



**Monitoring report form for CDM project activity**  
(Version 07.0)

**MONITORING REPORT**

<b>Title of the project activity</b>	Vaayu India Wind Power Project in Andhra Pradesh	
<b>UNFCCC reference number of the project activity</b>	4677	
<b>Version number of the PDD applicable to this monitoring report</b>	5.0	
<b>Version number of this monitoring report</b>	01	
<b>Completion date of this monitoring report</b>	27/05/2020	
<b>Monitoring period number</b>	07	
<b>Duration of this monitoring period</b>	01/01/2019 to 31/03/2020 <sup>1</sup> (Including both first & last date)	
<b>Monitoring report number for this monitoring period</b>	NA	
<b>Project participants</b>	1. M/s Vaayu (India) Power Corporation Private Limited 2. First Climate Markets A.G.	
<b>Host Party</b>	India	
<b>Applied methodologies and standardized baselines</b>	Sectoral Scope: 1 Energy industries (renewable/ non-renewable sources)	
<b>Sectoral scopes</b>	"Consolidated methodology for grid-connected electricity generation from renewable sources – ACM0002 - Version 11"	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period</b>	<b>Amount achieved before 1 January 2013</b>	<b>Amount achieved from 1 January 2013</b>
	0	108,989 tonnes of CO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	116,150 tonnes of CO <sub>2</sub> e	

<sup>1</sup> As per Joint meter reading (JMR) reporting practice, a particular day of the month (generally the start date of the new month) becomes the end date and the start date for two subsequent months' reading respectively. Here 01/01/2019 was the end date of the last monitoring period and the start date of the current monitoring period. Similarly, 01/04/2020 is the end reading date for the month of March 2020 and also the start reading for the month of April 2020. Thus, end date of the MP is 31/03/2020, where end reading was on dated 01/04/2020.

## SECTION A. Description of project activity

### A.1. General description of project activity

#### >> Purpose of the project activity and the measures taken to reduce greenhouse gas emissions:

The purpose of the project activity is to utilize renewable wind energy for generation of electricity. In the absence of the project activity equivalent amount of electricity would have been generated from the existing grid connected power plants and planned capacity additions which are also largely fossil fuel based. Thus electricity generation from the project displaces the electricity generated from existing and planned power plant capacities in the southern grid whose emission intensities are represented by the Combined Margin Emission Factor of the Southern Grid, which predominantly uses fossil fuels and has grid emission of 0.94515 tCO<sub>2</sub>/MWh of electricity produced.

Vaayu (India) Power Corporation Private Limited (VIPCL) has installed 50.4 MW wind farm in the state of Andhra Pradesh in India. Wind World (India) Limited<sup>2</sup> ("Wind World") is the equipment supplier and the operations and maintenance contractor for the Project. The Project is owned by VIPCL. There are 63 Wind Energy Convertors ("WEC's") of Wind World WW-53 make with rated capacity 800 KW each. The generated electricity is supplied to Electricity Distribution Company (DISCOM) under a long-term power purchase agreement (PPA). The expected operational lifetime of the project is for 20 years.

#### Brief description of the installed technology and equipment:

The technical specifications of the Wind World WW-53 make WECs with rated capacity 800 KW are given below:

Main Specifications E-53	
Turbine model	Wind World WW-53
Rated power	800 KW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.
Cut in wind speed	2.5 m/s
Rated wind speed	12 m/s
Cut out Wind speed	28-34 m/s
Extreme Wind Speed	59.5 m/s
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fibre Glass Epoxy reinforced with integral lightning protection
Gear box type	Gear less
Generator type	Synchronous generator

<sup>2</sup> With effect from 01/01/2013 name of Enercon (India) Limited has been changed to 'Wind World (India) Limited'

Braking	Aerodynamic
Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete

Wind World (India) Ltd has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.



**Technology Diagram**

#### Relevant dates for the project activity:

The first machine under the project activity was commissioned on 02/08/2010 and last machine was commissioned on 04/05/2011. The expected operational lifetime of the project is for 20 years. The details of issuance of CERs for the previous monitoring periods are as follows:

Monitoring Period No.	Monitoring Period	CER Issued
First Issuance	25/04/2011 – 25/03/2012 (Inclusive of both days)	93,324
Second issuance	26/03/2012 – 25/12/2012 (Inclusive of both days)	96,662
Third issuance	26/12/2012 – 25/12/2013 (Inclusive of both days)	104,621
Fourth issuance	26/12/2013 – 24/09/2014 (Inclusive of both days)	93,459
Fifth issuance	25/09/2014 – 02/09/2016 (Inclusive of both days)	157,704
Sixth issuance (awaiting issuance)	03/09/2016 – 31/12/2018 (Inclusive of both days)	176,550

#### Total emission reductions achieved in this monitoring period

This is the sixth monitoring report for the project activity. The total emission reductions achieved under the monitoring period 01/01/2019 to 31/03/2020 (Including first and last day) is 108,989 tCO<sub>2</sub>e.

