

**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 01 16/03/2012

**RREPL- 14 MW Rice Husk Power Project**

CDM reference No: 0598

**3<sup>rd</sup> Monitoring Period 01/04/2010 to 31/12/2011 (first and last day included)****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 generate electricity using Biomass like rice husk for generation of power to achieve better energy efficiency, produce eco-friendly power; achieve sustainable development of the industry by reducing CO<sub>2</sub> emission and other GHG emissions due to degeneration and uncontrolled atmospheric burning of biomass. RREL generates electricity and supply to or through CSEB grid which meets the demand of its consumers for electricity by producing and importing electricity from power stations generating electricity based on fossil fuel.

The 14 MW Rice Husk Power Project at R.R. Energy Limited, Raigarh, Chhattisgarh, India. The project activity is commissioned on 13<sup>th</sup> January 2007. The first monitoring period was from 1<sup>st</sup> February 2007 to 31<sup>st</sup> March 2008 and the second monitoring period was from 1<sup>st</sup> April 2008 to 31<sup>st</sup> March 2010. The present monitoring report is from 1<sup>st</sup> April 2010 to 31<sup>st</sup> December 2011.

Emission Reduction Claimed: 92953 tonnes CO<sub>2</sub>e

- Project Type: Small Scale
- Sectoral scope: 01
- Approved methodology: Type-I RENEWABLE ENERGY PROJECTS
- Category : Grid connected renewable electricity generation I.D./ Version 08
- Host Party: Govt. of India.

The project has been completed with major equipment supplied as given in Table 1

Table 1: List of Equipment

Sl. No.	Equipment Description /Technical Specifications	Supplier Name & Address
1	Steam Turbine (14 MW, (14 MW, Steam Temperature: 490-495 degree C, (Design/Maximum) Steam Pressure: 6.485/6.809 Mpa)	Greenesol Power System Pvt. Ltd. No. 11/23, "SURYADEV" 20 <sup>th</sup> Main Road, 1-R Block Rajajinagar, West of Chord Road, Bangalore – 560 010 India
2	Generator (15 MW) 3 phase synchronous generator)	Greenesol Power System Pvt. Ltd. No. 11/23, "SURYADEV" 20 <sup>th</sup> Main Road, 1-R Block Rajajinagar, West of Chord Road, Bangalore – 560 010 India
3	Boilers (62T/hr of steam at 66 kg/ cm <sup>2</sup> pressure and 490±5 <sup>0</sup> C temperature)	Thermax Babcock & Wilcox Limited D-1 MIDC, R. D. AGA Road Chinchwad PUNE –411019

4	Cooling Towers (Air cooled type)	COMPOSITE AQUA SYSTEMS & EQUIPMENTS P. L. 39, Shahpurjat, Opp. Asian Village Complex New Delhi 110 049
5	Distribution Transformers	EMCO LIMITED N-104, MIDC Area, Vill – Mehrun, Jalgaon
6	Power Control Centre & Motor Control Centre	Breaker from AREVA T&D INDIA Limited Naini Allahabad – 211 008 and other control system purchased from various suppliers assembled at Master Panel

## **A.2. Project Participants**

>> Project Participant: RR ENERGY LIMITED - Private Entity

Parties	Authorized Participants	Country
Host Parties	M/s R. R. Energy Limited	India
Other Parties Involved	Bunge Emissions Fund Limited	Switzerland

## **A.3. Location of the project activity:**

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Garh Umaria, Darramuda; Raigarh District, Chhattisgarh state  
Longitude 85 degree 24.5 minutes East; Latitude 21 degree 51.2 minutes North.

## **A.4. Technical description of the project**

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The biomass is mainly rice husk. The electricity generating system comprises of:

- Fluidised bed type boiler
- Steam drum
- Super heater
- 15 MW STG electromagnetic induction type
- Air cooled condensers
- De-mineralised water plant
- Fuel handling system
- Ash handling system
- Air dryer etc.
- Air preheater and Economizer.

The biomass is burnt in fluidised bed boiler where sand is used as inert bed to produce 62T/hr of steam at 66 kg/ cm<sup>2</sup> pressure and 490±5<sup>0</sup>C temperature. A small percentage of fossil fuel like coal is being used to ensure consistent generation of electricity. The outlet box of the FBB leads to ESP to remove SPM from exhaust gases. The exhaust gas temperature is kept at 160<sup>0</sup>C or lower. The steam from boiler at 66 kg/cm<sup>2</sup> pressure and 490<sup>0</sup>C temperature is taken to high efficiency extraction cum condensing multi stage Steam Turbine and Generator (STG) and operated to generate 14 MW Electricity. Ash collected from hoppers & ESP is conveyed to Ash Silo.

