

# VCS MONITORING REPORT



## WIND POWER PROJECT AT THENI BY POWERICA LIMITED



Document Prepared by EKI Energy Services Limited

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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Implementation Status of the Project

The project activity involves an installation of 6 Wind Turbine Generators (WTG) of total generating capacity of 9.9 MW (6 units of Vestas make V82 WTG). The WTG units are installed in Theni district in the state of Tamilnadu, India. The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources and to contribute to climate change mitigation efforts. In the absence of the project activity, the electricity thus supplied would have been generated through fossil fuel based thermal power plants. The project activity thus contributes to reduction in specific emissions (emissions of pollutant) including GHG emissions. The project activity is also responsible for sustainable economic growth and conservation of environment through use of wind as a renewable source. The project is located in Tamil Nadu state and each WTG have separate feeder and separate meter.

The project activity is a greenfield project for generation of electrical energy using wind which is a renewable source of energy. Thus, this project actually displaces the electricity grid which is essentially fossil-fuel based.

The start date of the project activity is 13-September-2010, which is the date of commissioning of the first WTG. The project has been operational since the commissioning and has contributed to reduction in greenhouse gas emissions.

The annual estimated emission reductions are 22,798 tCO<sub>2e</sub>.

Total GHG emissions reductions achieved during the current monitoring period 13-September-2010 to 30-April-2011 is 3,935 tCO<sub>2e</sub>.

## 1.2 Sectoral Scope and Project Type

Sectoral scope 1: Energy Industries (renewable / non-renewable sources).

Project type: Renewable energy project (Wind)

The project activity is not a grouped project

## 1.3 Project Proponent

<b>Organization name</b>	Powerica Limited
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<b>Contact person</b>	Mr. Pradeep Gupta
<b>Title</b>	Head - Wind Energy Division
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#### 1.4 Other Entities Involved in the Project

<b>Organization name</b>	EKI Energy Services Limited
<b>Role in the Project</b>	Project Consultant
<b>Contact person</b>	Mr. Rahul Kulkarni
<b>Title</b>	Project Manager
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#### 1.5 Project Start Date

The project start date is 13-September-2010 which is the date of commissioning of the first phase of the 9.9 MW wind power project.

#### 1.6 Project Crediting Period

The crediting period of the project activity is for 10 years (renewable twice).

Project crediting period: 13-September-2010 to 12-September-2020

The project is registered under Clean Development Mechanism (CDM) of UNFCCC with 7 years crediting period (Renewable) (Reference No: 4572<sup>1</sup>) on 17-March-2011. The First Crediting Period (Renewable twice) of the project under CDM starts on 01-May-2011 and ends on 30-April-2018 while the second crediting period starts on 01-May-2018 and ends on 30-April-2025<sup>2</sup>.

## 1.7 Project Location

The project activity located in Taluka: Andipatti, District: Theni, State: Tamilnadu.

The unique location information of the WTG is provided in the table below. The WTG numbers indicated in the table below are unique identification number provided by the state utility.

The geo-coordinates of each WTG are as follows:

WTG No.	HTSC No.	Latitude	Longitude	Village
TSSP1255	T-144	9° 59' 40//	77° 34' 10//	Shanmuga Sundarapuram
TM721	T-141	9° 58' 46//	77° 34' 43//	Mottanuthu
TSSP158	T-142	9° 59' 08//	77° 34' 39//	Shanmuga Sundarapuram
TM41	T-145	9° 58' 34//	77° 35' 24//	Mottanuthu
TGU28	T-139	9° 57' 03//	77° 33' 33//	Usilampatti
TSSP174	T-143	9° 59' 23//	77° 34' 43//	Shanmuga Sundarapuram

<sup>1</sup> <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view>

<sup>2</sup> <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view>



**Note:** Map not drawn to scale

## 1.8 Title and Reference of Methodology

Methodology: Grid connected renewable electricity generation

Reference: AMS-I.D. Version 16.0

Methodology AMS I.D. also refers to:-

- Tool to calculate the emission factor for an electrical system, Version 02, EB 50

## 1.9 Participation under other GHG Programs

The project activity has also been registration with UNFCCC under Clean Development Mechanism (CDM) program, Registration reference number is 4572<sup>3</sup>. The project proponent has provided undertaking that it will not claim any GHG credits for UNFCCC CDM during the current monitoring period.