**A.2. Location of project activity**

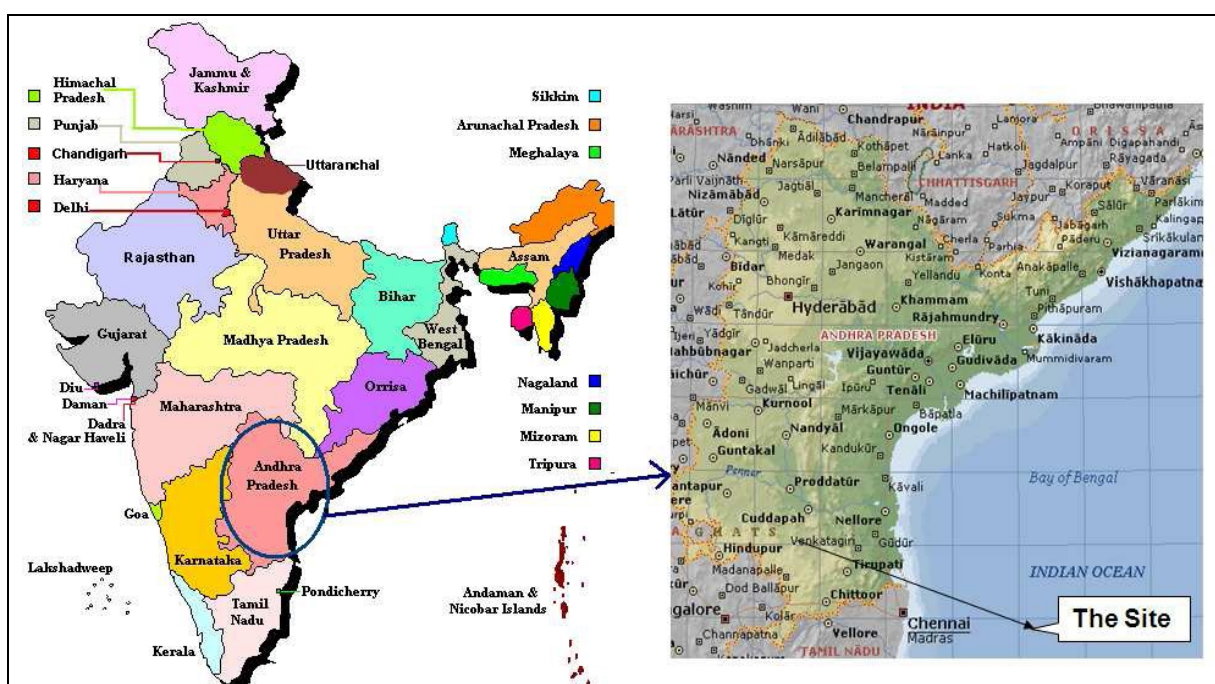
&gt;&gt; Host Party(ies); India

(b) Region/State/Province, etc.; Andhra Pradesh State

(c) City/Town/Community, etc.; Petnikota, Tummalapenta, Abdullapuram, Chintalayapalli villages in Kurnool district and Venkatampalli & Bhogasamudram villages in Anantapur district in Indian State of Andhra Pradesh.

(d) Physical/ Geographical location.

The detailed individual WECs location numbers and coordinates of project activity are provided in Appendix 1.

**A.3. Parties and project participants**

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (host)	Vaayu (India) Power Corporation Private Limited (Private Entity)	No
Spain (Withdrawn)	Kingdom of Spain	No
Sweden (Withdrawn)	Swedish Energy Agency	No
Germany	First Climate Markets A.G. (Private Entity)	No

**A.4. References to applied methodologies and standardized baselines**

>> **Title:** "Consolidated methodology for grid-connected electricity generation from renewable sources – Version 11"

**Reference:** Approved consolidated baseline and monitoring methodology ACM0002

**Version:** 11.0, EB 52

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 02
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology / tools can be obtained at <http://cdm.unfccc.int/UserManagement/FileStorage/HGY3TLRFPQVM016WA4I7XCZD92KE5S>

#### **A.5. Crediting period type and duration**

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The length of the Crediting period of the project activity as per registered PDD is 10 years (fixed) starting from 25/04/2011 to 24/04/2021 (including first and last day).

## **SECTION B. Implementation of project activity**

### **B.1. Description of implemented project activity**

>> The project start date is 05<sup>th</sup> December 2009. The first machine under the project activity was commissioned on 02/08/2010 and last machine was commissioned on 04/05/2011. During the monitoring period the project activity was operated and monitored in accordance with the applicable baseline and monitoring methodology ACM0002 (ver.11) and registered PDD approved by the EB on 22/11/2012.

The commissioning schedule of all the WECs under the project activity has been provided in Appendix 2.

There are no changes that have happened in project activity which may impact the applicability of the methodology. The operation and maintenance activities of Wind World are ISO certified and all the events are recorded in the log book available at the project site. Referring to the data available it can be inferred that there have not been any major special events for any of the machines that are included in the project activity. As a part of regular maintenance the machines are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly. During the monitoring period there were no events or situation occurred, which may impact the applicability of the methodology.

#### **Description of maintenance intervals:**

There is a pre-defined maintenance schedule for annual maintenance for all the WECs at project site. There are four types of maintenance activity have been executed for all the WECs. During maintenance, WEC needs to stop for defined time period which are as follows:

- 1) Visual maintenance : Average 3 to 4 hr stoppage of WEC
- 2) Grease maintenance : Average 3 to 4 hr stoppage of WEC
- 3) Electrical maintenance : Average 16 to 20 hr stoppage of WEC
- 4) Mechanical maintenance : Average 16 to 20 hr stop of WEC

Other than the above mentioned maintenance activity, WEC were generating electricity continuously without any technical fault. Hence no break down has been noted during the monitoring period.

### **B.2. Post-registration changes**

#### **B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

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There is no deviation from registered monitoring plan or applied methodology during this monitoring period.

#### **B.2.2. Corrections**

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There are no corrections from the registered PDD during this monitoring period

#### **B.2.3. Changes to the start date of the crediting period**

>> There are no changes to the start date of the crediting period.

**B.2.4. Inclusion of monitoring plan**

>> The monitoring plan has been revised

**B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents**

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The monitoring plan has been revised. The revision in monitoring plan was done to change in calibration/testing frequency from once each year to once in five years as calibration frequency for monitoring equipment which is not under control of PP. Revised PDD version 5.0, dated 22/05/2012 was approved by UNFCCC on 22/11/2012. The PRC ref number of project activity is PRC-4677-001. (Link: <http://cdm.unfccc.int/Projects/DB/DNV-CUK1302613748.83/view>).

**B.2.6. Changes to project design**

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There are no permanent changes to project design of registered project activity.

