

# GRID CONNECTED WIND POWER PROJECT IN TAMIL NADU

Document Prepared By CLP Wind Farms (India) Private Limited

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## Table of Contents

1	Project Details .....	3
1.1	Summary Description of Project.....	3
1.2	Sectoral Scope and Project Type.....	3
1.3	Project Proponent .....	3
1.4	Other Entities Involved in the Project.....	5
1.5	Project Start Date .....	5
1.6	Project Crediting Period .....	5
1.7	Project Location.....	6
1.8	Title and Reference of Methodology .....	6
2	Implementation Status.....	6
2.1	Implementation Status of the Project Activity.....	6
2.2	Project Description Deviations .....	6
2.3	Grouped Project .....	6
3	Data and Parameters .....	6
3.1	Data and Parameters Available at Validation .....	7
3.2	Data and Parameters Monitored .....	8
3.3	Description of the Monitoring Plan .....	9
4	Quantification of GHG Emission Reductions and Removals .....	12
4.1	Baseline Emissions .....	12
4.2	Project Emissions.....	12
4.3	Leakage.....	13
4.4	Summary of GHG Emission Reductions and Removals.....	13
5	Additional Information.....	14
	Annexure 01: WTG Co-ordinates.....	16

## 1 PROJECT DETAILS

### 1.1 Summary Description of Project

The project has been implemented by CLP Wind Farms (India) Private Limited (“CLP”) in the state of Tamil Nadu and is the Project Proponent (PP) of this project activity. The Wind Turbine Generators (“WTG”) have been supplied by Vestas Wind Technology India Private Limited (“Vestas”). As per the Supply and Services agreement signed between CLP and Vestas, lateris responsible for technology and equipment supply, as well as the operation and maintenance of the WTGs. The project activity involves generation of electric power using wind energy from CLP’s 24.75 MW(15 x 1.65 MW) wind farms (“the Project”) in the Tamil Nadu state in India. The power generated from this project activity will be supplied to the state electricity grid which is a part of Southern regional grid of India. The Southern regional grid comprises of 4 states, namely Andhra Pradesh, Tamil Nadu, Karnataka, Kerala and 2 union territories, namely Pondicherry and Lakshadweep.

### 1.2 Sectoral Scope and Project Type

The project activity is considered under ‘grid-connected electricity generation from renewable sources’.(Sectoral Scope)that generates electricity in excess of 15 MW (limit for small scale project). Therefore as per the scope of the project activity enlisted in the ‘list of sectoral scopes and related approved baseline and monitoring methodologies’, the project activity is categorized in Scope Number 1, Sectoral Scope - Energy industries (renewable/ non-renewable sources). The project activity is comes under “Project” category as per VCS definitions.

