

MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/09/2010

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
Version Number 1.0 and date 21/11/2011

TITLE: Vaayu India Wind Power Project in Andhra Pradesh
Reference Number: 4677
Monitoring Period – First Monitoring Period
First monitoring period: 25/04/2011 to 26/09/2011 (Including first and last day)

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

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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 tCO₂/MWh of electricity produced.

Vaayu (India) Power Corporation Private Limited (VIPCPL) has installed 50.4 MW wind farm in the state of Andhra Pradesh in India. Enercon (India) Limited (“Enercon”) is the equipment supplier and the operations and maintenance contractor for the Project. The Project is owned by VIPCPL. There are 63 Wind Energy Convertors (“WEC’s”) of Enercon E-53 make with rated capacity 800 KW each. The generated electricity will be 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.

The first machine under the project activity was commissioned on 02/08/2010 and last machine was commissioned on 04/05/2011. This is the first monitoring report associated with the project activity and the period covered under this monitoring report is from 25/04/2011 to 26/09/2011 (including first and last day).

The total emission reductions achieved under the monitoring period 25/04/2011 to 26/09/2011 (including first and last day) is 69,927 tCO₂e.

A.2. Project Participants

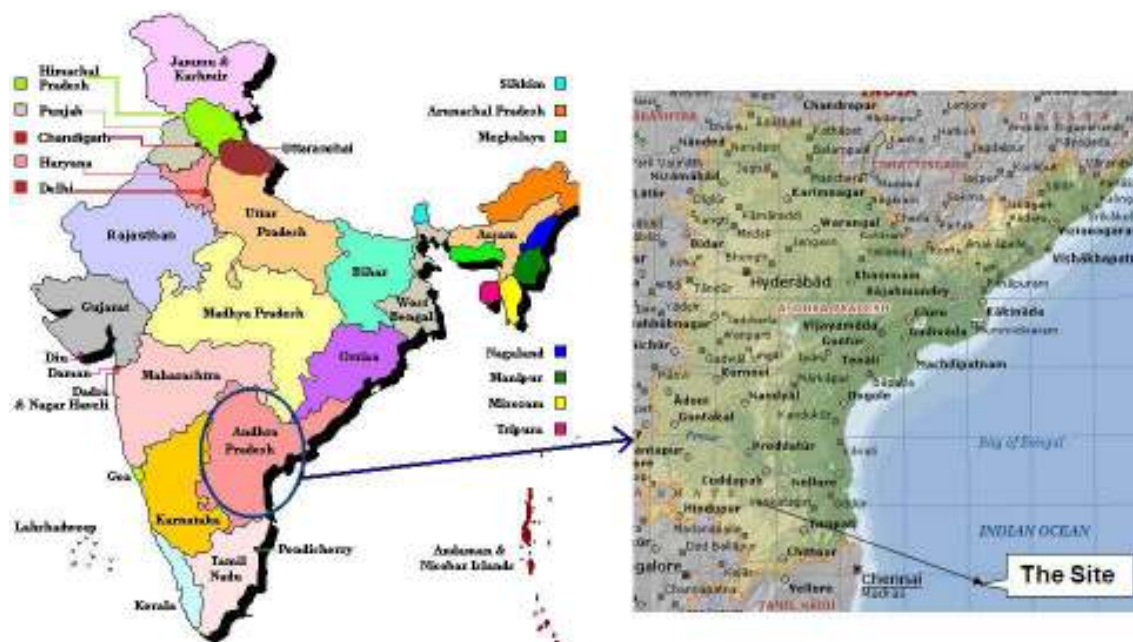
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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host)	Vaayu (India) Power Corporation Private Limited (Private Entity)	No

A.3. Location of the project activity:

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The project activity is spread across Petnikota, Tummalapenta, Itikyala, Abdullapuram, Chintalayapalli, Venkatampalli & Bhogasamudram villages in Kurnol district in Indian State of Andhra Pradesh. The project area extends between latitude 14° 59’ 10.2” and 15° 05’ 02.5” North and longitude 77° 59’ 15.7” and 78° 05’ 18.3” East. Nearest railway station is at Tadipatri which is about 25 kms away from the site. Nearest airport is at Bangalore which is about 250 kms from the site. The detailed individual WECs location numbers and coordinates of project activity are provided in Appendix 1.



