

**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 No. 04    Date 18/11/2011**  
**Rice Husk Based Power Project**  
**Reference No. 0186**  
**Monitoring Period: 6th Monitoring Period**  
**(01/04/2010-31/03/2011)- (first and last days included)**

**SECTION A. General description of the project activity**

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

Purpose of the project activity and Greenhouse Gas (GHG) abatement measures taken:

The project activity is a rice husk based power generation project with provisions to co-fire coal with rice husk, set up by Vandana Vidhyut Limited at Sirgitti Industrial Area, Bilaspur, Chhattisgarh. Entire power generated from the project activity is exported to the Chhattisgarh State Electricity Board (CSEB) Grid after meeting the auxiliary consumption of the power plant equipment. In absence of the project activity, equivalent quantum of electrical energy to that in the project activity would have been generated by fossil-fuel fired thermal power plants connected to the state grid. Thus the project activity is reducing corresponding GHG emission by replacing GHG intensive grid power.

Brief description of installed technology and equipments:

The total capacity of the power plant is 7.7MW. The power plant will have one condensing steam turbo generator unit with a matching boiler of travelling grate type design capable of firing multi-fuel with rice husk as the primary fuel along with coal being co-fired with rice husk. There is one 35 tph, 66 kg/cm<sup>2</sup>, 500<sup>0</sup>C high pressure boiler and a single bleed cum condensing steam turbine generator (STG) of 7.7 MW capacity.

Relevant dates for the project activity:

Start date of commercial operation: 1st December 2001.

(As per the certificate of “Commencement of Commercial Operation” from Government of Chhattisgarh).

The plant was on a complete shutdown mode for maintenance related purpose from 1<sup>st</sup> April 2010 to 28<sup>th</sup> April 2010

Monitoring Period:

The monitoring period is chosen from 01/04/2010 to 31/03/2011 (both days included).

Emission reductions achieved in the monitoring period – 28376 t CO<sub>2</sub>

**A.2. Project Participants**

Vandana Vidhyut Limited, Bilaspur, Raipur, Chattisgarh, India - Project Promoter

Contact: Mr Pankaj Baldua, Vandana Vidhyut Limited  
Vandana Bhawan, M.G. Road,  
Raipur – 492001,  
Chattisgarh,  
India

<b>A.3. Location of the project activity:</b>
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The project location is at Sirgitti Industrial Area of Bilaspur District, Chattisgarh State, India.

Latitude: - 21<sup>0</sup>47' N to 23<sup>0</sup>08' N

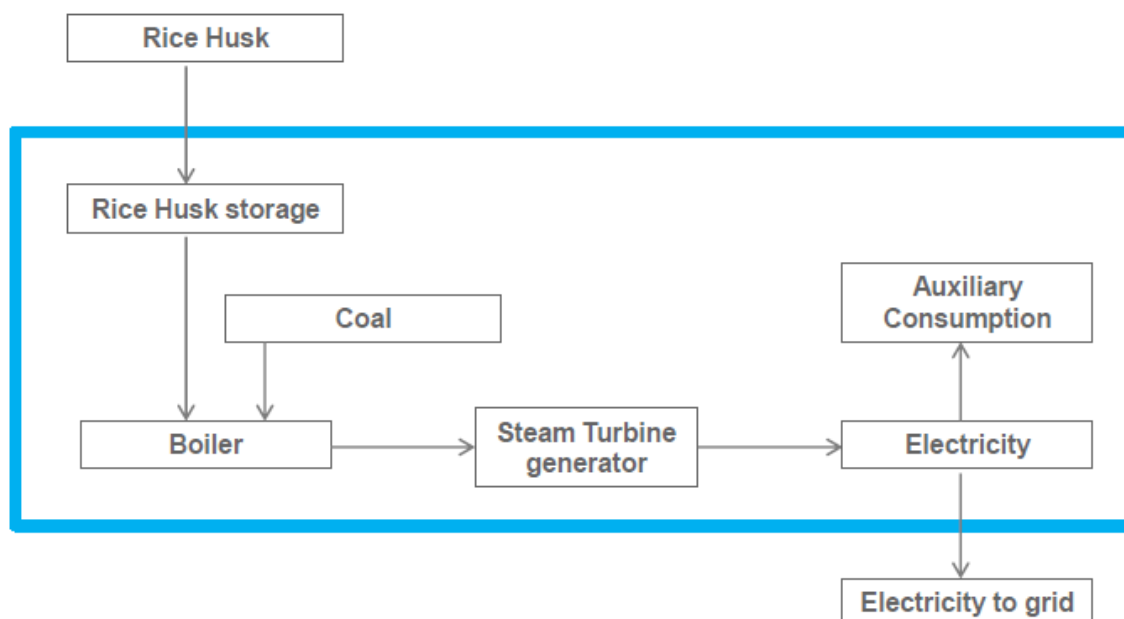
Longitude: - 81<sup>0</sup>14'E to 83<sup>0</sup>15' E

<b>A.4. Technical description of the project</b>
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The 7.7 MW power plant is based on Rankine Cycle. Rice husk is used as the primary fuel with provisions of co-firing coal. The steam generator is designed to operate on any combination of rice husk and coal to ensure consistent plant efficiency even in times of rice husk deficiency, if any. The power plant has one condensing steam turbo generator unit with a matching boiler of travelling grate type design capable of firing multi-fuel with rice husk as the primary fuel.

There is one 35 tph, 66 kg/cm<sup>2</sup>, 500<sup>0</sup>C high pressure boiler and a single bleed cum condensing steam turbine generator (STG) of 7.7 MW capacity. The 35 tph of steam from boiler is fed into the 7.7 MW bleed cum condensing turbine. The boiler is of Fluidized Bed Combustion type and has the advantages of high thermal and combustion efficiency reducing quantity of husk needed, to a minimum, automatic operation for consistent high efficiencies and reduced need for manpower.