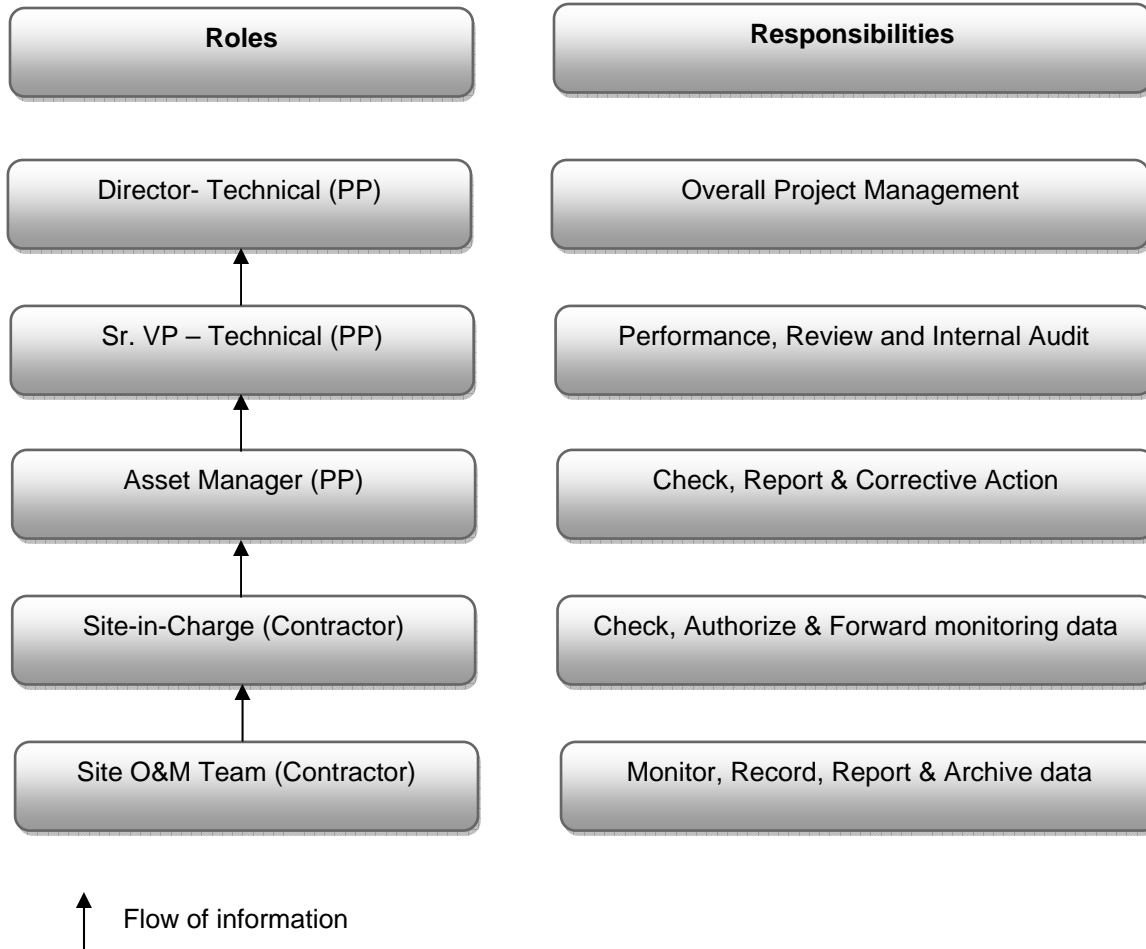
The Project activity is non-AFOLU and is not a grouped project

### 1.3 Project Proponent

<b>Organization:</b>	CLP Wind Farms (India) Private Limited
<b>Street/P.O.Box:</b>	Off Western Express Highway, Goregaon (East),
<b>Building:</b>	15th Floor, OberoiCommerz,
<b>City:</b>	Mumbai
<b>State/Region:</b>	Maharashtra.
<b>Postfix/ZIP:</b>	400 063
<b>Country:</b>	India
<b>Telephone:</b>	+91 - 22 - 6758 8888
<b>FAX:</b>	+91 - 22 - 6758 8811
<b>E-Mail:</b>	<a href="mailto:carbon@clpindia.in">carbon@clpindia.in</a>
<b>URL:</b>	<a href="http://www.clpindia.in">www.clpindia.in</a>
<b>Represented by:</b>	Dipjay Sanchania

<b>Title:</b>	Head – CDM
<b>Salutation:</b>	Mr.
<b>Last Name:</b>	Sanchania
<b>Middle Name:</b>	
<b>First Name:</b>	Dipjay
<b>Department:</b>	Business Development – Renewables
<b>Mobile:</b>	
<b>Direct FAX:</b>	+91 - 22 - 6758 8811
<b>Direct tel:</b>	+91 - 22 - 6758 8840
<b>Personal E-Mail:</b>	<a href="mailto:carbon@clpindia.in">carbon@clpindia.in</a>

The roles and responsibilities of the project proponent have been mentioned in the diagram below:



#### 1.4 Other Entities Involved in the Project

No other entities are involved in the project.

#### 1.5 Project Start Date

02/07/2010, being the date of commissioning of first WTG installed under the project activity.

#### 1.6 Project Crediting Period

The crediting period start date is 02/07/2010. The project proponent has chosen a 10 years renewable crediting period. Hence, the first crediting period for the project activity is from 02/07/2010 to 01/07/2020. The project proponents is undertaking the same project activity under CDM<sup>1</sup> however VCU's shall be claimed only till the day before the date of registration of the project under CDM.

<sup>1</sup><http://cdm.unfccc.int/Projects/Validation/DB/QEJVYBH36RERGD2GCQSDVVCZH1DK8/view.html>

## 1.7 Project Location

The Project is spread across Jangalpatti, Poomalaikundu, & Seepalakottai villages in Theni & Uttamapalayam taluka of Theni district of Tamil Nadu state in India. The nearest railway station and airport from Project activity site is Madurai, which is approximately 75 km from the project site. The details of the physical location (geographic co-ordinates) of the project activity are presented in Annexure 01.

