&M personnel prepare a monthly report on generation and consumption. This report contains details of power exported/imported to/from the grid by each of the wind turbines connected. This apportioned value is then used by the project proponent to raise invoice from MSEDCL.

$EG_{JMR,Raj,export}$, the electricity supplied to the grid by the project activity is calculated as follows:

$$EG_{JMR,Raj,export} = EG_{JMR,export} * \frac{\sum_{0}^{n} EG_{n,y}}{\left(\sum_{0}^{n} EG_{n,y} + \sum_{0}^{n} EG_{m,y}\right)}$$

$EG_{JMR,Raj,import}$, the electricity drawn from the grid by the project activity is calculated as follows:

$$EG_{JMR,Raj,import} = EG_{JMR,import} * \frac{\sum_{0}^{n} EG_{n,y}}{\left(\sum_{0}^{n} EG_{n,y} + \sum_{0}^{n} EG_{m,y}\right)}$$

EG_y, the net electricity supplied to the grid by the project activity, is calculated as follows:

$$EGy = EG_{JMR,Raj,export} - EG_{JMR,Raj,import}$$

The meters located at the grid sub-station are sealed, maintained and calibrated by the state electricity utility. The meters are tested and maintained as per the Metering Code for Maharashtra. Additionally, each wind turbine is equipped with an integrated electronic meter. The electricity generated is recorded by the O & M staff of the EPC contractor on 24 hour basis.

The Accounts department of Raj Group receives the data from both the sources and keeps track of project activity which reduces the carbon emission reductions. The project performance is communicated to the higher management by the accounts department.

Monitoring Roles and Responsibilities:

Designation	Responsibilities
Raj Infrastructure Development (I) Pvt. Ltd. and Raj Promoters & Civil Engineers Pvt. Ltd. Site Technician / Engineer (Suzlon)	▪ Performance Monitoring & recording (Joint Meter Reading) ▪ Verification of data ▪ Site visit to check authenticity of data and take corrective action, wherever necessary
Operation & Maintenance Contractor (Suzlon)	▪ Operation and maintenance ▪ Data recording(at controller)& verification ▪ Storage of data
State Utility officials	▪ Monitoring & recording (Joint Meter Reading) ▪ Storage of data Testing & calibration of meters

Training Procedure

Training of staff operating and maintaining the WTGs is carried out by the WTG manufacturer and supplier (Suzlon). Special emphasis is given to the training of the employees to enable them to develop their skills to meet changing WTG technology and to provide efficient and effective O&M services. There is an initial learning programme as well as continuous learning programmes for all employees. All newly hired employees are required to attend an intensive two- to four-week, full-time training programme to familiarize them with business and operations.

Besides the usual training programs for their staff Suzlon conducts specific familiarization capsules for customers, such that they are fully aware of the capabilities of the highly sophisticated WTGs of Suzlon.

The training program focuses mainly on the management, monitoring and maintenance, and safety and reliability aspects of wind power. The objectives include:

1. Understanding the various stages and aspects in the management of Wind Power systems

2. Understanding the importance of monitoring and maintenance of Wind Power systems and hence the various tasks involved in this

3. Understanding the importance of safety and reliability aspects involved with Wind Power and the measures taken.

4. Managing generation and other data for future reference.

5. Period of Monitoring

25.04.2007 to 31.05.2009

6. VER (Voluntary Emission Reduction) Calculations

Grid Emission Coefficient (or CO_2 Emission factor) have been estimated using combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in 'Tool to calculate the emission factor for an electricity system (Version 01, EB 35)'.

The baseline emission (BE_y in tCO_2) is the product of the baseline emission factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid(EG_y in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities (EG baseline in MWh), as follows:

$BE_y = (EG_y$ – EG baseline) x $EF_{grid,y}$

Since the following project does not involve any modification or retrofit of the existing generation facility hence **EG baseline = 0**

Emission coefficient for the grid electricity source is determined as follows:

Step 1: Calculation of an Operating Margin Emission Factor

For calculation of operating margin, four options are available:

(a) Simple operating margin;
(b) Simple adjusted operating margin;
(c) Dispatch data analysis operating margin;
(d) Average operating margin

CO_2 Baseline Database Version 3, Date – December 2007, published by Central Electricity Authority (hereafter CEA Database) has been referred for the values of OM. As per the "Tool to calculate the emission factor for an electricity system" (Version 01, EB 35), any of the four methods can be used, however, the simple OM method can be used only if the low-cost/must run resources constitute less than 50% of the total grid generation in: 1) average of the five most recent years, or 2) based on long term averages for hydroelectricity production.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)					
	2002-03	2003-04	2004-05	2005-06	2006-07
North	26.1%	28.1%	26.8%	28.1%	27.1%
East	7.5%	10.3%	10.5%	7.2%	9.0%
South	18.3%	16.2%	21.6%	27.0%	28.3%
West	8.2%	9.1%	8.8%	12.0%	13.9%
North-East	45.8%	41.9%	55.5%	52.7%	44.1%

India	16.3%	17.1%	18.0%	20.1%	20.9%
Average of five years for WR					10.40%

Table reference- CEA Baseline Database, Version 3

In Western region the low-cost/must run resources constitute only 10.40 % (as demonstrated above) of the total grid generation in average of the five most recent years, hence simple OM has been opted for.