**B.2.7. Changes specific to afforestation or reforestation project activity**

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Not applicable



## SECTION C. Description of monitoring system

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Approved methodology ACM0002 Version 11, "Consolidated methodology for grid connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

### Monitoring System of Project Activity:

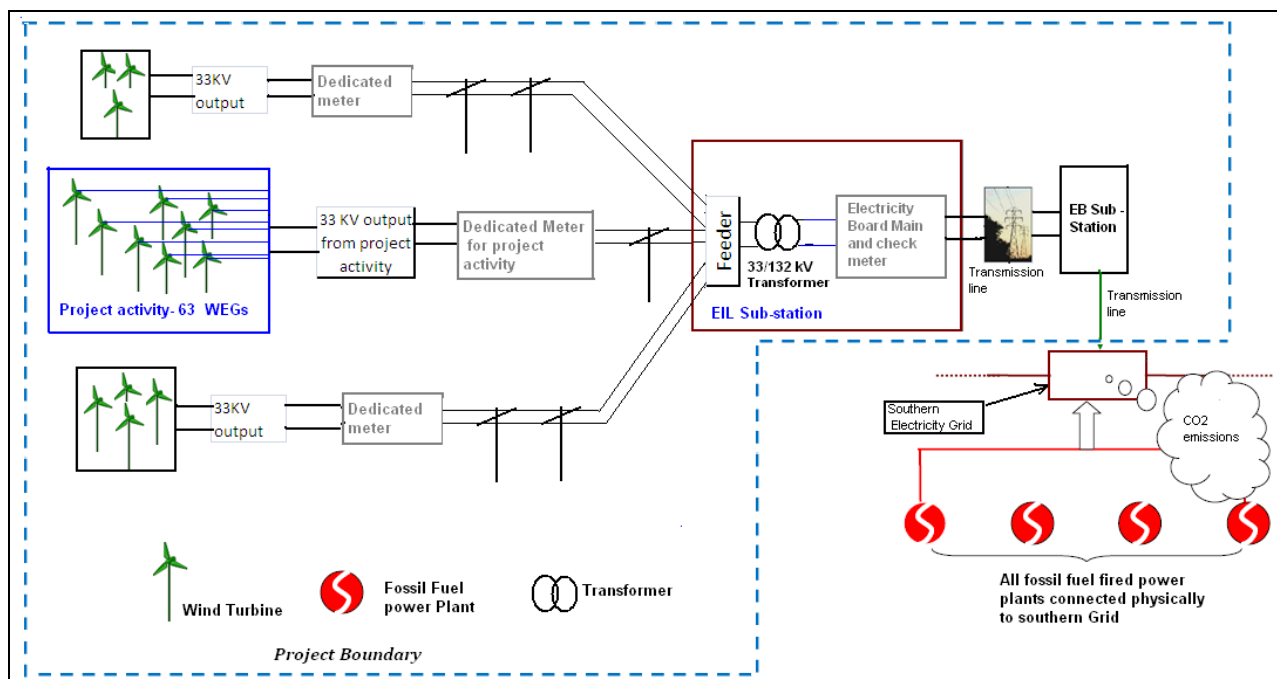
The PP has made clusters of Wind Energy Convertors (WEC's) at the project site for the purpose of metering. Each cluster has main and the check meter at 33 kV. All the clusters are exclusively connected to WECs of the project activity and no WECs of other project owners are connected to these clusters. Summations of meter reading for all the clusters (connecting 63 machines) provide total electricity generated by the project activity.

The electricity supplied to the grid is metered from main and check meters at 33kV that are connected to the 63 turbines of the project activity. The electricity export and import for the project activity has been taken from the summation of the joint meter readings noted from the cluster meters (dedicated meters) connecting 63 turbines of the project activity.

In addition to this there are main and check meters at Wind World pooling substation (132kV). Transmission loss between metering point at 33kV and the metering point at 132kV at Wind World pooling substation is applied to the meter reading taken at meters connected at 33 KV for the project activity. Wind World pooling substation is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore transmission loss is applied to the project activity by the state utility as reflected in the JMR taken at 33kV level. The JMR is signed by the representatives of Wind World and the state utility.

### METERING ARRANGEMENT:

A detailed line diagram of project activity is shown in below picture. Layout of Metering arrangement for project activity is as follows:-



Wind World is contracted for Operation and Maintenance of the project activity and provides the daily generation report to the Project participant. The project participant also maintains the records of daily generation report and joint meter report. The meter readings are noted in the form of joint meter report and are signed jointly by the representatives of Wind World and the state utility. From the above layout it is clear that the clusters meters (dedicated meters/ individual meters) of project activity and other customers are connected to the Wind World pooling sub-station (bulk metering point at 132 kV). Since the main and check meters (bulk meter) at 132 kV metering point at the



WIND WORLD pooling substation is connected to the machines of the project activity and the machines commissioned by the other project developers, therefore in order to determine the net electricity supplied to the grid at 132 kV at the WIND WORLD substation, the state utility apply the apportioning of transmission loss to the meter reading recorded at the 33 KV. The total % of transmission loss for export between 132kV metering point at Wind World sub-station and all the WECs connected to sub-station is calculated by the state utility is endorsed / confirmed jointly by the representatives of Wind World and the state utility. The transmission loss applied to the project activity by the state utility is reflected in transmission loss calculation sheet signed by the representatives of Wind World and Discom.

### **Calculation of net electricity supplied to the grid by project activity:**

Net Electricity exported to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering point of the project activity.

The procedure for calculation of the transmission loss is as follows:

Each project developer has dedicated individual metering system at 33kV. Energy export ( $X_{\text{Export}, N}$ ) and import ( $X_{\text{Import}, N}$ ) is recorded for the individual developers at 33 KV metering point; Where N is number of project developers connected to 132 kV metering point of the WIND WORLD substation

Total % of transmission losses for export (  $Lep$  ) are calculated as per following formula:

$$Lep (\%) = \frac{\{(X_{\text{Export},1} + X_{\text{Export},2} + X_{\text{Export},3} + \dots + X_{\text{Export},N}) - E_{Ge}\} * 100}{(X_{\text{Export},1} + X_{\text{Export},2} + X_{\text{Export},3} + \dots + X_{\text{Export},N})}$$

Where,

$E_{Ge}$  = Electricity export to the grid recorded at 132 kV (bulk meter) at the WIND WORLD pooling substation.

Value of  $Lep$  is calculated by state utility and would be sourced directly from the transmission loss calculation sheet.

Hence,

Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk meter)

$$E_{G_{\text{export}, y}} = E_{Gpe} * (1 - Lep (\%))$$

Where:

$E_{G_{\text{export}, y}}$  = Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk metering point)

$E_{Gpe}$  = Electricity Export recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity.

$Lep$  = Total percentage of Transmission loss for export between the metering point at 33 kV metering points (sum of all the WECs connected to Bulk metering point including non-project activity as well as project activity WECs) and the metering point at 132 kV at the WIND WORLD pooling substation.