Steam Turbine of fully condensing mode with suitable alternator generator is installed for generating electricity. The turbines are of the single cylinder, single exhaust fully condensing type, designed for high operating efficiencies and maximum reliability. Following is the set up of the project activity:-



Represents the project boundary

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

Title: - Renewable Electricity Generation for a Grid

Reference: - AMS- I.D version 07 dated 28th November, 2005

**A.6. Registration date of the project activity:**

9th of February, 2006

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

Crediting Period: 10 Years

Choice of crediting period: Fixed Crediting period

Start date of the Crediting Period: 1<sup>st</sup> April, 2002

Last date of the Crediting Period: 31<sup>st</sup> march, 2012

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

Contact Person - Mr. Pankaj Baldua<sup>1</sup>

Address - M/s Vandana Vidhyut Limited,

<sup>1</sup> The name of Mr Pankaj Baldua has been changed from Mr. G.P. Agarwal. The same has been notified to the UNFCCC by changing the necessary Modalities of Communication

Vandana Bhawan,  
M.G. Road,  
Raipur- 492001  
State- Chattishgarh,  
India

Tel: + 91 771-2535440/4207777

Fax: + 91 771- 4265491

E-mail: agmfinance@vandanaglobal.com

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

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

1. The start date of commercial operation was on 1<sup>st</sup> December 2001 (As per the certificate of “Commencement of Commercial Operation” from Government of Chhattisgarh). This is a single site project activity and so multiple start dates are not possible.
2. The project is continuing operation except some rare instances when the plant had to face shutdown. However, the plant was on a complete shutdown mode for maintenance related purposes from 1<sup>st</sup> April 2010 to 28<sup>th</sup> April 2010. Apart from this date, the shut down of the plant has been rare and was stopped only in case of any emergency. The details (hourly gross electricity generation readings) have been submitted to the DOE. No exchange of equipment within the project boundary is reported during the Monitoring period.
3. No change in configuration has taken place during the Monitoring period. Also, no event has taken place during the Monitoring period which might affect the applicability of the methodology and the registered monitoring plan.

### **B.2. Revision of the monitoring plan**

Not Applicable

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

Not Applicable.

### **B.4. Notification or request of approval of changes**

There has been no change in the in the project activity with reference to the registered PDD.

## **SECTION C. Description of the monitoring system**

The instrumentation and control system for the project activity is designed with adequate instruments to control and monitor the various operating parameters for safe and efficient operation of the plant. VVL has employed Distributed Control System (DCS). The data is inserted into the plant log books and they are checked and verified with DCS. All meters are calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time. The aim is to enable this project have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures is to direct and support continuous monitoring of project performance/key project indicators to determine project outcomes, greenhouse gas (GHG) emission reductions.

The project activity measures the gross energy generation, and the auxiliary consumption of electricity through dedicated energy meters located at the site of the plant. Inside the premises of the plant, the Chhattisgarh State Electricity Board has also installed an in-house export meter on the plant site itself. The meter was changed on 15<sup>th</sup> June 2010 and it is completely under the purview and control of the CSEB.

The Power Plant, after meeting its auxiliary requirements, sends the net electricity to the CSEB Grid. The Grid has a net meter and a check meter. The readings of the net meter are the basis of generation of carbon credits for this project activity.

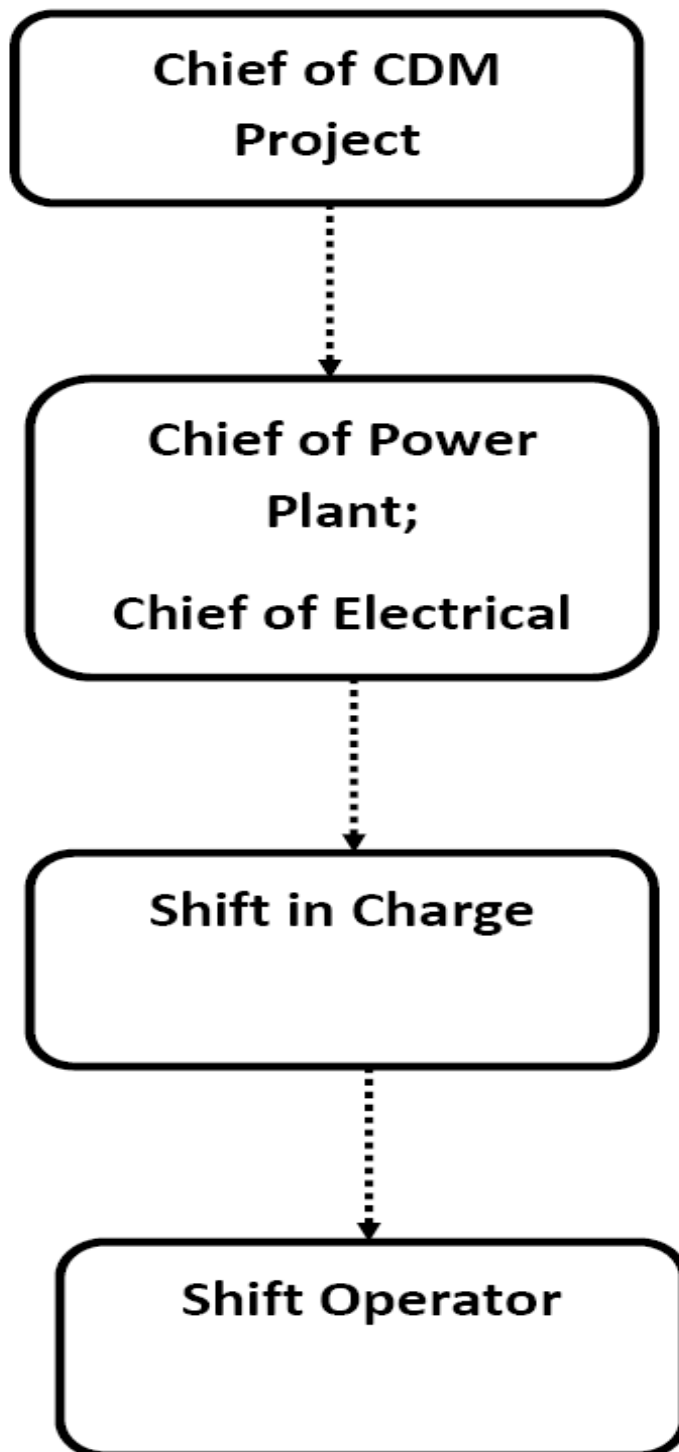
The project revenue is based on the units exported as measured by power meters at plant and main meter and check meters at the high-tension substation of the CSEB. The monitoring and verification system mainly comprises of these meters as far as power export is concerned. The rice husk and coal input quantities are also monitored. The export of electricity is done through invoices to CSEB. The readings are noted from the respective meters in the plant log book from where daily sheets are generated.