The "Tool to calculate the emission factor for an electricity system" (Version 01, EB 35) has been used in the CEA Baseline Database for the calculation of operating margin.

Simple Operating Margin emission factor (Western Region) in tCO_2/GWh (incl. imports)		
Year		**Simple OM (WR)**
2004-2005		**1013**
2005-2006		**1004**
2006-2007		**994**
Average of 3 years		**1004**

Table reference- CEA Baseline Database, Version 3

As per the "Tool to calculate the emission factor for an electricity system" (Version 01, EB 35), the calculation of OM has been done ex ante based on the most recent 3 years for which data is available at the time of PDD submission to UNFCCC.

Step 2: Calculation of build margin (EFgrid,BM,y) emission factor

BM values have been taken from CO_2 Baseline Database for the Indian Power Sector, Version 3, December 2007. CO_2 Baseline Database for the Indian Power Sector is published by Central Electricity Authority, Ministry of Power, Govt. of India.

Build Margin emission factor (Western Region) in tCO_2/GWh	
Year	**BM (WR)**
2006-2007	**594**

Table reference- CEA Baseline Database, Version 3

Step 3: Calculation of combined margin (CM) emissions factor

The combined margin emissions factor ($EF_{grid,CM,y}$) is calculated as follows:

$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EFgrid,BM,y \times w_{BM}$

Where,

EFgrid,BM,y	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
EFgrid,OM,y	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
wOM	=	Weighting of operating margin emissions factor (%)
wBM	=	Weighting of build margin emissions factor (%)

For wind power generation project activities: wOM = 0.75 and wBM = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

Emission Reduction Calculation:

Paragraph 9 of the approved methodology states that:

For all other systems, the baseline ($BE_{electricity, y}$) is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh). Hence baseline emissions or CERs generated by the project are estimated as under:

$$\mathbf{BE_{electricity, y} = EG_y \ X \ EF_{grid,CM, y}}$$

Where,

EG_y = Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh, and
$EF_{grid,CM, y}$ = Grid emission coefficient for the electricity displaced due to the project activity during the year y (tCO_2/MWh).

The emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions through substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y)

$$\mathbf{ER_y = BE_{electricity, y} - PE_y}$$

Where,

ER_y = the emission reductions of the project activity during the year y in tons of CO_2.

BE_y = the baseline emissions due to the displacement of electricity during the year y in tons of CO_2

PE_y = the project emissions during the year y in tons of CO_2

Since, the project emissions for this project (PE_y) is zero,

$$\mathbf{ER_y = BE_{electricity, y}}$$

7. Summary of Voluntary Emission Reduction (VERs)

Period	Project Activity Emission (tonnes CO_2e)	Total Baseline Emissions (tonnes CO_2e)	Estimation of Leakage (tonnes CO_2e)	Emission Reduction (tonnes CO_2e)
01.05.2007 to 31.12.2007	0.00	2015.00	0.00	2015.00
01.01.2008 to 31.12.2008	0.00	3274.00	0.00	3274.00
01.01.2009 to 31.05.2009	0.00	1291.00	0.00	1291.00
Total	0.00	6580.00	0.00	6580.00

Year	Estimated Net Electricity Supplied to grid by Project (MWh)	Estimated PLF	Actual Net Electricity Supplied to grid by Project (MWh)	Actual PLF	Estimated Emission Reductions (tCO_2e)	Actual Emission Reductions (tCO_2e)
01.05.2007 to 31.05.2009	**9125.000**	**20.000%**	**7305.141**	**16.011%**	**8220**	**6580**

Note :- Estimated Net electricity supplied to grid by project was 9125 MWh on the basis of 20% PLF, amounting to estimated emission reduction of 8220 tCO_2e, while Actual Net Electricity supplied to grid by the project during the whole monitoring period is 7305.141 (MWh)on the basis of actual PLF 16.011%, amounting to actual emission reductions 6580 tCO_2e only.

Energy supplied to Grid

Raj Infrastructure Development (India) Pvt. Ltd.