The Joint meter reading noted at 33 KV metering location contains the following data:-

1. Electricity Export
2. Electricity Import

The electricity export and import by the project activity can be cross checked from the certified statement of electricity export and import signed by Discom/State Utility.

Net Electricity supplied to the Grid is calculated as:

$$EG_{PJ,y} = EG_{\text{export}, y} - EG_{pi}$$

Where:

**$EG_{PJ,y}$**  = Net electricity supplied to the grid by the Project activity

**$EG_{\text{export}, y}$**  = Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk metering point)

**$EG_{pi}$**  = Electricity Import recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity

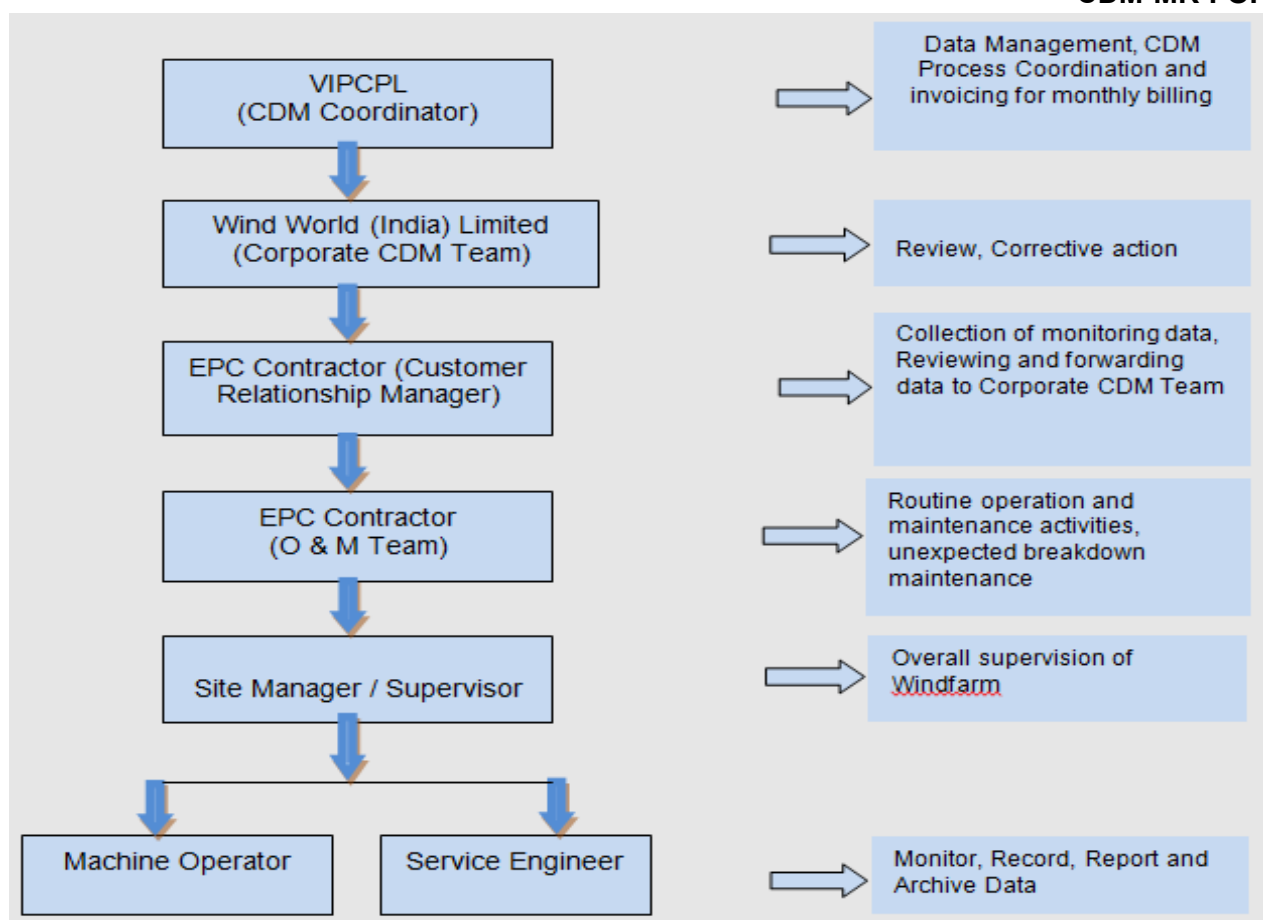
**Metering Equipment:** Metering system for the project activity consists of main and check meter. Both the meters are ABT meters capable of recording import and export of electricity. The metering equipment is calibrated once in five years. Metering equipment is electronic ABT meter of 0.2s accuracy class.

**Meter Readings:** The monthly meter reading is taken jointly by the parties (Wind World and State utility) for every last month. At the conclusion of each meter reading an appointed representative of State Utility and Wind World sign a document indicating the number of Kilowatt-hours (kWh) indicated by the meter.

**QA/QC Procedure:** All the meters are calibrated/ tested once in five years. The calibration is done by the officials of the state utility. The accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment once in five years. Wind World provides the daily generation report to the Project participant. In case the main meter(s) is found to operate outside the permissible limits, the main meter will be either replaced or calibrated immediately. Whenever a main meter goes defective, the consumption recorded by the Check meter will be referred.

The project participant, Vaayu (India) Power Corporation Private Limited, is monitoring the data for electricity generation and calibration reports post project implementation. Wind World (India) Limited is O&M contractor who has responsibility of maintaining electricity generation records, calibration records and maintenance of the WECs (Wind Energy Convertors). The project participant also maintains the records of daily generation report and joint meter report.