## 1.8 Title and Reference of Methodology

The approved consolidated baseline and monitoring methodology ACM0002 (Version 13.0.0, EB67)<sup>2</sup>, has been used to determine the baseline emissions and emission reduction due to the project activity. The title of this baseline methodology is “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”.

The other UNFCCC documents referred are as below

- Tool for the demonstration and assessment of additionality (Version 06.0.0, EB 65)
- Tool to calculate the emission factor for an electricity system (Version 02.2.1, EB 63)
- Guidance on assessment of investment analysis (05, EB 62)

## 2 IMPLEMENTATION STATUS

### 2.1 Implementation Status of the Project Activity

- **Implementation Status:**

All the WTGs of the project activity are commissioned. The commissioning dates of the individual WTGs have been provided in Annexure 01 of this document. There were neither major breakdowns nor other events for the Project activity during the monitoring period.

- **Operation of the project activity including Specific events that may impact the GHG emission reductions or removals and monitoring:**

No such events took place during the monitoring period that may impact the GHG emission reductions for the project activity.

### 2.2 Project Description Deviations

No deviation from the monitoring plan has been taken.

### 2.3 Grouped Project

The project activity is not a grouped project

## 3 DATA AND PARAMETERS

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<sup>2</sup><http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT>

### 3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	<b>EF<sub>grid,OM,y</sub></b>																	
Data unit:	tCO <sub>2</sub> e/MWh																	
Description:	Operating Margin (OM) Emission Factor of Southern regional electricity grid																	
Source of data:	The CO <sub>2</sub> Baseline Database for the Indian Power Sector - Ministry of Power: Central Electricity Authority (CEA) Version 7.																	
Value applied:	<table border="1"> <thead> <tr> <th>Year</th> <th>Simple operating margin of Southern regional grid (tCO<sub>2</sub>e/MWh)</th> <th>Net electricity generation in the year (MWh)</th> </tr> </thead> <tbody> <tr> <td><b>2008-09</b></td> <td>0.9729</td> <td>121471.25</td> </tr> <tr> <td><b>2009-10</b></td> <td>0.9415</td> <td>134716.87</td> </tr> <tr> <td><b>2010-11</b></td> <td>0.9419</td> <td>137387.26</td> </tr> <tr> <td colspan="2">Generation weighted average Operating Margin emission factor in the last three years</td> <td>0.9513</td> </tr> </tbody> </table>			Year	Simple operating margin of Southern regional grid (tCO <sub>2</sub> e/MWh)	Net electricity generation in the year (MWh)	<b>2008-09</b>	0.9729	121471.25	<b>2009-10</b>	0.9415	134716.87	<b>2010-11</b>	0.9419	137387.26	Generation weighted average Operating Margin emission factor in the last three years		0.9513
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<b>2010-11</b>	0.9419	137387.26																
Generation weighted average Operating Margin emission factor in the last three years		0.9513																
Purpose of the data:	Baseline emission calculations																	
Any comment:	Operating margin emission factor is fixed ex-ante throughout the crediting period.																	

Data Unit / Parameter:	<b>EF<sub>grid,BM,y</sub></b>		
Data unit:	tCO <sub>2</sub> e/MWh		
Description:	Build Margin (BM) Emission Factor of Southern regional electricity grid		
Source of data:	The CO <sub>2</sub> Baseline Database for the Indian Power Sector - Ministry of Power: Central Electricity Authority (CEA) Version 7.		
Value applied:	0.7339 tCO <sub>2</sub> /MWh for the year 2010-11		
Purpose of the data:	Baseline emission calculations		
Any comment:	Build margin emission factor is fixed ex-ante throughout the crediting period.		

Data Unit / Parameter:	<b>EF<sub>grid,CM,y</sub></b>		
Data unit:	tCO <sub>2</sub> e/MWh		
Description:	Combined Margin (CM) Emission Factor of Southern regional electricity grid		
Source of data:	The CO <sub>2</sub> Baseline Database for the Indian Power Sector - Ministry of Power: Central Electricity Authority (CEA) Version 7.		
Value applied:	Computed using the following formula		

	$EF_{grid,y} = W_{OM} * EF_{grid,OM,y} + W_{BM} * EF_{grid, BM,y}$ $EF_{grid,y} = 0.75 * 0.9513 + 0.25 * 0.7339 = 0.8969$ <p>Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”</p>
Purpose of the data:	Baseline emission calculations
Any comment:	Combined margin emission factor is fixed ex-ante throughout the crediting period.