A.4. Technical description of the project

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The project activity involves 63-wind energy converters (WECs) of Enercon make (800 kW E-53) with internal electrical lines connecting the project activity with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The project activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V \pm 12.5%. The average life time of the WEC is around 20 years as per the industry standards; however the project activity is yet to be commissioned. The other salient features of the state-of-art-technology are:

Main Specifications E-53	
Turbine model	Enercon E- 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

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

Enercon (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.



Enercon E-53: Technology Diagram

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

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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/methodologies/PAmethodologies/approved.html>

A.6. Registration date of the project activity:

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The project was registered with UNFCCC on 25/04/2011

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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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). This is first CER verification for the monitoring period 25/04/2011 to 26/09/2011 (including first and last day). There are no post-registration changes to the crediting period of the project activity.

A.8. Name of responsible person(s)/entity(ies):

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Contact Information of Vaayu (India) Power Corporation Private Limited is given in the table below:

Organization:	Vaayu (India) Power Corporation Private Limited
Street/P.O.Box:	Plot No. 33, Daman Patalia Road
Building:	
City:	Bhimpore
State/Region:	Daman (UT)
Postfix/ZIP:	396210
Country:	India
Telephone:	+91-260-2220624, 2220628
FAX:	+91-260-2221508
E-Mail:	yogesh.mehra@enerconindia.net
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Mehra
Middle Name:	
First Name:	Yogesh
Department:	Corporate
Mobile:	+91-98200 40301
Direct FAX:	+91-260-2221508
Direct tel:	+91-22-22-6702 2832 extn. 7111
Personal E-Mail:	yogesh.mehra@enerconindia.net

SECTION B. Implementation of the project activity**B.1. Implementation status of the project activity**

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The project start date is 05th 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.

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. Enercon operation and maintenance activities 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.

B.2. Revision of the monitoring plan

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The monitoring plan has not been revised.

B.3. Request for deviation applied to this monitoring period

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No request for deviation applied to this monitoring period.

B.4. Notification or request of approval of changes

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No notification or request of approval of changes applied to this monitoring period.

SECTION C. Description of the monitoring system

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Approved methodology ACM0002 Version 11, "Consolidated methodology for zero-emissions 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:

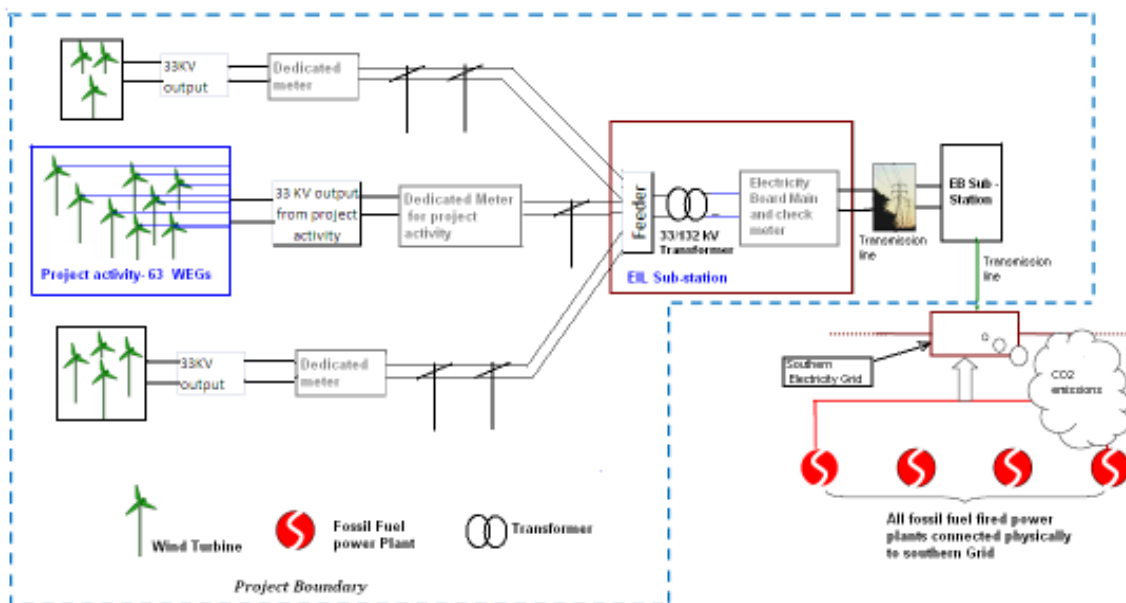
The PP has made clusters of Wind Energy Convertors (WEC's) at the project site for the purpose of metering. Each cluster has main and the check meter at 33 kV. All the clusters are exclusively connected to WECs of the project activity and no WECs of other project owners are connected to these clusters. Summation of meter reading for all the clusters (connecting 63 machines) will 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 Enercon pooling substation (132kV). Transmission loss between metering point at 33kV and the metering point at 132kV at Enercon pooling substation is applied to the meter reading taken at meters connected at 33 KV for the project activity. Enercon 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 Enercon 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:-