The operational and management structure implemented for data monitoring is as follows:



**Calibration Details:** Metering system for the project activity consists of main and check meter. The metering equipment is calibrated once in five years. The details of calibration of meters installed at 33kV for measuring export and import by WECs installed phase wise are provided below:

SIN	Customer Name	Meter Type	Meter Serial No.	Calibration Date	Calibration Due Date
1	Vaayu (India) Power Corporation Private Limited (Phase-1)	Main Meter	New Meter: APX00312	01-02-2015	01-02-2020
		Check Meter	New Meter: APX00345	01-02-2015	01-02-2020
2	Vaayu (India) Power Corporation Private Limited (Phase-2)	Main Meter	New Meter: APW00090	17/03/2016	17/03/2021
		Check Meter	New Meter: APW00091	06/02/2016	06/02/2021
3	Vaayu (India) Power Corporation Private Limited (Phase-3)	Main Meter	New Meter: APW00083	22/02/2016	22/02/2021
		Check Meter	New Meter: APW00084	06/02/2016	06/02/2021
4	Vaayu (India) Power Corporation Private Limited (Phase-4)	Main Meter	New Meter: APW00097	17/03/2016	17/03/2021

		Check Meter	New Meter: APW00098	17/03/2016	17/03/2021
5	Vaayu (India) Power Corporation Private Limited (Phase-5)	Main Meter	New Meter: APW00086	22/02/2016	22/02/2021
		Check Meter	New Meter: APW00087	08/02/2016	08/02/2021
6	Vaayu (India) Power Corporation Private Limited (Phase-6)	Main Meter	New Meter: APW00093	22/02/2016	22/02/2021
		Check Meter	New Meter: APW00094	17/03/2016	17/03/2021
7	Vaayu (India) Power Corporation Private Limited (Phase-7)	Main Meter	New Meter: APX00310	01/02/2015	01/02/2021
		Check Meter	New Meter: APX00311	01/02/2015	01/02/2021

The controller meter (also known as Local Control System (LCS) meter) located in the WEC tower do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will calibrate the meter immediately and correction factor will be determined.

Project participants (PP) contracted Wind World (India) Limited for operation and maintenance of all the WECs. Wind World (India) Limited has implemented the management structure for managing the monitored data. Wind World is an ISO 9001:2008 certified Quality Management system from Germanischer Lloyd.

#### **Training and maintenance requirements:**

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the WEGs, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Wind World's service staffs is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The Wind World Training Academy provides need-based training to meet the training requirements of Wind World projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

## SECTION D. Data and parameters

## D.1. Data and parameters fixed ex ante

<b>Data/Parameter</b>	<b><math>EF_{grid,OM,y}</math></b>
Unit	tCO <sub>2</sub> e/MWh
Description	Operating Margin Emission Factor of Southern Regional Electricity Grid
Source of data	“CO <sub>2</sub> Baseline Database for Indian Power Sector”, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.  The “CO <sub>2</sub> Baseline Database for Indian Power Sector” is available at <a href="http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm">www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</a>
Value(s) applied	0.98756
Choice of data or measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.
Purpose of data/parameter	Baseline emission calculations
Additional comments	None

<b>Data/Parameter</b>	<b><math>EF_{grid,BM,y}</math></b>
Unit	tCO <sub>2</sub> e/MWh
Description	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data	“CO <sub>2</sub> Baseline Database for Indian Power Sector” version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO <sub>2</sub> Baseline Database for Indian Power Sector” is available at <a href="http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm">www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</a>
Value(s) applied	0.81792
Choice of data or measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Purpose of data/parameter	Baseline emission calculations
Additional comments	None

<b>Data/Parameter</b>	<b><math>EF_{grid,CM,y}</math></b>		
Unit	tCO <sub>2</sub> e/MWh		
Description	Combined Margin Emission Factor of Southern Regional Electricity Grid		
Source of data	The “CO <sub>2</sub> Baseline Database for Indian Power Sector” version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO <sub>2</sub> Baseline Database for Indian Power Sector” is available at <a href="http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm">www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm</a>		
Value(s) applied	In case of wind power projects default weights of 0.75 for $EF_{grid,OM}$ and 0.25 for $EF_{grid,BM}$ are applicable as per ACM0002. <table border="1" data-bbox="518 1787 1342 1832"> <tr> <td>Combined Margin Emission Factor (<math>EF_y</math> or <math>EF_{CM,y}</math>)</td> <td>0.94515</td> </tr> </table>	Combined Margin Emission Factor ( $EF_y$ or $EF_{CM,y}$ )	0.94515
Combined Margin Emission Factor ( $EF_y$ or $EF_{CM,y}$ )	0.94515		
Choice of data or measurement methods and procedures	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.		
Purpose of data/parameter	Baseline emission calculations		
Additional comments	None		

## D.2. Data and parameters monitored

Data/Parameter	<b>EG<sub>PJ,y</sub></b>
Unit	MWh (Mega-watt hour)
Description	Net electricity supplied to the grid by the Project activity
Measured/Calculated /Default	Calculated
Source of data	Net electricity supplied to the grid by the Project activity calculated using the formula described in Section C.
Value(s) of monitored parameter	115,313.776 MWh
Monitoring equipment	Calculated as per formulas better described under section C.
Measuring/Reading/Recording frequency	Monthly: The apportioning is done as per the procedure described in section C.
Calculation method (if applicable)	Calculated using formula $EG_{PJ,y} = EG_{\text{export}, y} - EG_{pi}$ Refer section C for details and description of the above variables.
QA/QC procedures	QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters are calibrated by state utility once in five year and records are available with PP. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	Baseline Emissions calculations
Additional comment	The data has been archived both in electronic and hard paper format for crediting period + 2 years.

Data/Parameter	<b>EG<sub>Export,y</sub></b>
Unit	MWh (Mega-Watt hour)
Description	Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk metering point)
Measured/Calculated /Default	Calculated
Source of data	Electricity exported by project activity calculated using the formula described in Section C.
Value(s) of monitored parameter	115,448.294 MWh
Monitoring equipment	Calculated as per formulas better described under section C.
Measuring/Reading/Recording frequency	Monthly: The apportioning is done as per the procedure described in section C.
Calculation method (if applicable)	Calculated using formulae $EG_{\text{export}, y} = EG_{pe} * (1 - Lep \ (%))$ Refer section C for details and description of the above variables.
QA/QC procedures	Value of EG <sub>Export, y</sub> can be crosschecked from certified statement given by state utility showing cost of export and import. It may be noted that energy export by the project activity is denoted as import by the grid from the project activity and therefore electricity export by the project activity is denoted as import by the grid in the certified statement by the state utility.  QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.  All the main meter and check meters are calibrated by state utility once in

	five years and records are available with PP. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	Baseline Emissions calculations
Additional comment	The data has been archived both in electronic and hard paper format for crediting period + 2 years.