### 3.2 Data and Parameters Monitored

Data Unit / Parameter:	$EG_{PJ,y}$
Data unit:	MWh (Mega-watt hour)
Description:	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity during the period y
Source of data:	The electricity supplied to the grid would be taken from the Joint Meter Reading Report carried out at the TNEB meter located near each WTG.
Description of measurement methods and procedures to be applied:	<p>The net electricity supplied to the grid is measured by the main meters(or by check meter in case of error in main meter installed) by TNEB at the metering point near each WTG.</p> <p>Quantity of net electricity generated and fed grid by the project activity is the summation of net electricity supplied to grid by each of the 15 WTGs of the project activity</p>
Frequency of monitoring/recording:	<p>The main meter and check meters, located near the foot of the turbine, continuously monitors export, import and net export of energy from each turbine.</p> <p>The readings at the Metering Point are undertaken every month jointly by the representatives of the State Grid/ TNEB and CLP/Vestas representative.</p> <p>Based on these meter readings, TNEB issues generation record/ JMR that contains export, import and net export of each WTGs of the project activity. Thus the recording frequency for this data is monthly.</p>

Value monitored:	Electricity supplied to the grid by the Project during the monitoring period = 100,695.870 MWh
Monitoring equipment:	<p>The project proponent has installed two identical 0.5s accuracy class Trivector Meters, referred as main and check meters.</p> <p>These meters are located at the foot of the turbine on 33kv outgoing feeders. ( Metering Point)</p> <p>Reading of the main meter is taken for the billing purpose, while the same is getting cross checked using the check meter.</p> <p>The metering equipments (main and check) are duly approved, tested and sealed by TNEB in the presence of the parties involved (TNEB and Vestas).</p>
QA/QC procedures to be applied:	<p>The quantity of net electricity supplied will be cross-verified from the invoice raised to TNEB by the project proponent.</p> <p>The TNEB carries out the calibration, periodical testing, sealing and maintenance of meters in the presence of Vestas representative. The frequency of meter testing is once in 3 year. All meters are tested at the Metering Point.</p>
Calculation method:	Measured Quantity
Any comment:	The data will be archived for crediting period + 2 years.

### 3.3 Description of the Monitoring Plan

The approved large scale methodology ACM0002 (Version 13.0.0), stipulates the monitoring of the net electricity generation supplied by the project plant/unit to the grid.

#### Description of the Monitoring Plan

Each of the 15 WTGs considered in the Project has Main and Check meters installed on the 33kV outgoing feeder for metering of electricity produced/ consumed by the WTGs Both of these Main and Check meters are identical in terms of technical specification.

The TNEB carries out the calibration, periodical testing, sealing and maintenance of meters in the presence of Vestas representative. The frequency of meter testing is once in 3 year. All meters are tested at the Metering Point.