Enercon is contracted for Operation and Maintenance of the project activity and provides the daily generation report to the Project proponent. The project proponent 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 Enercon 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 Enercon pooling sub-station (bulk metering point at 132 kV). Since the main and check meters (bulk meter) at 132 kV metering point at the ENERCON 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 ENERCON 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 Enercon sub-station and all the WECs connected to sub-station is calculated by the state utility is endorsed / confirmed jointly by the representatives of Enercon 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 Enercon 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 ENERCON substation

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

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

Where, EGe = Electricity export to the grid recorded at 132 kV (bulk meter) at the ENERCON 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)

$$EG_{\text{export}, y} = EG_{pe} * (1 - Lep (\%))$$

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 cross checked from the certified statement of electricity export and import signed by Discom/State Utility. It may be noted that energy export by the project activity will be 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. Similarly, energy import by the project activity will be 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.

Net Electricity supplied to the Grid is calculated as:

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

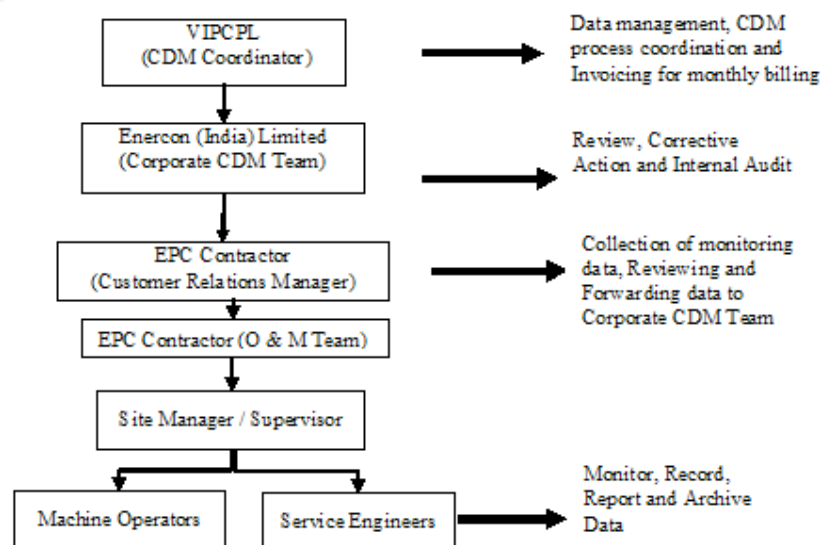
Metering Equipment: Metering system for the project activity consists of main and check meter. Both the meters are two-way trivector meters capable of recording import and export of electricity. The metering equipment is calibrated annually. Metering equipment is electronic trivector meter of 0.2% accuracy class.

Meter Readings: The monthly meter reading is taken jointly by the parties (Enercon and State utility) for every last month. At the conclusion of each meter reading an appointed representative of State Utility and Enercon 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 a year. 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 each year. Enercon provides the daily generation report to the Project proponent. 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 proponent, Vaayu (India) Power Corporation Private Limited, keeping and monitoring the data for electricity generation and calibration reports post project implementation. Enercon (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 proponent 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 annually. The details of calibration of meters installed at 33kV for measuring export and import by WECs installed phase wise are provided below:

SI N	Customer Name	Meter Type	Meter Serial No.	Accuracy Class	Calibration before monitoring period	Calibration Due date
1	Vaayu (India) Power Corporation Private Limited (Phase-I)	Main Meter	AP900318	0.2%	02/08/2010	01/08/2011
		Check Meter	AP900320	0.2%	02/08/2010	01/08/2011
2	Vaayu (India) Power Corporation	Main	AP900327	0.2%	25/09/2010	24/09/2011