Data/Parameter	<b>EG<sub>pe</sub></b>
Unit	MWh (Mega-Watt hour)
Description	Electricity Export recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity.
Measured/Calculated /Default	Measured
Source of data	Electricity export to the grid as per the joint meter reading recorded at cluster metering points connecting 63 turbines at 33kV level.
Value(s) of monitored parameter	116,056.814 MWh
Monitoring equipment	The completed details of metering equipment's have been provided in section C of monitoring report. Type of all the meters- ABT Meters Accuracy Class of all the meters -0.2s Frequency of Calibration of all the meters - once in five years
Measuring/Reading/Recording frequency	Measuring frequency: Continuous Recording frequency: Monthly
Calculation method (if applicable)	Not Applicable
QA/QC procedures	Value of <b>EG<sub>pe</sub></b> can be cross checked from transmission loss calculation sheet signed by the representatives of Wind World and Discom.  QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.  The meters are calibrated once in five years by the state utility. Refer Section C for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	Baseline Emissions calculations
Additional comment	The data has been archived both in electronic and hard paper format for crediting period + 2 years.

Data/Parameter	<b>EG<sub>pi</sub></b>
Unit	MWh (Mega-Watt hour)
Description	Electricity Import recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 63 machines of the project activity.
Measured/Calculated /Default	Measured
Source of data	Electricity import from the grid as per the joint meter reading recorded at cluster metering point connecting 63 turbines at 33kV level.
Value(s) of monitored parameter	134.518 MWh
Monitoring equipment	The completed details of metering equipment's have been provided in section C of monitoring report. Type of all the meters - ABT Meters Accuracy Class of all the meters -0.2s Frequency of Calibration of all the meters - once in five years
Measuring/Reading/Recording frequency	Measuring frequency: Continuous Recording frequency: Monthly
Calculation method (if applicable)	Not Applicable



QA/QC procedures	Value of EGpi can be crosschecked from certified statement given by state utility showing cost of export and import. It may be noted that energy import by the project activity is denoted as export by the grid to the project activity and therefore electricity import by the project activity is denoted as export by the grid in the certified statement by the state utility.  The meters are calibrated once in five years by the state utility. QA/QC procedures have been implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.  Refer Section C for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	Baseline Emissions calculations
Additional comment	The data has been archived both in electronic and hard paper format for crediting period + 2 years.

Data/Parameter	<b>EGe</b>
Unit	MWh (Mega-Watt hour)
Description	Electricity Export recorded at 132 kV meters (main and check) at wind world pooling substation connecting machines of the project activity and machines commissioned by the other project developers.
Measured/Calculated /Default	Measured
Source of data	Electricity export to the grid as per the joint meter reading recorded at 132 KV of the wind world pooling substation (Bulk metering point) connecting machines of the project activity and machines commissioned by the other project developers.
Value(s) of monitored parameter	186,281.940 MWh
Monitoring equipment	<p>Vaayu (India) Power Corporation Private Limited (Phase-1, Phase 4 and Phase 7)</p> <p>Main Meter Serial Number- 02798585 Check Meter Serial Number- 02798586</p> <p>Last calibration date: 06/03/2015. Calibration due date: 05/03/2020</p> <p>All the Vaayu phases were connected to above mentioned single 132 KV bulk metering point at S/S. The details of second metering point is provided below:</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-2, Phase 3, Phase 5 and Phase 6)</p> <p>Main Meter Serial Number- 02798587 Check Meter Serial Number- 02798588</p> <p>Last calibration date: 06/03/2015. Calibration due date: 05/03/2020</p> <p>Meters installed at both metering points are of accuracy class -0.2s and calibration frequency of meters is once in five years.</p>
Measuring/Reading/Recording frequency	Measuring frequency: Continuous Recording frequency: Monthly
Calculation method (if applicable)	Not Applicable
QA/QC procedures	Value of EGe can be cross checked from transmission loss calculation sheet signed by the representatives of Wind World and Discom.

	<p>The meters are calibrated once in five years by the state utility.</p> <p>QA/QC procedures have been implemented by Discom/state utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.</p> <p>Refer Section C for an illustration of the provisions for QA/QC procedures.</p>
Purpose of data/parameter	Baseline Emissions calculations
Additional comment	The data has been archived both in electronic and hard paper format for crediting period + 2 years.

Data/Parameter	<b>L<sub>ep</sub></b>
Unit	MWh (Mega-watt hour)
Description	Total percentage of Transmission loss for export between the metering point at 33 kV metering points (sum of all the WECs connected to Bulk metering point including non-project activity as well as project activity WECs) and the metering point at 132 kV at the wind world pooling substation.
Measured /Calculated /Default	Calculated as per formulas better described under section C.
Source of data	Transmission Loss is directly applied from the joint meter reading for the project activity. This value is certified by the State utility and Wind World India in the transmission loss calculation sheet.
Value(s) of monitored parameter	Calculated as per formulas better described under section C. Monthly values of L <sub>ep</sub> are provided in ER spreadsheet.
Monitoring equipment	Not Applicable
Measuring/ Reading/ Recording frequency	Monthly. Calculations are based on procedure described in section C.
Calculation method (if applicable)	<p>Total % of transmission losses for export ( L<sub>ep</sub>) are calculated as per following formula:</p> $L_{ep}(\%) = \frac{\{(X_{Export,1} + X_{Export,2} + X_{Export,3} + \dots + X_{Export,N}) - E_{Ge}\} * 100}{(X_{Export,1} + X_{Export,2} + X_{Export,3} + \dots + X_{Export,N})}$ <p>Refer section C for details and description of the above variables.</p>
QA/QC procedures	QA/QC procedures have been as implemented by Discom/ State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Please refer Section C for QA/QC procedures.
Purpose of data/parameter	Baseline Emissions calculations
Additional comment	The data has been archived both in electronic and hard paper format for crediting period + 2 years.

### D.3. Implementation of sampling plan

>>

As the parameter to be monitored does not require sampling approach for its determination this section is not applicable for the proposed project activity.