**Emergency Procedures:**

1. In case of any data discrepancy being identified at the review stage, the same is corrected with immediate effect with reference to any back up data as available.
2. In case of failure of a Energy meter recording data for a parameter, provisions are there for putting up an alternate energy meter (calibrated) in its place.

**Organizational Structure:**

1. The organizational structure including the various roles and responsibilities is as given below:



**Chief of CDM project:**

He is responsible for carrying out all compliance related activities related as per the Monitoring activities of the Registered PDD. He is also responsible for error reporting, internal CDM audit, and drafting of the Monitoring report as per the Monitoring Plan of the Registered PDD.

**Chief of Power Plant; Chief of Electrical:**

He is responsible for data collating, cross checking, presenting the same to the top management for review and data archiving. He is also responsible for calibration of the equipments (as per the Monitoring Plan), addressing the audit findings.

**Shift-in-charge:**

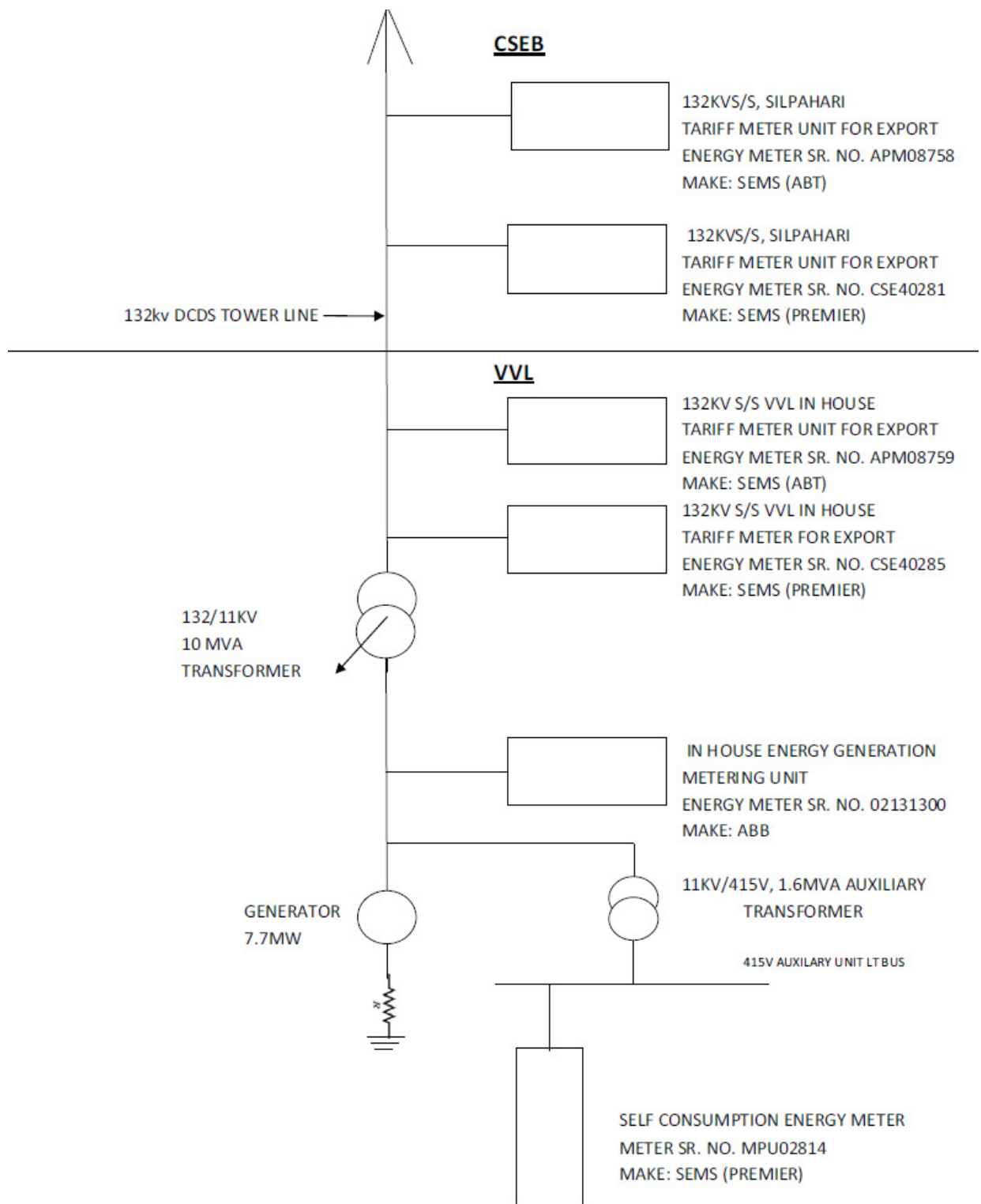
He is responsible for data collection and data recording and cross check.