	Private Limited (Phase-2)	Meter				
		Check Meter	AP900328	0.2%	25/09/2010	24/09/2011
3	Vaayu (India) Power Corporation Private Limited (Phase-3)	Main Meter	AP900314	0.2%	30/03/2011	29/03/2012
		Check Meter	AP900315	0.2%	30/03/2011	29/03/2012
4	Vaayu (India) Power Corporation Private Limited (Phase-4)	Main Meter	AP900338	0.2%	27/09/2010	26/09/2011
		Check Meter	AP900339	0.2%	27/09/2010	26/09/2011
5	Vaayu (India) Power Corporation Private Limited (Phase-5)	Main Meter	AP900319	0.2%	30/09/2010	29/09/2011
		Check Meter	AP900321	0.2%	30/09/2010	29/09/2011
6	Vaayu (India) Power Corporation Private Limited (Phase-6)	Main Meter	AP900329	0.2%	02/12/2010	01/12/2011
		Check Meter	AP900330	0.2%	02/12/2010	01/12/2011
7	Vaayu (India) Power Corporation Private Limited (Phase-7)	Main Meter	AP900331	0.2%	31/12/2010	30/12/2011
		Check Meter	AP900332	0.2%	31/12/2010	30/12/2011

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 Enercon (India) Limited for operation and maintenance of all the WECs. Enercon (India) Limited has implemented the management structure for managing the monitored data. Enercon is an ISO 9001:2000 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 Enercon'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 Enercon Training Academy provides need-based training to meet the training requirements of Enercon 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 determined at registration and not monitored during the monitoring period, including default values and factors	
<i>(Copy this table for each data and parameter. To report multiple values, a table may be used)</i>	
Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO ₂ e/MWh
Description:	Operating Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO ₂ Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government

	of India. The “CO ₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in The detailed information is available in Appendix 3.
Value(s) :	0.98756
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	None

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO ₂ e/MWh
Description:	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	“CO ₂ Baseline Database for Indian Power Sector” version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO ₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in The detailed information is available in Appendix 3.
Value applied:	0.81792
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Any Comment	None

Data / Parameter:	$EF_{grid,CM,y}$		
Data unit:	tCO ₂ e/MWh		
Description:	Combined Margin Emission Factor of Southern Regional Electricity Grid		
Source of data used:	The “CO ₂ Baseline Database for Indian Power Sector” version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO ₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in The detailed information is available in Appendix 3.		
Value 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="630 1507 1395 1545"> <tr> <td>Combined Margin Emission Factor (EF_y or EF_{CM,y})</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		
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations		
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.		

D.2. Data and parameters monitored	
<i>(Copy this table for each data and parameter. To report multiple values, a table may be used)</i>	
Data / Parameter:	EG_{PJ,y}
Data 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:	74050.381 MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	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 $EG_{PJ,y} = EG_{export,y} - EG_{pi}$ Refer section C for details and description of the above variables.
QA/QC procedures applied:	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.

Data / Parameter:	EG_{Export,y}
Data 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:	74065.681 MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	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 $EG_{export,y} = EG_{pe} * (1 - Lep \ (%))$ Refer section C for details and description of the above variables.

QA/QC procedures applied:	<p>Value of $EG_{\text{export}, y}$ 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 will be 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.</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>
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Data / Parameter:	<i>EG_{pe}</i>
Data 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.
Value(s) of monitored parameter:	74702.800 MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Vaayu (India) Power Corporation Private Limited (Phase-1) Main Meter Serial Number- AP900318 Check Meter Serial Number- AP900320 Last date of Test – 02/08/2010 Validity of Test- 01/08/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-2) Main Meter Serial Number- AP900327 Check Meter Serial Number- AP900328 Last date of Test – 25/09/2010 Validity of Test- 24/09/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-3) Main Meter Serial Number- AP900314 Check Meter Serial Number- AP900315 Last date of Test – 30/03/2011 Validity of Test- 29/03/2012 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-4) Main Meter Serial Number- AP900338 Check Meter Serial Number- AP900339 Last date of Test – 27/09/2010 Validity of Test- 26/09/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-5) Main Meter Serial Number- AP900319 Check Meter Serial Number- AP900321 Last date of Test – 30/09/2010 Validity of Test- 29/09/2011 (one year)</p>