## 1.10 Other Forms of Credit

India is Non-annex 1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM and UNFCCC (Registration ID 4572<sup>4</sup>). The project proponent (PP) has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. PP has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

<sup>3</sup> <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view>

<sup>4</sup> <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view>

## 1.11 Sustainable Development

The Designated National Authority (DNA) for the Government of India (GoI) on the Ministry of Environment, Forest and Climate Change (MoEFCC)<sup>5</sup>, called the National CDM Authority (NCDMA), has stipulated four indicators on sustainable development for Clean Development Mechanism (CDM) projects structured in India. The project participants' view on the contribution of this project activity towards sustainable development follows these four indicators as explained below:

### Social well-being:

- **Generating Local Employment:** The installation of wind power project in rural areas resulted in generating local employment opportunities and capacity building of the local employees. The project activity created both direct and indirect employment throughout the life-cycle of the project activity.
- **Encouragement to entrepreneurs:** The project has provided encouragement to other entrepreneurs to invest into renewable energy sources.

### Economic well-being:

- **Rural Development:** The installation of wind power project resulted in rural and infrastructural development in the surrounding rural areas.
- **Economic Development:** The generation of wind power resulted in improving the reliability of the Grid electricity and thereby enhance economic development in the region.

### Environment well-being:

- **Reduction in the consumption of fossil fuels:** The installation of power plant generating electricity through renewable resource such as wind power, lead to reduction in usage of fossil fuels e.g. Coal, oil, natural gas.
- **Reduction in GHG emissions:** The reduction in usage of fossil fuels for electricity generation resulted in reduction of the release of associated GHG emissions (CO<sub>2</sub> and CH<sub>4</sub> emissions).
- **Improvement of Air Quality:** The use of renewable energy for power generation avoided the emission of air pollutants such as Suspended Particulate Matter (SPM), Sulphur Dioxide (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>x</sub>) thereby improving the surrounding air quality
- **Conservation of Natural Resources:** Installation of wind power plant resulted in conserving fast depleting natural resources such as coal, oil etc.

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<sup>5</sup> <https://moef.gov.in/en/>

**Technological well-being:**

- **Advanced Technology:** The project activity has installation and operation of state-of-art wind turbine generators (WTGs) of Vestas make. The implementation of these new technologies helped in increasing reliability of renewable energy generation and encourage development of even better technology in the future.
- **Safe and Sound Technology:** The project activity deploys the technology, which is environmentally safe and sound, as it does not produce greenhouse gases and any toxic or radioactive waste.

## 2 SAFEGUARDS

### 2.1 No Net Harm

The project does not involve any potential negative environmental and socio economic impacts and hence this criteria is not applicable to this project activity.

### 2.2 Local Stakeholder Consultation

Project Proponent had invited different stakeholders to a meeting to explain the proposed project activity and benefits associated with it on 09-July-2010.

The stakeholders identified for the project activity are as follows:

1. Vestas employees
2. Local Villagers
3. Government officials (District Magistrate, etc.)

In order to address and incorporate the concerns of the local stake-holders, Powerica Limited sent out invitation letters to the identified stake-holders 4-5 days in advance. The letter contained information regarding date and place of the meeting along with a clear picture of the agenda of the meeting and a broad description of the project activity. An advertisement for the meeting was displayed in local newspaper as well.

The stakeholder meeting was conducted on 09-July-2010.