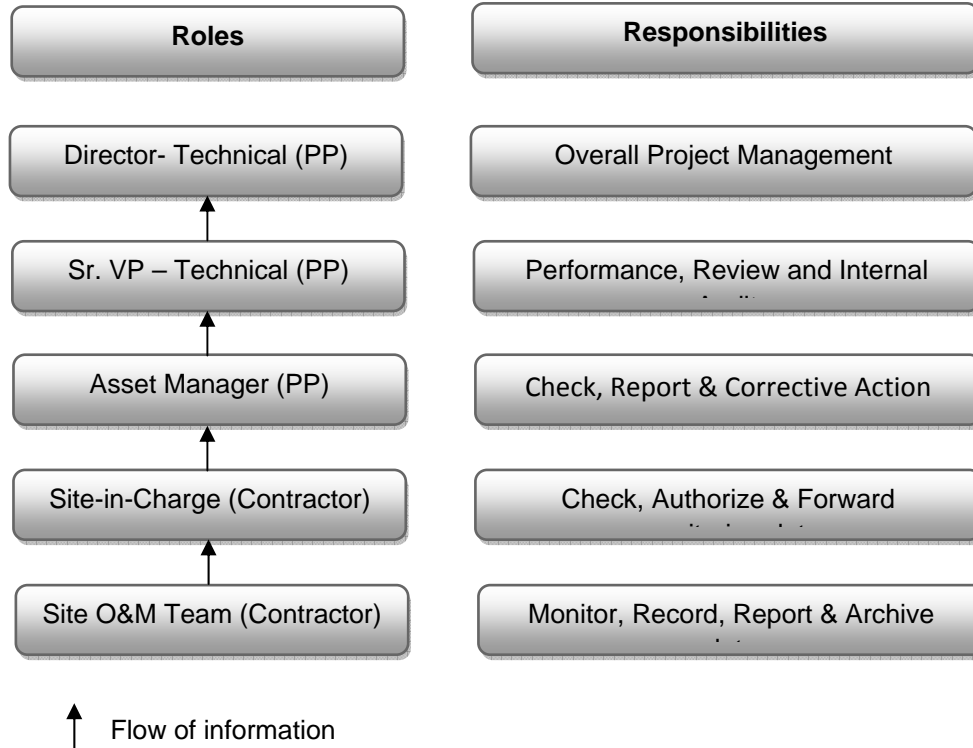
### **Metering procedure**

The generated electricity is measured through a two step procedure wherein the first metering is carried out at the micro-processor based controller (Local Control System) specially designed to control the WTG. The primary function of the LCS is to ensure that all the components of the WTG remain fully operational under all conditions. In order to meet this requirement, it is necessary to monitor wind speed, wind direction, temperature, rotational speeds, electricity generated, voltage etc. The LCS display and keyboard enable control of all WTG functions. The electricity generation details will be displayed in the LCS. 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, Vestas, are always present on site to monitor various parameters of power generation and deal with any problems related to generation, transmission or maintenance.

The second metering is carried out at TNEB meter located near each WTG. This is the metering point wherein the Joint Meter Reading (JMR) is carried out every month in presence of the representatives of the project proponent & the state electricity utility (TNEB). 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” and “import” of the electricity to/ from the Southern grid. There is a single meter which gives both the export and import values, this metered reading would give value net of line losses (negligible since metering/JMR point is very close to the WTG) and auxiliary consumption.

### **Organizational structure, responsibilities and competencies**

The representatives of Operations and Maintenance contractor (Vestas) will record the readings and prepare daily generation reports of all the WTGs. The primary recording of the electricity fed to the electricity grid will be carried out jointly at the TNEB meter located near each WTG. The operations and maintenance structure for the project activity is as follows:



**Generating, recording, storing, aggregating, collating and reporting data**

The meter readings at the Metering Point (main meter and check meter) are undertaken every month jointly by the representatives of the TNEB and Vestas representative for the previous month and it is certified by representatives of TNEB. The reporting structure has been presented in the preceding section. The monthly data is recorded and stored by the project proponent.

**Procedures for handling data uncertainty (internal auditing and non-conformities):**

- a. In case main meter is faulty- check meter is used to calculate the electricity exported to the grid. Main meter is immediately replaced by a new meter and meter reading from the replaced meter is used thereafter.
- b. In case the check meter is faulty- The check meter is immediately replaced. The emission reduction calculation would not be affected as reading from main meter is used to calculate the net electricity exported to the grid.
- c. In case error is identified during annual accuracy testing- If during the annual tests, the meter is found to be beyond the permissible limits of error, the meter shall be immediately calibrated and replaced, if necessary. The error that is identified in the annual accuracy testing would be applied to all the readings of electricity exported as indicated in the credit note from the state utility from the date of last accuracy testing. Billing for the period thereafter shall be as per the calibrated meter.

The Project Management team of CLP receives the data from both the sources and keeps track of project activity which reduces the carbon emission reductions.