	<p>Vaayu (India) Power Corporation Private Limited (Phase-6) Main Meter Serial Number- AP900329 Check Meter Serial Number- AP900330 Last date of Test – 02/12/2010 Validity of Test- 01/12/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-7) Main Meter Serial Number- AP900331 Check Meter Serial Number- AP900332 Last date of Test – 31/12/2010 Validity of Test- 30/12/2011 (one year)</p> <p>Type- Tri-vector Meter Accuracy Class-0.2% Frequency of Calibration- Annual</p>
Measuring/ Reading/ Recording frequency:	<p>Measuring frequency: Continuous Recording frequency: Monthly</p>
Calculation method (if applicable):	Not Applicable
QA/QC procedures applied:	<p>Value of EG_{pe} can be cross checked from transmission loss calculation sheet signed by the representatives of Enercon and Discom.</p> <p>The meters will be calibrated once each year by the state utility. Refer Section C for an illustration of the provisions for QA/QC procedures.</p>

Data / Parameter:	EG_{pi}
Data 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.
Value(s) of monitored parameter:	15.300 MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Vaayu (India) Power Corporation Private Limited (Phase-1) Main Meter Serial Number- AP900318 Check Meter Serial Number- AP900320 Last date of Test – 02/08/2010 Validity of Test- 01/08/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-2) Main Meter Serial Number- AP900327 Check Meter Serial Number- AP900328 Last date of Test – 25/09/2010 Validity of Test- 24/09/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-3) Main Meter Serial Number- AP900314 Check Meter Serial Number- AP900315</p>

	<p>Last date of Test – 30/03/2011 Validity of Test- 29/03/2012 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-4) Main Meter Serial Number- AP900338 Check Meter Serial Number- AP900339 Last date of Test – 27/09/2010 Validity of Test- 26/09/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-5) Main Meter Serial Number- AP900319 Check Meter Serial Number- AP900321 Last date of Test – 30/09/2010 Validity of Test- 29/09/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-6) Main Meter Serial Number- AP900329 Check Meter Serial Number- AP900330 Last date of Test – 02/12/2010 Validity of Test- 01/12/2011 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-7) Main Meter Serial Number- AP900331 Check Meter Serial Number- AP900332 Last date of Test – 31/12/2010 Validity of Test- 30/12/2011 (one year)</p> <p>Type- Tri-vector Meter Accuracy Class-0.2% Frequency of Calibration- Annual</p>
Measuring/ Reading/ Recording frequency:	<p>Measuring frequency: Continuous Recording frequency: Monthly</p>
Calculation method (if applicable):	Not Applicable
QA/QC procedures applied:	<p>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 will be 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.</p> <p>The meters will be calibrated once each year by the state utility. Refer Section C for an illustration of the provisions for QA/QC procedures.</p>

Data / Parameter:	EGe
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Export recorded at 132 kV meters (main and check) at ENERCON 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 ENERCON pooling substation (Bulk metering point).
Value(s) of monitored parameter:	426705.000 MWh
Indicate what the data are	Baseline Emissions calculations

used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Vaayu (India) Power Corporation Private Limited (Phase-1, Phase 4 and Phase 7) Main Meter Serial Number- 5341444 Check Meter Serial Number- 10286994 Last date of Test – 03/08/2011 Validity of Test- 02/08/2012 (one year)</p> <p>Vaayu (India) Power Corporation Private Limited (Phase-2, Phase 3, Phase 5 and Phase 6) Main Meter Serial Number- 11070263 Check Meter Serial Number- 11070295 Last date of Test – 26/08/2011 Validity of Test- 25/08/2012 (one year)</p> <p>Accuracy Class-0.2% Frequency of Calibration- Annual</p>
Measuring/ Reading/ Recording frequency:	<p>Measuring frequency: Continuous Recording frequency: Monthly</p>
Calculation method (if applicable):	Not Applicable
QA/QC procedures applied:	<p>Value of EGe can be cross checked from transmission loss calculation sheet signed by the representatives of Enercon and Discom. The meters will be calibrated once each year by the state utility. Refer Section C for an illustration of the provisions for QA/QC procedures.</p>