Powerica Limited received all necessary approvals / clearances / permissions from various local bodies which represent the local stakeholders. The stake holders meetings was conducted at the respective project sites and was attended by the

office bearers and residents of the nearby villages and those employed in the project activity. Powerica Limited has taken care of all the conditions stipulated in the relevant clearances and no adverse comment has been raised. The local villagers and the office bearers expressed their happiness with the setting up of an environment friendly power project in their village as it had resulted in generation of direct and indirect employment opportunities both for literate and illiterate people. Development of infrastructure in the locality was highly appreciated. The employees hired for the project activity from the local area stated that the project activity has provided them with a means of livelihood in their own village and helped them in getting equipped with technical skills.

The process of local stakeholder consultation is continuous. During the current monitoring period, the project proponent has kept grievance register in plant site office and sought comments/grievances/suggestions from local stakeholders including local community, government agencies and NGOs. However, no comments/grievances/suggestions have been received from the aforementioned stakeholders during the current monitoring period.

### 2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

## 3 IMPLEMENTATION STATUS

### 3.1 Implementation Status of the Project Activity

The project has been completed and the monitoring equipments were installed to monitor the parameters as described in the registered Project Description (PD). All the WTGs involved in the project activity are already commissioned and operational.

The salient features of the technology utilized are:

#### **Vestas V82 1.65 MW\_50Hz**

Lifetime	20 years
Rated Power	1,650 kW
Rotor diameter	82 m
Swept area	5,281 m <sup>2</sup>
No. of blades	3
Cut in wind speed	3.5 m/s
Cut out wind Speed	25 m/s

Rotor Speed	14.4 rpm
Regulation	Active-Stall
Hub Height	78 m
Generator Type	Asynchronous
Insulation	Class F

The WTGs are under operation since the date of commissioning and no event has been identified which may impact GHG emission reduction. The commissioning dates of all the WTGs are provided as below.

<b>WTG No.</b>	<b>Village Name</b>	<b>Date of commissioning</b>
TSSP1255	Shanmuga Sundarapuram	13-September-2010
TM721	Mottanuthu	13-September-2010
TSSP158	Shanmuga Sundarapuram	13-September-2010
TM 41	Mottanuthu	17-September-2010
TGU28	Usilampatti	13-September-2010
TSSP174	Shanmuga Sundarapuram	13-September-2010

The energy meters are installed at each WTG site and also at substation feeder line. The WTGs undergone normal operation without any major breakdown during the current monitoring period.

## 3.2 Deviations

### 3.2.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

### 3.2.2 Project Description Deviations

No project description deviation is applied during the monitoring period.

### 3.3 Grouped Projects

The project is not a grouped project thus this is not applicable.

## 4 DATA AND PARAMETERS

### 4.1 Data and Parameters Available at Validation

<b>Data / Parameter</b>	EF <sub>grid,OM,y</sub>
<b>Data unit</b>	tCO <sub>2</sub> /MWh
<b>Description</b>	Weighted average of 3 years , 2006-07, 2007-08 and 2008-09) CO <sub>2</sub> Operating Margin emission factor of the Southern(erstwhile) grid
<b>Source of data</b>	Central Electricity Authority:CO <sub>2</sub> Emission Database CEA CO <sub>2</sub> Baseline database Version 05, November 2009
<b>Value applied</b>	0.9868
<b>Justification of choice of data or description of measurement methods and procedures applied</b>	Obtained from the CEA database on CO <sub>2</sub> Baseline for Indian Power Sector, Version 04 as the weighted average of Operating Margin (incl. imports) for years 2006-07, 2007-08 and 2008-09 of Southern grid
<b>Purpose of Data</b>	Calculation of baseline emissions
<b>Comments</b>	The value is fixed and it is same for the entire crediting period

<b>Data / Parameter</b>	EF <sub>grid,BM,y</sub>
<b>Data unit</b>	tCO <sub>2</sub> /MWh
<b>Description</b>	Build margin CO <sub>2</sub> emission factor of Southern (erstwhile) grid
<b>Source of data</b>	Central Electricity Authority:CO <sub>2</sub> Emission Database CEA CO <sub>2</sub> Baseline database Version 05; November 2009
<b>Value applied</b>	0.8179