**Shift-Operator:**

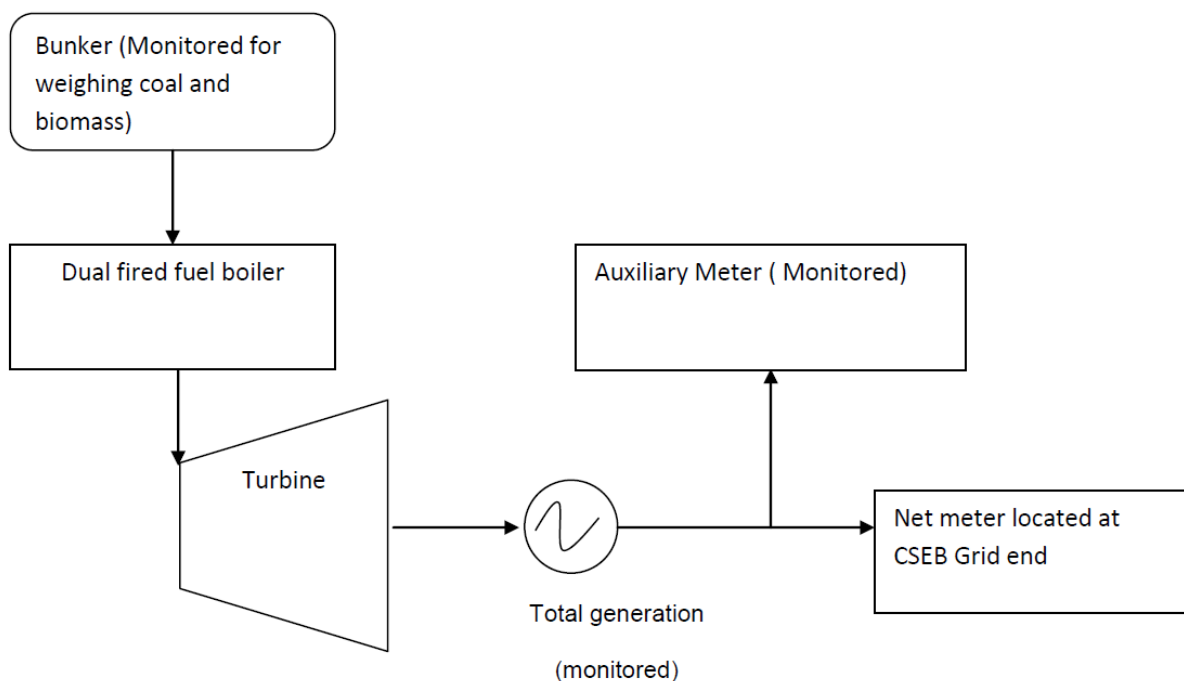
He is responsible for data collection and data reporting.

The Single Line diagram of the project activity plant is as follows:





The diagram showing the monitoring points is as shown in the diagram below:



The internal audit is performed in each quarter. For the period 1<sup>st</sup> April 2010-31<sup>st</sup> March 2011, internal audit was performed on four occasions. The respective dates are mentioned below.

1. 05/07/2010 (Ref No. : Audit Report No. 1)
2. 04/10/2010(Ref No. : Audit Report No. 2)
3. 04/01/2011(Ref No. : Audit Report No. 3)
4. 05/04/2011 (Ref No. : Audit Report No.4)

#### **SECTION D. Data and parameters**

The Monitoring Protocol requires the following parameters to be monitored for the computation of emission reductions:

- Power export
- Carbon content in coal

Apart from the above parameters, the project proponent also monitors the following supplementary parameters to check the operational performance of the power plant:

- Total electricity generated
- Auxiliary consumption
- Type of fuel used (Coal, Biomass)
- Total quantity of fuel consumption (Coal, Biomass)
- Calorific value of fuels used (Coal, Biomass)
- Plant heat rate
- Efficiency of power generation activity

##### **D.1. Data and parameters determined at registration and not monitored during the monitoring**

**period, including default values and factors**

<b>Data / Parameter:</b>	<b>CO<sub>2</sub> emission factor of the grid (EF<sub>y</sub>)</b>
Data unit:	<b>Kg CO<sub>2</sub>/KWh</b>
Description:	The same has been calculated ex-ante in the PDD (page 32 of the registered PDD) and has been kept as constant throughout the crediting period.
Source of data used:	Calculated as per the data published by CEA and other publicly available sources
Value(s) :	0.820
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Additional comment:	The same has been calculated once at the start of the crediting period and kept constant for the entire crediting period.

**D.2. Data and parameters monitored**

<b>Data / Parameter:</b>	<b>Total electricity generated</b>
Data unit:	kWh
Description:	Gross electricity generation (In house Generation meter)
Measured /Calculated /Default:	Measured
Source of data:	Plant Log Sheets further cross checked with DCS logs
Value(s) of monitored parameter:	60851700
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Type: ABB P+ Accuracy class : +/- 0.5% SI No. -02131300 Calibration frequency : Once in a year Date of last calibration: 27/01/2011 by Yenkey Instruments and Controls Pvt. Ltd. Validity upto : 26/01/2012 Calibration was also done on 12/03/2010 by Yenkey Instruments and Controls Pvt. Ltd. Calibration covers the entire Monitoring Period.
Measuring/ Reading/ Recording frequency:	Measured continuously and recorded shift-wise
Calculation method (if applicable):	Not Applicable.
QA/QC procedures applied:	There is a defined procedure on "GHG Performance Monitoring, Measurement and Reporting of Data" which ensures that proper corrective actions are undertaken immediately if any discrepancies are identified in the gross generation figures (like inconsistencies in reported parameters). These discrepancies are also documented as 'History' in the daily

	report.
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<b>Data / Parameter:</b>	<b>Power Export</b>														
Data unit:	kWh														
Description:	Power Export as per the meter readings of Chhattisgarh State Electricity Board (CSEB)														
Measured /Calculated /Default:	Measured														
Source of data:	Monthly HT Meter Reading Statements of Chhattisgarh State Power Distribution Company Ltd.														
Value(s) of monitored parameter:	54460560														
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission calculation														
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>The details of the main meter and the check meter is as follows:</p> <p>Main Meter details:  Type: Energy meter  Make: SEMS  SI No.: CSE 40281  Accuracy class: 0.5 S</p> <p>Check meter details:  Type: Energy Meter  Make: SEMS (ABT)  SI No.: APM 08758  Accuracy class: 0.2 S</p> <p>The Meters were changed as on 15<sup>th</sup> June 2010. The details of the meter as was present before 15<sup>th</sup> June 2010 is as follows:</p> <p>Type: Energy meter  Make: SEMS (Secure Meter)  SI No.: CSE 00046  Accuracy class: 0.5 S</p> <p>The meter is maintained and sealed and calibrated by CSEB. The PP has no control over the calibration of the meter. CSEB sends the monthly readings to Vandana Vidhyut Limited on the last day of the month or the first day of the next month.</p> <p>The dates on which the readings were received from CSEB are as follows:</p> <table border="1"> <thead> <tr> <th>Months</th><th>Date</th></tr> </thead> <tbody> <tr> <td>April 2010</td><td>30/04/2010</td></tr> <tr> <td>May 2010</td><td>31/05/2010</td></tr> <tr> <td>June 2010</td><td>21/06/2010      and 01/07/2010</td></tr> <tr> <td>July 2010</td><td>31/07/2010</td></tr> <tr> <td>August 2010</td><td>31/08/2010</td></tr> <tr> <td>September 2010</td><td>30/09/2010</td></tr> </tbody> </table>	Months	Date	April 2010	30/04/2010	May 2010	31/05/2010	June 2010	21/06/2010      and 01/07/2010	July 2010	31/07/2010	August 2010	31/08/2010	September 2010	30/09/2010
Months	Date														
April 2010	30/04/2010														
May 2010	31/05/2010														
June 2010	21/06/2010      and 01/07/2010														
July 2010	31/07/2010														
August 2010	31/08/2010														
September 2010	30/09/2010														