## SECTION E. Calculation of emission reductions or net anthropogenic removals

### E.1. Calculation of baseline emissions or baseline net removals

>>

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 methodology assumes that existing grid-connected power plants and the addition of new grid-connected power plants would have generated all project electricity generation above baseline levels. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where:

$BE_y$  = Baseline emissions in year y (tCO<sub>2</sub>/yr)

$EG_{PJ,y}$  = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$  = Combined margin CO<sub>2</sub> 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" (tCO<sub>2</sub>e/MWh)

Accordingly:

Baseline emissions calculation for the period 01/01/2019 to 01/04/2020<sup>3</sup> (Including only the first day here) is as follows:

$$\begin{aligned} BE_y &= 115,313.776 \text{ (MWh)} * 0.94515 \text{ (tCO}_2\text{e/MWh)} \\ &= 108,989 \text{ tCO}_2\text{e} \end{aligned}$$

The details of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity is provided in ER spreadsheet.

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<sup>3</sup> As per Joint meter reading (JMR) reporting practice, a particular day of the month (generally the start date of the new month) becomes the end date and the start date for two subsequent months' reading respectively. Here 01/01/2019 was the end date of the last monitoring period and the start date of the current monitoring period. Similarly, 01/04/2020 is the date of end reading for the month of March 2020, whereas monitoring period ends as on 31/03/2020. Here 01/04/2020 is also the start reading for the month of April 2020. Thus, monitoring period covered is from 01/01/2019 to 31/03/2020 only. However in order to keep the dates in line with JMR, end date is mentioned as - 01/04/2020.

**Baseline Emission Reductions calculations for project activity:-**

Duration	Net electricity supplied to the grid by the Project [MWh]	Baseline Emission Factor (tCO <sub>2</sub> e/MWh)	Baseline Emissions (tCO <sub>2</sub> e)
	[EGP <sub>J,y</sub> ]	[EF <sub>y</sub> ]	[BE <sub>y</sub> ]
01/01/2019 to 01/04/2020 (including only the first date)	115,313.776 <sup>4</sup>	0.94515	108,989
<b>Total</b>	115,313.776		108,989

**E.2. Calculation of project emissions or actual net removals**

&gt;&gt;

The project activity uses wind power to generate electricity and hence, the emissions from the project activity have been taken as zero.

$$PE_y = 0$$

**E.3. Calculation of leakage emissions**

&gt;&gt;

No leakage has been considered from the project activity as per approved methodology ACM0002. Hence,  $Ly = 0$

**E.4. Calculation of emission reductions or net anthropogenic removals**

	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
<b>Total</b>	108,989	0	0	0	108,989	108,989

**E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD**

Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante for this monitoring period in the PDD (t CO <sub>2</sub> e)
108,989	116,150

<sup>4</sup> Detailed calculations provided in ER spreadsheet.

**E.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the PDD”**

&gt;&gt;

As per CDM registered PDD, 92,971 tCO<sub>2</sub>e is the amount of CERs generated annually. Therefore, following unitary method, the amount of estimated ex ante for this monitoring period is identified. The total number of days in this monitoring period is 456 =  $(92,971/365) * 456 = 116,150$  tCO<sub>2</sub>e

**E.6. Remarks on increase in achieved emission reductions**

&gt;&gt;

There is a difference of 6.17% (downside) in the expected and actual emission reductions due to lower PLF achieved during the monitoring period under consideration

**E.7. Remarks on scale of small-scale project activity**

&gt;&gt;

Not applicable.

**Appendix 1. Details of Physical Location**

Sl. No.	WEC Location No.	Latitude			Longitude		
		DEG	MIN	SEC	DEG	MIN	SEC
1	1	14	59	10.3	78	5	17.5
2	2	14	59	17.7	78	5	16.5
3	3	14	59	24.7	78	5	14.9
4	4	14	59	30.0	78	5	14.0
5	5	14	59	39.0	78	5	16.5
6	6	14	59	46.6	78	5	18.3
7	7	14	59	51.8	78	5	0.7
8	8	14	59	58.2	78	4	59.8
9	9	15	0	1.3	78	4	44.5
10	10	14	59	37.2	78	5	1.8
11	11	14	59	43.6	78	4	51.9
12	12	14	59	47.5	78	4	42.5
13	13	14	59	52.5	78	4	37.0
14	14	14	59	52.5	78	4	21.6
15	15	14	59	57.8	78	4	16.3
16	16	15	0	3.2	78	4	11.2
17	17	15	0	9.5	78	4	4.4
18	21	15	0	18.2	78	4	45.5
19	22	15	0	25.6	78	4	39.3
20	23	15	0	30.1	78	4	22.0
21	24	15	0	42.0	78	3	52.3
22	25	15	0	33.2	78	3	42.2
23	26	15	0	39.6	78	3	38.6
24	27	15	0	47.0	78	3	35.2
25	28	15	0	51.2	78	3	29.4
26	29	15	0	57.0	78	3	25.
27	30	15	1	25.9	78	4	50.2
28	31	15	1	32.1	78	4	47.3
29	32	15	1	36.5	78	4	39.4
30	33	15	1	41.9	78	4	39.2
31	34	15	1	43.5	78	4	53.8
32	35	15	1	38.1	78	4	55.4
33	43	15	2	58.6	78	2	57.9
34	43A	15	2	50.4	78	2	59.3
35	61	15	3	22.2	78	2	33.8
36	69	15	4	32.3	78	1	39.2
37	70	15	4	38.5	78	1	38.0
38	71	15	4	44.7	78	1	38.4
39	72	15	4	49.7	78	1	32.0
40	73	15	4	55.4	78	1	34.4
41	74	15	5	2.5	78	1	50.6
42	85	15	3	28.7	78	2	31.0

43	86	15	3	35.6	78	2	29.0
44	90	15	3	6.5	78	2	43.6
45	A1	15	4	32.6	78	2	26.8
46	A2	15	4	40.0	78	2	22.4
47	A3	15	4	28.1	78	2	42.3
48	A4	15	4	40.5	78	2	33.5
49	A5	15	4	54.0	78	2	17.2
50	A6	15	5	7.4	78	2	21.8
51	W1	15	2	37.0	77	59	16.0
52	W2	15	2	29.9	77	59	15.7
53	W3	15	2	24.2	77	59	18.6
54	W4	15	2	13.8	77	59	17.1
55	W5	15	2	5.9	77	59	20.8
56	W6	15	2	0.5	77	59	26.5
57	W7	15	1	49.3	77	59	36.4
58	W8	15	1	41.8	77	59	44.8
59	W9	15	1	36.5	77	59	50.5
60	W10	15	2	3.9	77	59	52.3
61	W11	15	2	10.8	77	59	56.7
62	W12	15	2	21.0	77	59	34.8
63	W13	15	1	55.4	77	59	29.9