Data / Parameter:	<i>Lep</i>
Data 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 ENERCON pooling substation.
Measured /Calculated /Default:	Calculated as per formulas better described under section C.
Source of data:	Transmission Loss will directly applied from the joint meter reading for the project activity.
Value(s) of monitored parameter:	Calculated as per formulas better described under section C.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emissions calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable
Measuring/ Reading/ Recording frequency:	Monthly. Calculations are based on procedure described in section C.
Calculation method (if applicable):	Total % of transmission losses for export (<i>Lep</i>) are calculated as per following formula:

	$Le_p (\%) = \frac{\{(X_{\text{Export},1} + X_{\text{Export},2} + X_{\text{Export},3} + \dots + X_{\text{Export},N}) - E_{\text{Ge}}\} * 100}{(X_{\text{Export},1} + X_{\text{Export},2} + X_{\text{Export},3} + \dots + X_{\text{Export},N})}$ <p>Refer section C for details and description of the above variables.</p>
QA/QC procedures applied:	The value is calculated. Please refer Section C for QA/QC procedures.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

>>

Baseline emission:

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Where:

BE_y = Baseline emissions in year y (tCO₂/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 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” (tCO₂e/MWh)

Accordingly:

Baseline emissions calculation for the period 25/04/2011 to 26/09/2011(including first and last day) is as follows:

$$BE_y = 73986130 \text{ (kWh)} * 0.94515 \text{ (tCO}_2\text{e/MWh)/1000}$$

$$= \mathbf{69,927 \text{ tCO}_2\text{e}}$$

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 Appendix 4.

E.2. Project emissions calculation

>>

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 11, there are no project emissions in the project activity

$$PE_y = \mathbf{0.}$$

E.3. Leakage calculation

>>

As per ACM0002 Version 11, no leakage has been considered for the calculation of emission factor

$$LE_y = \mathbf{0.}$$

E.4. Emission reductions calculation / table

>>

According to the approved methodology ACM0002 (Version 11) Emission Reductions are calculated as:-

$$ER_y = BE_y - PE_y$$

Where:

BE_y Baseline Emissions in year y (t CO₂e/yr)

PE_y Project Emissions in year y (t CO₂e/yr)

Emission reductions from the project activity are equal to the baseline emissions as project emissions and leakage are nil.

$$\begin{aligned} ER_y &= BE_y \\ &= 69,927 \text{ tCO}_2\text{e.} \end{aligned}$$

Period	Estimations of baseline emissions (tCO ₂ e)	Estimation of project activity emissions (tCO ₂ e)	Estimation of leakage (tCO ₂ e)	Estimation of overall emission reductions (tCO ₂ e)
25/04/2011 to 26/09/2011 (Inclusive of both days)	69,927	0	0	69,927

Total Emission Reductions for the monitoring period are **69,927 tCO₂e**.

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

>>

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	39,481 (=92971/365*155) (Emission reductions estimated in the registered PDD)	69,927

The actual emission reductions achieved during the monitoring period: 69,927 tCO₂e.

E.6. Remarks on difference from estimated value in the PDD

>>

The estimated annual emission reductions in the registered PDD for the monitoring period are 39,481 tCO₂e. The actual emission reductions are 69,927 which are more than the estimated emission reduction. Wind power generation in India is characterized by seasonal variation (peak, off peak and lean wind season) and yearly variation (with the difference of good-wind year, average year, and poor-wind year). The reason for more CERs is high PLF in high wind season of year during the monitoring period.

Appendix 1: Details of Physical Location (Latitude and Longitude)