Justification of choice of data or description of measurement methods and procedures applied	Obtained from the CEA database on CO <sub>2</sub> Baseline for Indian Power Sector, Version 05, November 2009
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO <sub>2</sub> /MWh
Description	Combined margin CO <sub>2</sub> emission factor for Southern(erstwhile) grid
Source of data	Central Electricity Authority:CO <sub>2</sub> Emission Database CEA CO <sub>2</sub> Baseline database Version 05; November 2009
Value applied	0.9445
Justification of choice of data or description of measurement methods and procedures applied	<p>The combined margin emissions factor is calculated as follows:</p> $EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM}$ <p>The following default values should be used for <math>w_{OM}</math> and <math>w_{BM}</math>: For Wind power generation project activities: <math>w_{OM} = 0.75</math> and <math>w_{BM} = 0.25</math> for the selected crediting period Data compiled in CEA CO<sub>2</sub> CDM database is in line with the requirements Version 02.2.1 of "Tool to calculate the emission factor for an electricity system"</p>
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

## 4.2 Data and Parameters Monitored

Data / Parameter	$EG_y$
Data unit	MWh
Description	Quantity of net electricity exported to grid in year y

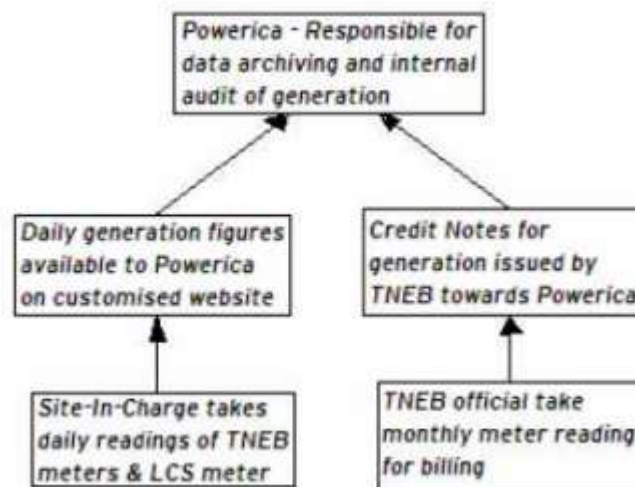
Source of data	TNEB statement
Description of measurement methods and procedures to be applied	<p><u>Monitoring</u>: Electrical Energy Meters which are electronic tri-vector meters of</p> <p>Accuracy class 0.5s (Main &amp; Check meters)</p> <p><u>Data type</u>: Measured &amp; Calculated</p> <p><u>Archiving</u>: Paper &amp; Electronic</p> <p><u>Recording Frequency</u>: Daily</p> <p><u>Responsibility</u>: The O&amp;M site-in-charge shall be responsible for the regular recording of data.</p> <p><u>Calibration Frequency</u>: The meters shall be calibrated once every two years.</p>
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value monitored	4167.72
Monitoring equipment	<p><b>Monitoring Equipment</b>: Monitored through the main meter and check meter readings. Both the energy meters are bi-directional tri-vector meters.</p> <p>Meter accuracy: 0.5s of the meter at respective WTG yards that used for the electricity metering.</p> <p>Please refer to Appendix 1 for energy meter details and calibration of the meters.</p>
QA/QC procedures to be applied	The Quantity of net electricity generation from the certificates for share of electricity are cross-checked with the invoices for the sale of power by Powerica Limited.
Purpose of the data	Calculation of baseline emissions
Calculation method	Not Applicable
Comments	The Monitored Data to be kept for a minimum of two years after the end of the crediting period or the last issuance whichever is later.

### 4.3 Monitoring Plan

The project activity is in accordance with approved small scale methodology AMS I.D, and therefore, of the simplified M&P for small-scale CDM project activities-Version 16, - Grid connected renewable electricity generation.