**Calibration details:**

**All meters are 0.5 s class, and were tested by TNEB prior to commissioning**

HTSC Number	Main Meter			Check Meter		
	Sr. No.	Calibration Dt.	Due Dt.	Sr. No.	Calibration Dt.	Due Dt.
T-110	TNB04059	31-Oct-09	30-Oct-12	TNB04075	6-Jan-10	5-Jan-13
T-123	TNB04086	21-Oct-09	20-Oct-12	TNB04070	6-Jan-10	5-Jan-13
T-124	TNB04074	6-Jan-10	5-Jan-13	TNB04028	2-Nov-09	1-Nov-12
T-125	TNB02942	17-Feb-10	16-Feb-13	TNB04052	15-Dec-09	14-Dec-12
T-126	TNB04089	17-Dec-09	16-Dec-12	TNB02945	17-Feb-10	16-Feb-13
T-127	TNB04073	6-Jan-10	5-Jan-13	TNB04025	2-Nov-09	1-Nov-12
T-128	TNB04093	14-Dec-09	13-Dec-12	TNB04078	6-Jan-10	5-Jan-13
T-129	TNB02941	17-Feb-10	16-Feb-13	TNB04053	15-Dec-09	14-Dec-12
T-130	TNB04050	15-Dec-09	14-Dec-12	TNB02944	15-Dec-09	14-Dec-12
T-131	TNB04048	6-Jan-10	5-Jan-13	TNB04084	31-Oct-09	30-Oct-12
T-132	TNB04051	15-Dec-09	14-Dec-12	TNB04049	15-Dec-09	14-Dec-12
T-133	TNB02946	17-Feb-10	16-Feb-13	TNB04090	17-Dec-09	16-Dec-12
T-134	TNB04071	6-Jan-10	5-Jan-13	TNB04023	31-Oct-09	30-Oct-12
T-135	TNB04061	31-Oct-09	30-Oct-12	TNB04076	6-Jan-10	5-Jan-13
T-136	TNB04060	31-Oct-09	30-Oct-12	TNB02943	17-Feb-10	16-Feb-13

**4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS**

**4.1 Baseline Emissions**

Baseline emissions include only CO<sub>2</sub> emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The baseline emissions for the monitoring period are calculated as follows:

$$BE_v = EG_{PJ,v} \cdot EF_{grid,CM,v} \text{-----Equation 6 of ACM0002}$$

Thus,

BE<sub>y</sub> = 100,695,870 \* 0.8969= 90,314 tCO<sub>2</sub>e~ 90,312 tCO<sub>2</sub>e (after yearwise rounding down values as show in section 4.4)

**4.2 Project Emissions**

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 13.0.0, there will be no project emissions in the project activity

**PE<sub>y</sub> = 0**

According to the approved methodology ACM0002 (Version 13.0.0) Emission Reductions are calculated as

**ER<sub>y</sub> = BE<sub>y</sub> – PE<sub>y</sub>..... Equation 11 of ACM0002**

Where:

- ER<sub>y</sub>                      Emission reductions in year y (tCO<sub>2</sub>e/yr)
- BE<sub>y</sub>                      Baseline Emissions in year y (tCO<sub>2</sub>e/yr)
- PE<sub>y</sub>                      Project Emissions in year y (tCO<sub>2</sub>e/yr)

Thus,

ER<sub>y</sub>= **90,314**- 0 = **90,314** tCO<sub>2</sub>e ~ 90,312 tCO<sub>2</sub>e (after yearwise rounding down values as show in section 4.4)

**4.3 Leakage**

As per ACM0002 Version 13.0.0, no leakage has been considered for the calculation of emission factor.

**4.4 Summary of GHG Emission Reductions and Removals**

The net GHG emission reductions from the Project Activity during this monitoring period is 90,312 tCO<sub>2</sub>e. Vintage wise breakdown of the net GHG emission reductions are as follows,

Year	Months considered in year	EG <sub>PJ,y</sub> (Net Generation in kWh)	Baseline Emissions (tCO <sub>2</sub> e)	Project emissions (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	Emission reductions (tCO <sub>2</sub> e)
2010	July 2010 to December 2010	28,219,350	25,309	0	0	25,309
2011	January 2011 to December 2011	56,071,560	50,290	0	0	50,290
2012	January 2012 to My 2012	16,404,960	14,713	0	0	14,713
<b>Total</b>		<b>100,695,870</b>	<b>90,312</b>	<b>0</b>	<b>0</b>	<b>90,312</b>

**5 ADDITIONAL INFORMATION**

The monthly values of electricity export (in kWh) are given below:

<b>From</b>	<b>To</b>	<b>Export</b>	<b>Import</b>	<b>EG<sub>y</sub></b>
02-Jul-10	10-Jul-10	83,880	390	83,490
10-Jul-10	10-Aug-10	3,315,360	5,880	3,309,480
10-Aug-10	10-Sep-10	12,348,840	6,000	12,342,840
10-Sep-10	10-Oct-10	6,209,250	34,260	6,174,990
10-Oct-10	10-Nov-10	5,292,210	33,660	5,258,550
10-Nov-10	10-Dec-10	613,110	70,920	542,190
10-Dec-10	10-Jan-11	580,440	72,630	507,810
10-Jan-11	10-Feb-11	779,790	62,640	717,150
10-Feb-11	10-Mar-11	430,320	67,980	362,340
10-Mar-11	10-Apr-11	1,032,660	66,510	966,150
10-Apr-11	10-May-11	2,624,760	41,640	2,583,120
10-May-11	10-Jun-11	7,680,630	18,810	7,661,820
10-Jun-11	10-Jul-11	11,593,320	3,660	11,589,660
10-Jul-11	10-Aug-11	14,017,230	1,590	14,015,640
10-Aug-11	10-Sep-11	9,404,940	7,650	9,397,290
10-Sep-11	10-Oct-11	7,032,030	17,310	7,014,720
10-Oct-11	10-Nov-11	382,020	88,020	294,000
10-Nov-11	10-Dec-11	881,940	74,190	807,750
10-Dec-11	10-Jan-12	739,410	77,490	661,920
10-Jan-12	10-Feb-12	401,490	90,870	310,620
10-Feb-12	10-Mar-12	858,030	78,090	779,940
10-Mar-12	10-Apr-12	716,550	85,650	630,900
10-Apr-12	10-May-12	2,968,290	50,790	2,917,500

<b>From</b>	<b>To</b>	<b>Export</b>	<b>Import</b>	<b>EG<sub>y</sub></b>
10-May-12	10-Jun-12	11,772,780	6,780	11,766,000
<b>Total Generation (kWh)</b>				100,695,870

**Annexure 01: WTG Co-ordinates**

Sr. No.	Loc No.	Village	District	HTSC No.	DOC	Latitude	Longitude
1	TPK 221	Poomalaikundu	Theni	WTG T 110	2-Jul-2010	N9°52'46.15 "	E77°26'10.50 "
2	TPK 130	Poomalaikundu	Theni	WTG T 129	29-Jul-2010	N9°53'52.07 "	E77°25'37.12 "
3	TPK 58	Poomalaikundu	Theni	WTG T 127	29-Jul-2010	N9°54'52.23 "	E77°26'16.84 "
4	TJP 247	Jangalpatti	Theni	WTG T 135	29-Jul-2010	N9°53'19.14 "	E77°28'54.39 "
5	TJP 391	Jangalpatti	Theni	WTG T 133	29-Jul-2010	N9°52'32.08 "	E77°28'35.14 "
6	TPK 520	Poomalaikundu	Theni	WTG T 124	29-Jul-2010	N9°54'45.33 "	E77°27'59.91 "
7	TPK 603	Poomalaikundu	Theni	WTG T 126	29-Jul-2010	N9°54'29.73 "	E77°27'00.05 "
8	TSK 447	Seepalakottai	Theni	WTG T 131	29-Jul-2010	N9°52'36.71 "	E77°27'22.31 "
9	TPK 108	Poomalaikundu	Theni	WTG T 128	29-Jul-2010	N9°54'07.38 "	E77°25'34.54 "
10	TPK 529	Poomalaikundu	Theni	WTG T 125	29-Jul-2010	N9°54'30.80 "	E77°27'31.72 "
11	TJP 78	Jangalpatti	Theni	WTG T 123	29-Jul-2010	N9°54'08.24 "	E77°28'35.82 "
12	TJP 198	Jangalpatti	Theni	WTG T 136	29-Jul-2010	N9°53'23.69 "	E77°29'16.57 "
13	TJP 324	Jangalpatti	Theni	WTG T 134	29-Jul-2010	N9°52'56.42 "	E77°28'51.89 "
14	TSK 470	Seepalakottai	Theni	WTG T 132	29-Jul-2010	N9°52'32.26 "	E77°28'10.93 "
15	TPK 228	Poomalaikundu	Theni	WTG T 130	29-Jul-2010	N9°52'59.62 "	E77°26'27.69 "