WTG No. J 129 Feeder Jamde 9

Month	Controller (kWh)	Gross Export (kWh)	Import (kWh)	Net Export (kWh)
May-07	384061	372150	142	372008
Jun-07	267027	257080	615	256465
Jul-07	306776	295030	431	294599
Aug-07	267142	257499	193	257306
Sep-07	93472	89335	577	88758
Oct-07	53630	50109	1570	48539
Nov-07	24551	21613	2262	19351
Dec-07	44082	40541	1128	39413
Jan-08	60083	56541	1122	55419
Feb-08	68201	64647	860	63787
Mar-08	91524	86842	1117	85725
Apr-08	174653	168337	335	168002
May-08	442421	428381	5	428376
Jun-08	277843	266330	202	266128
Jul-08	296137	284709	68	284641
Aug-08	268015	258873	69	258804
Sep-08	124745	119881	749	119132
Oct-08	42534	39283	1760	37523
Nov-08	42476	39560	1245	38315
Dec-08	43189	40305	1230	39075
Jan-09	42927	39865	1067	38798
Feb-09	56710	53867	1005	52862
Mar-09	89703	85721	791	84930
Apr-09	188,878	181,723	513	181,210
May-09	377,933	365,567	54	365,513
Total	**4,128,713**	**3,963,789**	**19,110**	**3,944,679**

Raj Promoters & Civil Engineers Pvt. Ltd.

WTG No. J 116 Feeder Jamde 3

Month	Controller (kWh)	Gross Export (kWh)	Import (kWh)	Net Export (kWh)
May-07	62,849	60,983	65	60,918
Jun-07	222,902	215,915	261	215,654
Jul-07	253,281	244,645	288	244,357
Aug-07	204,309	197,550	456	197,094
Sep-07	77,090	73,591	620	72,971
Oct-07	37,669	35,398	1,112	34,286
Nov-07	13,717	11,975	1,215	10,760
Dec-07	27,899	25,747	947	24,800
Jan-08	49,741	46,665	924	45,741
Feb-08	63,114	59,874	954	58,920
Mar-08	81,655	77,665	983	76,682
Apr-08	174,994	170,358	487	169,871
May-08	450,733	436,076	-	436,076
Jun-08	273,637	264,816	260	264,556
Jul-08	276,930	268,255	-	268,255
Aug-08	266,949	258,366	-	258,366
Sep-08	119,419	114,236	950	113,286
Oct-08	34,151	31,545	1,423	30,122
Nov-08	38,711	36,141	1,011	35,130
Dec-08	35,983	33,239	1,204	32,035
Jan-09	35,725	33,191	942	32,249
Feb-09	54,410	51,936	1,144	50,792
Mar-09	85,367	81,646	700	80,946
Apr-09	155,665	150,282	425	149,857
May-09	408,671	396,762	-	396,762
Total	**3,505,571**	**3,376,857**	**16,371**	**3,360,486**

Thus the total Emission Reductions of **6580.00 tCO_2** is achieved by the project activity between 25th **April 2007 to 31st May 2009.**

Annexure 1

Table CEA database; version 3[2]

Baseline emission reductions have been estimated using combined margin emission factor (in kgCO2 equ/kWh) for the Western Region Grid

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE[3]

VERSION	3.0
DATE	15 December 2007
BASELINE METHODOLOGY	ACM0002 / Ver 07

Simple Operating Margin (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.98	0.98	1.00	0.99	0.98	1.00	1.00
East	1.22	1.19	1.17	1.20	1.17	1.13	1.09
South	1.02	1.00	1.01	1.00	1.00	1.01	1.00
West	0.98	1.01	0.99	0.99	1.01	1.00	0.99
North-East	0.74	0.71	0.74	0.74	0.90	0.70	0.70
India	1.01	1.02	1.02	1.02	1.02	1.02	1.01

Build Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.53	0.60	0.63
East					0.90	0.97	0.93
South					0.70	0.71	0.71
West					0.77	0.63	0.59
North-East					0.15	0.15	0.23
India					0.69	0.68	0.68

Combined Margin/MWh		
Year	Value	Unit
Simple operating margin(2004-05)	1.01	tCO2/MWh
Simple operating margin(2005-06)	1.00	tCO2/MWh
Simple operating margin(2006-07)	0.99	tCO2/MWh
Average operating margin	1.00	tCO2/MWh
operating margin(2006-07	0.59	tCO2/MWh
Weight of OM (wOM)	0.75	
Weight of BM (wBM)	0.25	

[2] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver3.pdf
[3] http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver3.zip

BE = EGy * EFgrid

Where:

EGy - is the net quantity of electricity generated by the project in year y, and

EFgrid – is the carbon emission factor of the Grid

Emission Estimation:

Western Regional Grid Emission Factor – 901 T CO2/GWh

Baseline emissions or CERs generated by the project are estimated to be:

Baseline emissions (project) = Grid emission factor) * Power generated from the Project (tons of CO2) (tons of CO2/GWh) (GWh/year)

Annexure 2: Undertaking from PP related to VCS PD clause 1.12; 1.13

410, PRIDE SILICON PLAZA, SENAPATI BAPAT RD.,
NEXT TO CHATUSHRINGI TEMPLE, PUNE 411016

TEL : 25635050, 25636060
FAX : 91 20 25633030
EMAIL : rajgrouppune@rediffmail.com
WEBSITE : www.rajgrouppune.net

RAJ GROUP

RAJ PROMOTERS & CIVIL ENGINEERS PVT. LTD.
GOVT. REGD. CLASS I CONTRACTORS

TO WHOMSOEVER IT MAY CONCERN

We hereby inform that Raj Promoters & Civil Engineers. Pvt. Ltd. has setup 1 wind turbine generator (WTGs), at wind prone locations in Village: Isharde, Taluka: Sakri, Dist. Dhule, Maharashtra. Central & State Govt. has declared these locations for wind power development. Total installed capacity is 1.25 MW (1.25 X 1) WTG No. J - 116. The WTG is commissioned in year 2006 and is in running condition.

We also hereby confirm that we shall not claim GHG credits of this project under more than one GHG program.

With Best Regards,
For **Raj Promoters & Civil Engineers. Pvt. Ltd.,**

RAJ PROMOTERS & CIVIL ENGRS. PVT. LTD. REG NO: 11-101975

(Dr. R. G. Hiremath)
Director - Finance & Admin

Date : November 16, 2009
Place : Pune

410, PRIDE SILICON PLAZA, SENAPATI BAPAT RD.,
NEXT TO CHATUSHRINGI TEMPLE, PUNE 411016

TEL : 25635050, 25636060
FAX : 91 20 25633030
EMAIL : rajgrouppune@rediffmail.com
WEBSITE : www.rajgrouppune.net

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We also hereby inform that the project has not applied / created another form of environmental credit.

With Best Regards,
For **Raj Promoters & Civil Engineers. Pvt. Ltd.,**

RAJ PROMOTERS & CIVIL ENGRS. PVT. LTD. REG NO: 11-101975

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410, PRIDE SILICON PLAZA, SENAPATI BAPAT RD.,
NEXT TO CHATUSHRINGI TEMPLE, PUNE 411016

TEL : 25635050, 25636060
FAX : 91 20 25633030
EMAIL : rajgrouppune@rediffmail.com
WEBSITE : www.rajgrouppune.net

RAJ GROUP

RAJ INFRASTRUCTURE DEVELOPMENT (INDIA) PVT. LTD.
GOVT. REGD. CLASS I CONTRACTORS

TO WHOMSOEVER IT MAY CONCERN

We hereby inform that Raj Infrastructure Development (India) Pvt. Ltd. has setup 1 wind turbine generator (WTGs), at wind prone locations in Village: Chhadvel, Taluka: Sakri, Dist. Dhule, Maharashtra. Central & State Govt. has declared these locations for wind power development. Total installed capacity is 1.25 MW (1.25 X 1) WTG No. J - 129. The WTG is commissioned in year 2006 and is in running condition.

We also hereby confirm that we shall not claim GHG credits of this project under more than one GHG program.

With Best Regards,
For **Raj Infrastructure Development (India) Pvt. Ltd.,**

RAJ INFRASTRUCTURE DEVELOPMENT (I) PVT. LTD. REG NO: 11-102009

(Dr. R. G. Hiremath)
Director - Finance & Admin

Date : November 16, 2009
Place : Pune

410, PRIDE SILICON PLAZA, SENAPATI BAPAT RD.,
NEXT TO CHATUSHRINGI TEMPLE, PUNE 411016

TEL : 25635050, 25636060
FAX : 91 20 25633030
EMAIL : rajgrouppune@rediffmail.com
WEBSITE : www.rajgrouppune.net

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GOVT. REGD. CLASS I CONTRACTORS

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We also hereby inform that the project has not applied / created another form of environmental credit.

With Best Regards,
For **Raj Infrastructure Development (India) Pvt. Ltd.,**

RAJ INFRASTRUCTURE DEVELOPMENT (I) PVT. LTD. REG NO: 11-102009

(Dr. R. G. Hiremath)
Director - Finance & Admin

Date : November 16, 2009
Place : Pune

Annexure 3: Proof of Title

Copies of Commissioning Certificates of both the WTG's are provided to the verification team.