	October 2010	31/10/2010
	November 2010	30/11/2010
	December 2010	31/12/2010
	January 2011	31/01/2011
	February 2011	01/03/2011
	March 2011	31/03/2011
Measuring/ Reading/ Recording frequency:	Measured continuously and recorded on monthly basis. The CSEB officials note the meter reading on either the last day of the month, or the first day of the next month.	
Calculation method (if applicable):	Not Applicable.	
QA/QC procedures applied:	Since the meter is calibrated and sealed by CSEB, Government of Chhattisgarh, hence the accuracy of the meter is ensured. Vandana Vidhyut Limited (Project Proponent) has no control over the meter.	

<b>Data / Parameter:</b>	<b>Auxiliary Consumption</b>
Data unit:	kWh
Description:	Auxiliary Consumption of electricity for the project activity
Measured /Calculated /Default:	Measured
Source of data:	Monthly Performance Report
Value(s) of monitored parameter:	6259340
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Type: Energy Meter  Make : SEMS  Serial number: MPU 02814  Accuracy class: +/- 0.55%  Calibration frequency : Once in a year  Date of last calibration: 16/11/2010  Validity upto: 15/11/2011  The meter was installed on 29 November 2010.  Before 29 November 2010, the details of the meter that was in place is as follows:  Type: GEC ALSTOM  Accuracy class : +/- 1.0 %  Serial number : 7138950  Calibration frequency : Once in a year  Date of last calibration: 23/03/2010.  Validity upto: 22/03/2011.</p>
Measuring/ Reading/ Recording frequency:	Measured continuously and recorded on daily basis.
Calculation method (if applicable):	Not Applicable.
QA/QC procedures applied:	There is a defined procedure on “GHG Performance Monitoring, Measurement and Reporting of Data” which ensures that proper corrective actions are undertaken immediately if any discrepancies are

	<p>identified in the Auxiliary Consumption figures (like inconsistencies in reported parameters).</p> <p>These discrepancies are also documented as 'History' in the daily report.</p>
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<b>Data / Parameter:</b>	<b>Type of fuel used- Biomass</b>
Data unit:	Tonnes
Description:	Total quantity of rice husk consumption
Measured /Calculated /Default:	Measured
Source of data:	Rice Husk Stock Register
Value(s) of monitored parameter:	70177.01
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>The quantity of rice husk consumed is monitored by scaling of husk bunker (i.e. by measuring the difference in levels of rice husk in the bunker before feeding rice husk and after discharging the same into the feeding hoppers of the FBC boiler). A standardized scaling chart for the bunker is used to calculate the fuel fed from the bunker to the FBC boiler.</p> <p>The scaling of bunker was carried out by VVL which was certified by Power Tech Engineers (Consulting Engineers).</p> <p>Bunker certificate details:</p> <p>Calibration done by: Power Tech Engineers (Consulting Engineers)</p> <p>Date of last Calibration: 06/02/2011</p> <p>Validity: 05/02/2012</p> <p>Certificate No. : VVL-SK-16</p> <p>Accuracy class: N/A</p> <p>Calibration was also done on 06/02/2010.</p>
Measuring/ Reading/ Recording frequency:	Recorded on a daily basis.
Calculation method (if applicable):	Not Applicable.
QA/QC procedures applied:	<p>The annual rice husk consumption figure can also be cross-checked from the audited (by a third party statutory auditor) Balance Sheet of VVL.</p> <p>There is a defined procedure on "GHG Performance Monitoring, Measurement and Reporting of Data" which ensures that proper corrective actions are undertaken immediately if any discrepancies are identified in the rice husk consumption data. These discrepancies are also documented as 'History' in the daily report.</p>

<b>Data / Parameter:</b>	<b>Type of fuel used- Coal</b>
Data unit:	Tonnes
Description:	Total quantity of coal consumption
Measured /Calculated /Default:	Measured
Source of data:	Coal Stock Register
Value(s) of monitored	15088.417

parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emission calculations.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>The quantity of coal consumed is monitored by scaling of coal bunker (i.e. by measuring the difference in levels of coal in the bunker before feeding coal and after discharging the same into the feeding hoppers of the FBC boiler). A standardized scaling chart for the bunker is used to calculate the fuel fed from the bunker to the FBC boiler.</p> <p>The scaling of bunker was carried out by VVL which was certified by Power Tech Engineers (Consulting Engineers).</p> <p>Bunker certificate details:  Calibration done by: Power Tech Engineers (Consulting Engineers)  Date of last Calibration: 06/02/2011  Validity: 05/02/2012  Certificate No. : VVL-SK-16  Accuracy class: N/A  Calibration was also done on 06/02/2010.</p>
Measuring/ Reading/ Recording frequency:	Recorded on a daily basis.
Calculation method (if applicable):	Not Applicable.
QA/QC procedures applied:	The annual coal consumption figure can also be cross-checked from the audited (by a third party statutory auditor) Balance Sheet of VVL. There is a defined procedure on “GHG Performance Monitoring, Measurement and Reporting of Data” which ensures that proper corrective actions are undertaken immediately if any discrepancies are identified in the coal consumption data. These discrepancies are also documented as ‘History’ in the daily report.