**Appendix 2. Details of commissioning of WECs**

SN	No. of WECs	Name	Capacity	Village Name	District	Commissioning Date	Machine No	Location No
1	6	Vaayu (India) Power Corporation Private Limited (Phase-1)	800 kW	Petnikota	Kurnool	02.08.2010	8572	74
2			800 kW	Petnikota	Kurnool	02.08.2010	8568	73
3			800 kW	Petnikota	Kurnool	02.08.2010	8566	72
4			800 kW	Petnikota	Kurnool	02.08.2010	8574	71
5			800 kW	Petnikota	Kurnool	02.08.2010	8579	70
6			800 kW	Petnikota	Kurnool	02.08.2010	8581	69
7	6	Vaayu (India) Power Corporation Private Limited (Phase-2)	800 kW	Thummalapenta	Kurnool	24.12.2010	8582	43
8			800 kW	Thummalapenta	Kurnool	24.12.2010	8587	43A
9			800 kW	Petnikota	Kurnool	25.09.2010	8593	61
10			800 kW	Petnikota	Kurnool	25.09.2010	8594	86
11			800 kW	Petnikota	Kurnool	25.09.2010	8595	85
12			800 kW	Petnikota	Kurnool	04.05.2011	8828	90
13	6	Vaayu (India) Power Corporation Private Limited (Phase-3)	800 kW	Petnikota	Kurnool	30.03.2011	9052	A1
14			800 kW	Petnikota	Kurnool	30.03.2011	8777	A2
15			800 kW	Petnikota	Kurnool	30.03.2011	8814	A4
16			800 kW	Petnikota	Kurnool	30.03.2011	8810	A3
17			800 kW	Petnikota	Kurnool	30.03.2011	8817	A5
18			800 kW	Petnikota	Kurnool	04.05.2011	9047	A6
19	14	Vaayu (India) Power Corporation Private Limited (Phase-4)	800 kW	Thummalapenta	Kurnool	07.02.2011	8608	28
20			800 kW	Thummalapenta	Kurnool	28.09.2010	8609	27
21			800 kW	Thummalapenta	Kurnool	28.09.2010	8610	26
22			800 kW	Chintalayapalli	Kurnool	28.09.2010	8611	25
23			800 kW	Chintalayapalli	Kurnool	28.09.2010	8613	24
24			800 kW	Abudullapuram	Kurnool	28.09.2010	8633	17
25			800 kW	Abudullapuram	Kurnool	28.09.2010	8630	16
26			800 kW	Abudullapuram	Kurnool	28.09.2010	8627	15
27			800 kW	Abudullapuram	Kurnool	28.09.2010	8625	14
28			800 kW	Abudullapuram	Kurnool	12.11.2010	8638	13
29			800 kW	Abudullapuram	Kurnool	12.11.2010	8637	12
30			800 kW	Abudullapuram	Kurnool	12.11.2010	8605	11
31			800 kW	Abudullapuram	Kurnool	12.11.2010	8599	10
32			800 kW	Thummalapenta	Kurnool	24.12.2010	8607	29
33	6	Vaayu (India) Power Corporation Private Limited (Phase-5)	800 kW	Chintalayapalli	Kurnool	30.09.2010	8614	30
34			800 kW	Chintalayapalli	Kurnool	30.09.2010	8617	31
35			800 kW	Chintalayapalli	Kurnool	30.09.2010	8618	32
36			800 kW	Chintalayapalli	Kurnool	30.09.2010	8619	33
37			800 kW	Chintalayapalli	Kurnool	30.09.2010	8620	35
38			800 kW	Chintalayapalli	Kurnool	30.09.2010	8622	34
39	12	Vaayu (India) Power	800 kW	Abudullapuram	Kurnool	02.12.2010	8604	9
40			800 kW	Abudullapuram	Kurnool	02.12.2010	8603	8

41		Corporation Private Limited (Phase-6)	800 kW	Abudullapuram	Kurnool	02.12.2010	8602	7
42			800 kW	Abudullapuram	Kurnool	02.12.2010	8601	6
43			800 kW	Abudullapuram	Kurnool	02.12.2010	8600	5
44			800 kW	Abudullapuram	Kurnool	02.12.2010	8941	4
45			800 kW	Abudullapuram	Kurnool	02.12.2010	8597	3
46			800 kW	Abudullapuram	Kurnool	02.12.2010	8596	2
47			800 kW	Abudullapuram	Kurnool	02.12.2010	8589	1
48			800 kW	Abudullapuram	Kurnool	02.12.2010	8831	23
49			800 kW	Abudullapuram	Kurnool	02.12.2010	8639	22
50			800 kW	Abudullapuram	Kurnool	02.12.2010	8830	21
51	13	Vaayu (India) Power Corporation Private Limited (Phase-7)	800 kW	Venkatampalli	Anantapur	31.12.2010	9044	W6
52			800 kW	Venkatampalli	Anantapur	31.12.2010	8775	W7
53			800 kW	Venkatampalli	Anantapur	31.12.2010	8980	W13
54			800 kW	Venkatampalli	Anantapur	31.12.2010	8992	W12
55			800 kW	Bhogasamudram	Anantapur	31.12.2010	9006	W8
56			800 kW	Bhogasamudram	Anantapur	31.12.2010	8988	W9
57			800 kW	Venkatampalli	Anantapur	31.12.2010	8773	W4
58			800 kW	Venkatampalli	Anantapur	31.12.2010	8979	W5
59			800 kW	Venkatampalli	Anantapur	24.01.2011	8811	W1
60			800 kW	Venkatampalli	Anantapur	24.01.2011	8802	W2
61			800 kW	Venkatampalli	Anantapur	24.01.2011	8803	W3
62			800 kW	Bhogasamudram	Anantapur	24.01.2011	8986	W10
63			800 kW	Bhogasamudram	Anantapur	24.01.2011	8987	W11

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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period;</li> <li>• Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes;</li> <li>• Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods;</li> <li>• Make editorial improvements.</li> </ul>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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