The monitoring methodology specified in the methodology requires that the project monitoring plan to consist of monitoring of quantity of net electricity supplied to the grid in the year y. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

Since the baseline methodology is based on ex-ante determination of the baseline emission factor, the monitoring of baseline emission factor is not required. The sole parameter for monitoring is the electricity exported to the grid. The Project is operated and managed by Vestas Wind Technology India Private Limited (Vestas). Vestas have a designated Site-In-Charge (O&M) on site who is responsible for monitoring the electricity exported from the project activity. The overall flow of information has been depicted using the following hierarchical structure:



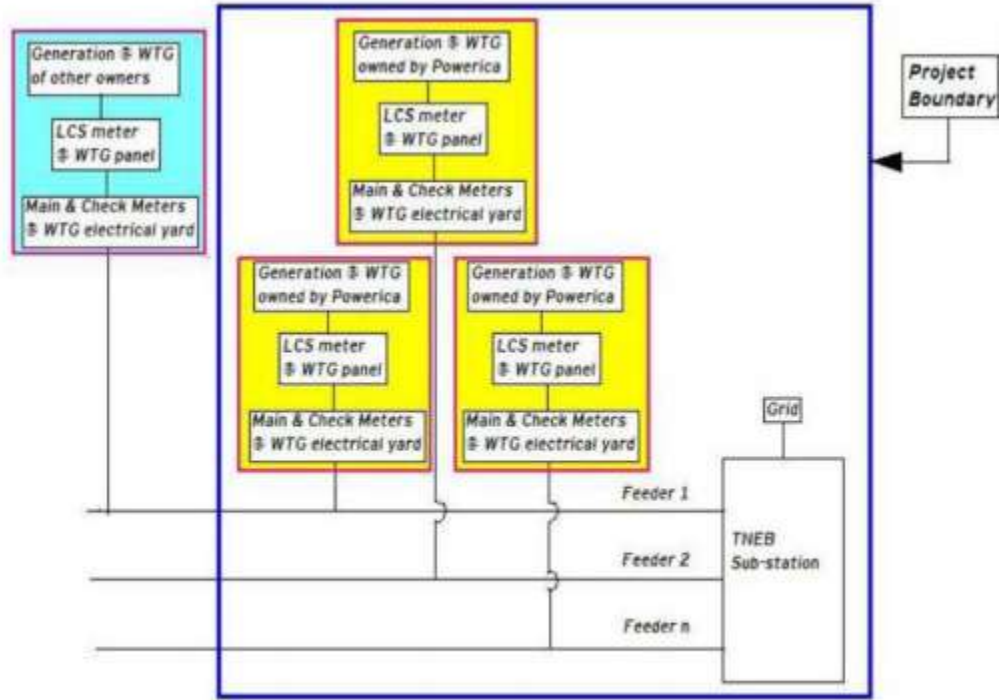


Figure 3: Project Boundary Diagram

The monitoring is done at the WTG electrical yard substation using a TNEB owned electronic trivector meters. The net electricity exported to grid is calculated as the product of difference of current and previous TNEB meter readings multiplied with the multiplying factor of the meter.

Additionally, all the WTGs at the site are connected to a central monitoring system located at that site only. This system captures daily generation figures which are later made available to Powerica on the customized website of Vestas.

#### Internal audits & Performance review

The records are regularly audited and checked by the senior officials from project proponent on an annual basis. The officials have monitored the actual emission reduction. The personnel responsible for taking readings at site are adequately trained.

#### Emergency Preparedness

In the context of the project activity, the meters are sealed by TNEB and all maintenance has been taken up by TNEB only. In case of failure of the main meter, generation value of controller meter would be considered. The state electricity board has removed check meters, hence only main meters are part of project activity.

The project promoters have contracted the technology supplier for providing O&M services for the power project. The service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities. Additionally, spare meters would also be kept available at the site for replacement in case of failure of any of the monitoring equipment.

## 5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

### 5.1 Baseline Emissions

The emission factor value has been fixed Ex-ante and the same shall be used for the monitoring period. Net Electricity Generated is obtained by deducting total import (from grid) from total export (to grid). These values are taken from the “Certificate for Share of Electricity Generated by Wind Farm” issued by state electricity board. This statement is issued on a monthly basis.