Data / Parameter:	Carbon Content in Coal																										
Data unit:	%																										
Description:	Carbon Content in Coal																										
Measured /Calculated /Default:	Actual sample testing																										
Source of data:	Coal Analysis Reports of National Accredited Laboratory																										
Value(s) of monitored parameter:	<table><tr><td>01/04/10 to 30/04/10</td><td>29.7</td></tr><tr><td>01/05/10 to 31/05/10</td><td>33.9</td></tr><tr><td>01/06/10 to 30/06/10</td><td>28.2</td></tr><tr><td>01/07/10 to 31/07/10</td><td>25.7</td></tr><tr><td>01/08/10 to 31/08/10</td><td>31.2</td></tr><tr><td>01/09/10 to 30/09/10</td><td>26.4</td></tr><tr><td>01/10/10 to 31/10/10</td><td>29.0</td></tr><tr><td>01/11/10 to 30/11/10</td><td>35.0</td></tr><tr><td>01/12/10 to 31/12/10</td><td>35.1</td></tr><tr><td>01/01/11 to 31/01/11</td><td>22.9</td></tr><tr><td>01/02/11 to 28/02/11</td><td>26.3</td></tr><tr><td>01/03/11 to 31/03/11</td><td>26.1</td></tr></table>			01/04/10 to 30/04/10	29.7	01/05/10 to 31/05/10	33.9	01/06/10 to 30/06/10	28.2	01/07/10 to 31/07/10	25.7	01/08/10 to 31/08/10	31.2	01/09/10 to 30/09/10	26.4	01/10/10 to 31/10/10	29.0	01/11/10 to 30/11/10	35.0	01/12/10 to 31/12/10	35.1	01/01/11 to 31/01/11	22.9	01/02/11 to 28/02/11	26.3	01/03/11 to 31/03/11	26.1
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01/01/11 to 31/01/11	22.9																										
01/02/11 to 28/02/11	26.3																										
01/03/11 to 31/03/11	26.1																										
Indicate what the data are used for (Baseline/ Project/	Project Emissions calculations.																										

Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable.
Measuring/ Reading/ Recording frequency:	Recorded on a monthly basis.
Calculation method (if applicable):	Not Applicable.
QA/QC procedures applied:	The carbon content of the coal used is analyzed by a National Accredited Laboratory following the standard testing procedure which will ensure lower uncertainty level of the parameter.

Data / Parameter:	Calorific value of fuel used- coal																									
Data unit:	kcal/kg																									
Description:	Calorific value of coal used																									
Measured /Calculated /Default:	Actual sample testing																									
Source of data:	Reports of National Accredited Laboratory																									
Value(s) of monitored parameter:	<table><tr><td>01/04/10 to 30/04/10</td><td>2855</td></tr><tr><td>01/05/10 to 31/05/10</td><td>3195</td></tr><tr><td>01/06/10 to 30/06/10</td><td>2635</td></tr><tr><td>01/07/10 to 31/07/10</td><td>2320</td></tr><tr><td>01/08/10 to 31/08/10</td><td>2800</td></tr><tr><td>01/09/10 to 30/09/10</td><td>2450</td></tr><tr><td>01/10/10 to 31/10/10</td><td>2745</td></tr><tr><td>01/11/10 to 30/11/10</td><td>3430</td></tr><tr><td>01/12/10 to 31/12/10</td><td>3490</td></tr><tr><td>01/01/11 to 31/01/11</td><td>2175</td></tr><tr><td>01/02/11 to 28/02/11</td><td>2315</td></tr><tr><td>01/03/11 to 31/03/11</td><td>2280</td></tr></table>		01/04/10 to 30/04/10	2855	01/05/10 to 31/05/10	3195	01/06/10 to 30/06/10	2635	01/07/10 to 31/07/10	2320	01/08/10 to 31/08/10	2800	01/09/10 to 30/09/10	2450	01/10/10 to 31/10/10	2745	01/11/10 to 30/11/10	3430	01/12/10 to 31/12/10	3490	01/01/11 to 31/01/11	2175	01/02/11 to 28/02/11	2315	01/03/11 to 31/03/11	2280
01/04/10 to 30/04/10	2855																									
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01/09/10 to 30/09/10	2450																									
01/10/10 to 31/10/10	2745																									
01/11/10 to 30/11/10	3430																									
01/12/10 to 31/12/10	3490																									
01/01/11 to 31/01/11	2175																									
01/02/11 to 28/02/11	2315																									
01/03/11 to 31/03/11	2280																									
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)																										
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable.																									
Measuring/ Reading/ Recording frequency:	Recorded on a monthly basis.																									
Calculation method (if applicable):	Not Applicable.																									
QA/QC procedures applied:	The calorific value of coal is tested by an external Laboratory, which is a National Accredited Laboratory (Central Fuel Research Institute, Bilaspur Unit).																									



Data / Parameter:	Calorific value of fuel used- biomass																									
Data unit:	kcal/kg																									
Description:	Calorific value of rice husk used																									
Measured /Calculated /Default:	Actual sample testing																									
Source of data:	Lab Analysis Report																									
Value(s) of monitored parameter:	<table><tr><td>01/04/10 to 30/04/10</td><td>3168</td></tr><tr><td>01/05/10 to 31/05/10</td><td>3254</td></tr><tr><td>01/06/10 to 30/06/10</td><td>3266</td></tr><tr><td>01/07/10 to 31/07/10</td><td>3242</td></tr><tr><td>01/08/10 to 31/08/10</td><td>3187</td></tr><tr><td>01/09/10 to 30/09/10</td><td>3142</td></tr><tr><td>01/10/10 to 31/10/10</td><td>3168</td></tr><tr><td>01/11/10 to 30/11/10</td><td>3095</td></tr><tr><td>01/12/10 to 31/12/10</td><td>3108</td></tr><tr><td>01/01/11 to 31/01/11</td><td>3174</td></tr><tr><td>01/02/11 to 28/02/11</td><td>3206</td></tr><tr><td>01/03/11 to 31/03/11</td><td>3230</td></tr></table>		01/04/10 to 30/04/10	3168	01/05/10 to 31/05/10	3254	01/06/10 to 30/06/10	3266	01/07/10 to 31/07/10	3242	01/08/10 to 31/08/10	3187	01/09/10 to 30/09/10	3142	01/10/10 to 31/10/10	3168	01/11/10 to 30/11/10	3095	01/12/10 to 31/12/10	3108	01/01/11 to 31/01/11	3174	01/02/11 to 28/02/11	3206	01/03/11 to 31/03/11	3230
01/04/10 to 30/04/10	3168																									
01/05/10 to 31/05/10	3254																									
01/06/10 to 30/06/10	3266																									
01/07/10 to 31/07/10	3242																									
01/08/10 to 31/08/10	3187																									
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01/11/10 to 30/11/10	3095																									
01/12/10 to 31/12/10	3108																									
01/01/11 to 31/01/11	3174																									
01/02/11 to 28/02/11	3206																									
01/03/11 to 31/03/11	3230																									
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-																									
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Bomb Calorimeter Type: Advance Research Instrument Corporation, New Delhi Model: BCM/21018 Date of last calibration: 20/05/2010. Calibration frequency: Once in a year Validity upto: 19/05/2011 The calorific value of the rice husk is determined in the in-house laboratory of VVL as per the standard national practices by taking samples at random. Calibration was also done on 10/06/2009																									
Measuring/ Reading/ Recording frequency:	Recorded on a monthly basis.																									
Calculation method (if applicable):	Not Applicable.																									
QA/QC procedures applied:	There is a defined procedure on “GHG Performance Monitoring, Measurement and Reporting of Data” which ensures that proper corrective actions are undertaken immediately if any observations in the calorific value of rice husk (like inconsistencies in reported parameters) are identified																									