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: Commissioning Schedule

SN	Name	Village Name	District	Commissioning Date	Machine No	Location No
1	Vaayu (India) Power Corporation Private Limited (Phase-1)	Petnikota	Kurnool	02.08.2010	8572	74
2		Petnikota	Kurnool	02.08.2010	8568	73
3		Petnikota	Kurnool	02.08.2010	8566	72
4		Petnikota	Kurnool	02.08.2010	8574	71
5		Petnikota	Kurnool	02.08.2010	8579	70
6		Petnikota	Kurnool	02.08.2010	8581	69
7	Vaayu (India) Power Corporation Private Limited (Phase-2)	Thummalapenta	Kurnool	24.12.2010	8582	43
8		Thummalapenta	Kurnool	24.12.2010	8587	43A
9		Petnikota	Kurnool	29.09.2010	8593	61
10		Petnikota	Kurnool	29.09.2010	8594	86
11		Petnikota	Kurnool	29.09.2010	8595	85
12		Petnikota	Kurnool	04.05.2011	8828	90
13	Vaayu (India) Power Corporation Private Limited (Phase-3)	Petnikota	Kurnool	30.03.2011	9052	A1
14		Petnikota	Kurnool	30.03.2011	8777	A2
15		Petnikota	Kurnool	30.03.2011	8814	A4
16		Petnikota	Kurnool	30.03.2011	8810	A3
17		Petnikota	Kurnool	30.03.2011	8817	A5
18		Petnikota	Kurnool	04.05.2011	9047	A6
19	Vaayu (India) Power Corporation Private Limited (Phase-4)	Thummalapenta	Kurnool	07.02.2011	8608	28
20		Thummalapenta	Kurnool	28.09.2010	8609	27
21		Thummalapenta	Kurnool	28.09.2010	8610	26
22		Chintalayapalli	Kurnool	28.09.2010	8611	25
23		Chintalayapalli	Kurnool	28.09.2010	8613	24
24		Abudullapuram	Kurnool	28.09.2010	8633	17
25		Abudullapuram	Kurnool	28.09.2010	8630	16
26		Abudullapuram	Kurnool	28.09.2010	8627	15
27		Abudullapuram	Kurnool	28.09.2010	8625	14
28		Abudullapuram	Kurnool	12.11.2010	8638	13
29		Abudullapuram	Kurnool	12.11.2010	8637	12
30		Abudullapuram	Kurnool	12.11.2010	8605	11
31		Abudullapuram	Kurnool	12.11.2010	8599	10
32		Thummalapenta	Kurnool	24.12.2010	8607	29
33	Vaayu (India) Power Corporation Private Limited (Phase-5)	Chintalayapalli	Kurnool	30.09.2010	8614	30
34		Chintalayapalli	Kurnool	30.09.2010	8617	31
35		Chintalayapalli	Kurnool	30.09.2010	8618	32
36		Chintalayapalli	Kurnool	30.09.2010	8619	33
37		Chintalayapalli	Kurnool	30.09.2010	8620	35
38		Chintalayapalli	Kurnool	30.09.2010	8622	34
39	Vaayu (India) Power Corporation Private Limited (Phase-6)	Abudullapuram	Kurnool	02.12.2010	8604	9
40		Abudullapuram	Kurnool	02.12.2010	8603	8
41		Abudullapuram	Kurnool	02.12.2010	8602	7
42		Abudullapuram	Kurnool	02.12.2010	8601	6

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

Appendix 3: Baseline Information

The Operating Margin data for the most recent three years and the Build Margin data for the Southern Region Electricity Grid as published in the CEA database are as follows:

Simple Operating Margin

	Southern Grid (tCO₂e/MWh)
Simple Operating Margin – 2006-07	0.99912
Simple Operating Margin – 2007-08	0.99062
Simple Operating Margin – 2008-09	0.97293
Average Operating Margin of last three years	0.98756

Build Margin

	Southern Grid (tCO₂e/MWh)
Build Margin- 2008-09	0.81792

Combined Margin Calculations

	Weights	Southern Grid (tCO₂e/MWh)
Operating Margin	0.75	0.98756
Build Margin	0.25	0.81792
Combined Margin		0.94515

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.