Baseline emissions are calculated by multiplying the Net electricity exported to the grid with net baseline emission factor, as given in the registered VCS PD.

$$BE_y = EG_{BL, y} \times EF_{grid, CM, y}$$

Where,

$BE_y$  = Baseline Emissions (tCO<sub>2</sub>/year)

$EG_{BL, y}$  = Net Electricity exported to grid in year y (MWh)

$EF_{grid, CM, y}$  = Baseline Emission Factor (Combined margin CO<sub>2</sub> emission factor for grid)

Total net electricity exported to grid during the monitoring period= 4167.72 MWh

$EF_{grid, CM, y} = 0.9445 \text{ tCO}_2/\text{MWh}$

Therefore, Baseline Emission ( $BE_y$ ) =  $4167.72 \times 0.9445 = 3,935$  tCO<sub>2</sub> (The value is rounded down)

Hence the baseline emission calculated for the reported monitoring period is 3,935 tCO<sub>2</sub> i.e.  $BE_y = 3,935$  tCO<sub>2</sub>e

## 5.2 Project Emissions

No project emissions are applicable to this wind electric power project, since the electricity generation is based on wind resources, which does not involve in combustion or generation of emissions from fossil fuels. Hence, these emission sources are neglected.

$$PE_y = 0$$

## 5.3 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.

$$LE_y = 0$$

## 5.4 Net GHG Emission Reductions and Removals

The Formula used to calculate the net emission reduction for the project activity is

$$ER_y = BE_y - PE_y - LE_y$$

Where,

$ER_y$  = Emission Reduction in tCO<sub>2</sub>/year

$BE_y$  = Baseline emission in tCO<sub>2</sub>/year

$PE_y$  = Project emissions in tCO<sub>2</sub>/year

$LE_y$  = Leakage Emissions in tCO<sub>2</sub>/year

For the project activity during the current monitoring period, as per section 5.1

$$BE_y = 3,935 \text{ tCO}_2\text{e}$$

$$PE_y = 0 \text{ tCO}_2\text{e}$$

$$LE_y = 0 \text{ tCO}_2\text{e}.$$

Year	Baseline emissions or removals (tCO <sub>2</sub> e)	Project emissions or removals (tCO <sub>2</sub> e)	Leakage emissions (tCO <sub>2</sub> e)	Net GHG emission reductions or removals (tCO <sub>2</sub> e)
2010	2,722	0	0	2,722
2011	1,213	0	0	1,213
<b>Total</b>	3,935	0	0	3,935

The actual ER is about 72.61% lower than the estimated VCUs. This variation is majorly due to the variations in wind flow pattern, grid availability and other parameters which are not in the control of PP.

# APPENDIX 1: METER CALIBRATION DETAILS

WTG No.	Serial No.	Make	Accuracy Class	Date of calibration	Due date of Calibration
TGU 28 (T-139)	Main meter TNB 04397 Check meter TNB 04431	Secure	0.5 S	11-August-2010	10-August-2012
TM 41 (T-145)	Main Meter TNB 04425 Check meter TNB04434	Secure	0.5 S	11-August-2010	10-August-2012
TSSP 158 (T-142)	Main meter TNB 04415 Check meter TNB 04433	Secure	0.5 S	11-August-2010	10-August-2012
TSSP 174 (T-143)	Main meter TNB 04423 Check meter TNB04432	Secure	0.5 S	11-August-2010	10-August-2012
TM 721 (T-141)	Main meter TNB04426 Check meter TNB04435	Secure	0.5 S	11-August-2010	10-August-2012
TSSP 1255 (T-144)	Main meter TNB 04427 Check meter TNB 04436	Secure	0.5 S	11-August-2010	10-August-2012

As per registered PDD, the calibration frequency is once in every two years, hence considering the above details. There is no any delay in energy meter calibration during this monitoring period.