Data / Parameter:	Efficiency of power generation activity				
Data unit:	%				
Description:	Efficiency of power generation activity				
Measured /Calculated /Default:	Calculated				
Source of data:	Emission Reduction calculation sheet provided to DOE.				
Value(s) of monitored parameter:	<table><tr><td>01/04/10 to 30/04/10</td><td>21.26</td></tr></table>			01/04/10 to 30/04/10	21.26
01/04/10 to 30/04/10	21.26				

	01/05/10 to 31/05/10	19.21	
	01/06/10 to 30/06/10	19.70	
	01/07/10 to 31/07/10	20.19	
	01/08/10 to 31/08/10	19.95	
	01/09/10 to 30/09/10	20.60	
	01/10/10 to 31/10/10	20.13	
	01/11/10 to 30/11/10	24.87	
	01/12/10 to 31/12/10	19.40	
	01/01/11 to 31/01/11	16.49	
	01/02/11 to 28/02/11	17.71	
	01/03/11 to 31/03/11	20.22	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-		
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable.		
Measuring/ Reading/ Recording frequency:	It is a calculated parameter. However, the same is recorded continuously (on a per hour basis).		
Calculation method (if applicable):	The parameters are computed following the standard methods of calculation. Efficiency =860/ (plant heat rate)%		
QA/QC procedures applied:	There is a defined procedure on “GHG Performance Monitoring, Measurement and Reporting of Data” which ensures that proper corrective actions are undertaken immediately if any observations in the efficiency of power generation (like inconsistencies in computed parameters) are identified. These discrepancies are also documented as ‘History’ in the daily report.		

Data / Parameter:	Plant Heat Rate																							
Data unit:	kcal/kWh																							
Description:	Plant Heat Rate																							
Measured /Calculated /Default:	Calculated																							
Source of data:	Emission Reduction calculation sheet provided to DOE.																							
Value(s) of monitored parameter:	<table><tr><td>01/04/10 to 30/04/10</td><td>4044.30</td></tr><tr><td>01/05/10 to 31/05/10</td><td>4476.83</td></tr><tr><td>01/06/10 to 30/06/10</td><td>4365.92</td></tr><tr><td>01/07/10 to 31/07/10</td><td>4259.13</td></tr><tr><td>01/08/10 to 31/08/10</td><td>4310.30</td></tr><tr><td>01/09/10 to 30/09/10</td><td>4175.42</td></tr><tr><td>01/10/10 to 31/10/10</td><td>4271.38</td></tr><tr><td>01/11/10 to 30/11/10</td><td>3457.46</td></tr><tr><td>01/12/10 to 31/12/10</td><td>4433.82</td></tr><tr><td>01/01/11 to 31/01/11</td><td>5216.65</td></tr><tr><td>01/02/11 to 28/02/11</td><td>4856.98</td></tr></table>		01/04/10 to 30/04/10	4044.30	01/05/10 to 31/05/10	4476.83	01/06/10 to 30/06/10	4365.92	01/07/10 to 31/07/10	4259.13	01/08/10 to 31/08/10	4310.30	01/09/10 to 30/09/10	4175.42	01/10/10 to 31/10/10	4271.38	01/11/10 to 30/11/10	3457.46	01/12/10 to 31/12/10	4433.82	01/01/11 to 31/01/11	5216.65	01/02/11 to 28/02/11	4856.98
01/04/10 to 30/04/10	4044.30																							
01/05/10 to 31/05/10	4476.83																							
01/06/10 to 30/06/10	4365.92																							
01/07/10 to 31/07/10	4259.13																							
01/08/10 to 31/08/10	4310.30																							
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01/11/10 to 30/11/10	3457.46																							
01/12/10 to 31/12/10	4433.82																							
01/01/11 to 31/01/11	5216.65																							
01/02/11 to 28/02/11	4856.98																							

	01/03/11 to 31/03/11	4252.92	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-		
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable.		
Measuring/ Reading/ Recording frequency:	It is a calculated parameter. However, the same is recorded continuously (on a per hour basis).		
Calculation method (if applicable):	The parameter is computed following the standard methods of calculation. [(Quantity of rice husk × GCV of rice husk) +(Quantity of coal × GCV of coal)]/ Gross generation		
QA/QC procedures applied:	There is a defined procedure on “GHG Performance Monitoring, Measurement and Reporting of Data” which ensures that proper corrective actions are undertaken immediately if any observations in the plant heat rate (like inconsistencies in computed parameters) are identified. These discrepancies are also documented as ‘History’ in the daily report.		

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

Baseline Emissions = (Net Export to CSEB Grid \* Grid emission Factor) tCO<sub>2</sub>

The grid emission factor is calculated ex-ante and is fixed for the entire crediting period. The value of the grid emission factor was calculated in the Registered PDD based on figures provided by the Central Electricity Authority, Government of India and other government agencies of India (mentioned in the Registered PDD).