APPENDIX 4: GENERATION DETAILS

		Net electricity supplied to the grid (kWh)	Electricity exported to grid after apportioning of transmission Losses (kWh)	Electricity Export recorded at 33kV (kWh)	Electricity Import recorded at 33kV (kWh)	Electricity Export recorded at 132 Kv (kWh)	Transmission loss (%)
Month	Phase	EG _{PJ,y}	EG _{Export,y}	EG _{pe}	EG _{pi}	EG _e	L _{ep}
May-11	Vaayu (India) Power Corporation Private Limited (Phase-1)	532142	532842	535800	700	7921000	0.552
	Vaayu (India) Power Corporation Private Limited (Phase-2)	431502	432102	434500	600	7921000	0.552
	Vaayu (India) Power Corporation Private Limited (Phase-3)	554718	555218	558300	500	7921000	0.552
	Vaayu (India) Power Corporation Private Limited (Phase-4)	1093127	1094027	1100100	900	7921000	0.552
	Vaayu (India) Power Corporation Private Limited (Phase-5)	465412	466212	468800	800	7921000	0.552
	Vaayu (India) Power Corporation Private Limited (Phase-6)	1258408	1259608	1266600	1200	7921000	0.552
	Vaayu (India) Power Corporation Private Limited (Phase-7)	736601	738401	742500	1800	7921000	0.552
Jun-11	Vaayu (India) Power Corporation Private Limited (Phase-1)	1703954	1704354	1704900	400	11256000	0.032
	Vaayu (India) Power Corporation Private Limited (Phase-2)	1334258	1334558	1362100	300	13060000	2.022
	Vaayu (India) Power Corporation	1095488	1095688	1118300	200	13060000	2.022

	Private Limited (Phase-3)						
	Vaayu (India) Power Corporation Private Limited (Phase-4)	3547087	3547587	3620800	500	13060000	2.022
	Vaayu (India) Power Corporation Private Limited (Phase-5)	1443114	1443314	1473100	200	13060000	2.022
	Vaayu (India) Power Corporation Private Limited (Phase-6)	3146457	3146857	3211800	400	13060000	2.022
	Vaayu (India) Power Corporation Private Limited (Phase-7)	2728826	2729426	2730300	600	11256000	0.032
Jul-11	Vaayu (India) Power Corporation Private Limited (Phase-1)	2291534	2291634	2320000	100	19512000	1.223
	Vaayu (India) Power Corporation Private Limited (Phase-2)	1958763	1958763	1962500	0	13608000	0.190
	Vaayu (India) Power Corporation Private Limited (Phase-3)	1985213	1985313	1989100	100	13608000	0.190
	Vaayu (India) Power Corporation Private Limited (Phase-4)	5091770	5092070	5155100	300	19512000	1.223
	Vaayu (India) Power Corporation Private Limited (Phase-5)	2150996	2151196	2155300	200	13608000	0.190
	Vaayu (India) Power Corporation Private Limited (Phase-6)	4270652	4270852	4279000	200	13608000	0.190
	Vaayu (India) Power Corporation Private	3740200	3740500	3786800	300	19512000	1.223

	Limited (Phase-7)						
Aug-11	Vaayu (India) Power Corporation Private Limited (Phase-1)	1699960	1700360	1720500	400	14105000	1.171
	Vaayu (India) Power Corporation Private Limited (Phase-2)	1389693	1390093	1390200	400	10102000	0.008
	Vaayu (India) Power Corporation Private Limited (Phase-3)	1462387	1462787	1462900	400	10102000	0.008
	Vaayu (India) Power Corporation Private Limited (Phase-4)	3747306	3748006	3792400	700	14105000	1.171
	Vaayu (India) Power Corporation Private Limited (Phase-5)	1697269	1697669	1697800	400	10102000	0.008
	Vaayu (India) Power Corporation Private Limited (Phase-6)	3213252	3213952	3214200	700	10102000	0.008
	Vaayu (India) Power Corporation Private Limited (Phase-7)	2502945	2503645	2533300	700	14105000	1.171
Sep-11	Vaayu (India) Power Corporation Private Limited (Phase-1)	1819370	1819570	1834900	200	15161000	0.835
	Vaayu (India) Power Corporation Private Limited (Phase-2)	1462928	1463028	1474600	100	10568000	0.785
	Vaayu (India) Power Corporation Private Limited (Phase-3)	1542399	1542499	1554700	100	10568000	0.785
	Vaayu (India) Power Corporation Private Limited	4021517	4021717	4055600	200	15161000	0.835

	(Phase-4)						
	Vaayu (India) Power Corporation Private Limited (Phase-5)	1833993	1834093	1848600	100	10568000	0.785
	Vaayu (India) Power Corporation Private Limited (Phase-6)	3328470	3328770	3355100	300	10568000	0.785
	Vaayu (India) Power Corporation Private Limited (Phase-7)	2768671	2768971	2792300	300	15161000	0.835
	Total	74050381	74065681	74702800	15300	426705000	

History of the document

Version	Date	Nature of revision
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