Parameters Months	Baseline Emissions		
	Net Export to CSEB Grid	Grid Emission Factor	Baseline Emissions
	(kWh)	(Kg CO <sub>2</sub> /KWh)	(tCO <sub>2</sub> )
01/04/10 to 30/04/10	34960	0.820	29
01/05/10 to 31/05/10	4897440	0.820	4016
01/06/10 to 30/06/10	4731920	0.820	3880
01/07/10 to 31/07/10	5019360	0.820	4116
01/08/10 to 31/08/10	5189040	0.820	4255
01/09/10 to 30/09/10	4882800	0.820	4004

01/10/10 to 31/10/10	4983600	0.820	4087
01/11/10 to 30/11/10	4926720	0.820	4040
01/12/10 to 31/12/10	5190000	0.820	4256
01/01/11 to 31/01/11	4725840	0.820	3875
01/02/11 to 28/02/11	4858800	0.820	3984
01/03/11 to 31/03/11	5020080	0.820	4116
<b>Total</b>	<b>54460560</b>		<b>44658</b>

The baseline emissions in this case comes out to be 44658 tonnes of CO<sub>2</sub> for the current monitoring period.

## E.2. Project emissions calculation

Project Emissions = [(44/12) \* Quantity of Coal consumed \* Carbon content of coal] tCO<sub>2</sub>

Parameters Months	Project Emissions		
	Coal Consumption	Total Carbon in Coal	Project Emissions
	(tonnes)	(%)	(tCO <sub>2</sub> )
01/04/10 to 30/04/10	22.175	29.70	24
01/05/10 to 31/05/10	1266.787	33.90	1575
01/06/10 to 30/06/10	1185.988	28.20	1226
01/07/10 to 31/07/10	1347.517	25.70	1270
01/08/10 to 31/08/10	1359.594	31.20	1555
01/09/10 to 30/09/10	1273.860	26.40	1233
01/10/10 to 31/10/10	1272.107	29.00	1353
01/11/10 to 30/11/10	1279.291	35.00	1642
01/12/10 to 31/12/10	2180.238	35.10	2806
01/01/11 to 31/01/11	1228.387	22.90	1031
01/02/11 to 28/02/11	1204.930	26.30	1162
01/03/11 to 31/03/11	1467.543	26.10	1404
<b>Total</b>	<b>15088.417</b>	<b>29.13</b>	<b>16282</b>

The project emissions works out to be 16282 tonnes of CO<sub>2</sub> for the current monitoring period.

## E.3. Leakage calculation

Not Applicable

## E.4. Emission reductions calculation / table

Emission Reductions = (Baseline Emissions – Project Emissions) tCO<sub>2</sub>

Parameters  Months	Baseline Emissions			Project Emissions			Emission Reductions
	Net Export to CSEB Grid	Grid Emission Factor	Baseline Emissions	Coal Consumption	Total Carbon in Coal	Project Emissions	
	(kWh)	(Kg CO <sub>2</sub> /KWh)	(tCO <sub>2</sub> )	(tonnes)	(%)	(tCO <sub>2</sub> )	(tCO <sub>2</sub> )
01/04/10 to 30/04/10	34960	0.820	29	22.175	29.70	24	5
01/05/10 to 31/05/10	4897440	0.820	4016	1266.787	33.90	1575	2441
01/06/10 to 30/06/10	4731920	0.820	3880	1185.988	28.20	1226	2654
01/07/10 to 31/07/10	5019360	0.820	4116	1347.517	25.70	1270	2846
01/08/10 to 31/08/10	5189040	0.820	4255	1359.594	31.20	1555	2700
01/09/10 to 30/09/10	4882800	0.820	4004	1273.860	26.40	1233	2771
01/10/10 to 31/10/10	4983600	0.820	4087	1272.107	29.00	1353	2734
01/11/10 to 30/11/10	4926720	0.820	4040	1279.291	35.00	1642	2398
01/12/10 to 31/12/10	5190000	0.820	4256	2180.238	35.10	2806	1450
01/01/11 to 31/01/11	4725840	0.820	3875	1228.387	22.90	1031	2844
01/02/11 to 28/02/11	4858800	0.820	3984	1204.930	26.30	1162	2822
01/03/11 to 31/03/11	5020080	0.820	4116	1467.543	26.10	1404	2712
<b>Total</b>	<b>54460560</b>		<b>44658</b>	<b>15088.417</b>		<b>16282</b>	<b>28376</b>

#### 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 <sub>2</sub> e)	21076	28376

#### E.7. Remarks on difference from estimated value in the PDD

In the registered PDD, the emission reductions for the entire crediting period were projected based on

- Baseline emissions corresponding to a net exportable electricity of 45.41 GWh to Chattisgarh State Electricity Board (CSEB) grid for the year 2002-2003 and
- Project emissions resulting from co-firing of 9784.9 tonnes of coal with rice husk in 2002-2003 and a total carbon content of 45% in coal.

In line with the registered monitoring plan, the emission reductions for the period 2010-2011 are calculated based on

- Baseline emissions corresponding to a net exported electricity of 54.46 GWh to CSEB grid for the year 2010-2011. The main reason for it was the increase in gross generation due to an increased quantity of rice husk and coal fired in comparison to the quantity fired in the year 2002-03 during the initial phase of the project. Further, the generation of 54.46 GWh is within the capacity of generation of 7.7 MW, i.e. with nearly 330 days of operation during the year 2010-2011, the plant has generated within the rated capacity and there has been a change in the gross generation as compared to the projected generation reported in 2002-03.

- Project emissions resulting from co-firing of 15088.417 tonnes of coal with rice husk in 2010-2011 and a total carbon content of coal (measured monthly) ranging between 22.90% to 35.10%

The above explanation signifies:

- (i) an increase in baseline emissions of 7436 tonnes CO<sub>2</sub> in 2010-2011 with respect to that in 2002-2003 (as provided in the registered PDD) which is attributed to an increase in net exported electricity to CSEB grid,
- (ii) an increase in project emissions by 136 tonnes CO<sub>2</sub> in 2010-2011 with respect to that in 2002-2003 (as provided in the registered PDD) which is attributed to a corresponding reduction in total carbon content of coal used.

This justifies an increase in emission reductions for the period 2010-2011 by 7300 tonnes of CO<sub>2</sub> with respect to that projected in the registered PDD.

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#### History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Guideline, Form <b>Business Function:</b> Issuance		