Other system used is circulating water, Demineralised water plant, Instrument Air Compressor; air dryer. Steam from FBB passes through steam turbine rotor and exhausted in water cooled condenser and water is cooled in air cooled heat exchanger. Total Waste water is recycled and reused after treatment. The entire 14MW power after using around 8% of 14 MW for in-house consumption for equipment will be sold to or through CSEB grid who will further distribute to their consumers.

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

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Title: RREPL-14MW Rice Husk Power Project

Baseline methodology used and its version: Type-I RENEWABLE ENERGY PROJECTS

Category I.D. Grid connected renewable electricity generation I.D./ Version 08, March 2006

Registered PDD and its version: RREPL-14MW Rice Husk Power Project (0598),

CDM document version no: 04, date: 07/08/2006

UNFCCC link: <http://cdm.unfccc.int/Projects/DB/SGS-UKL1158161760.22/view>

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

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Date when project was registered: 28<sup>th</sup> Oct 2006 '

UNFCCC link: <http://cdm.unfccc.int/Projects/DB/SGS-UKL1158161760.22/view>

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

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Crediting Period: 10 years, 01 Feb 2007 - 31 Jan 2017 (Fixed)

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

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

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

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The project has started commercial production from 13<sup>th</sup> January 2007. The first monitoring period was from 1<sup>st</sup> February 2007 to 31<sup>st</sup> March 2008 and the second monitoring period was from 01<sup>st</sup> April 2008 to 31<sup>st</sup> March 2010 and the present monitoring report is from 1<sup>st</sup> April 2010 to 31<sup>st</sup> December 2011.

The total shutdown period of the plant was 2140 hrs & 32 minutes for period from 1<sup>st</sup> April 2010- 31<sup>st</sup> December 2010 and 1954 hrs & 57 minutes for period from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2011 respectively.

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

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Revised Monitoring Plan approved on 08<sup>th</sup> Nov 2008

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

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Not applicable

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

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A notification of changes in the Registered PDD is accepted by UNFCCC EB on 25<sup>th</sup> Nov 2011

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

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The power generated within the project boundary by TG is recorded through independent energy meter installed by the project proponent on the TG set and power exported to the Grid is recorded by electrical energy meter installed at the Sub-station of CSEB, which is sealed by the Government agency i.e. CSEB. Project participant submits the monthly power export bill based on the joint meter reading recorded at CSEB sub-station based on the data recorded by CSEB personnel. Export meter is at the substation of CSEB. In the similar fashion the auxiliary meter installed at transformer for supplying auxiliary power to the Power plant is metered and recorded by the project proponent. These data are used for computation of net power generation by the project activity. The auxiliary power consumed by the project activity is recorded and deducted from Gross Power generation. This way the Net power generated by the project activity is arrived by deducting the auxiliary power consumed by the project activity from the gross power generated by the project activity. However the net power exported to the Grid which is recorded at “CSEB sub station” which already excludes the auxiliary power consumed within the plant as well as transmission losses incurred during wheeling of the power from project site to the substation, but does not exclude the power imported from the Grid. Therefore the net exported power to the grid is more conservative than the net power generation calculated by deducting the auxiliary power consumption from gross power generation, therefore as a conservative approach the net exported power to the Grid is considered after deducting the power imported from the Grid, for CER calculations.

Total fossil fuel consumption in the plant is recorded separately. The project emission from fossil fuel consumption is calculated based on the total net calorific value energy provided. The project emission is deducted for arriving at the net emission reduction due to the Project Activity.

The in-house generation meters (or the Energy Meter) will be micro-processor based metering device monitor, the total power generation as well as the net unit of auxiliary electricity consumed by RREPL. The reading of this meter will be used to cross-check the reading of the External Metering System of CSEB. The Shift Engineer (Electrical) shall monitor hourly and eight hourly data on total generation, auxiliary consumption, net electricity available for export. The hourly data will be recorded in the generation log book and the eight hourly data will be recorded in the plant log book. The complete and accurate records in the plant log book will be signed by the Shift Engineer (Electrical). Both of these reports will be sent to the Manager (Electrical & Instrumentation) for his review on a daily basis. A daily report of 24 hours will be made based on the three shift reports.

### **QA/QC Procedures:**

Log book signed by the shift In charge daily. Meters are calibrated annually. As the main meters of Generation and Auxiliary Consumption are sealed by CSEB, the meters are regularly under QA/QC procedure for any variation. If variation is noticed, calibration will be done immediately. Manager (QA & QC) would be responsible for the calibration of the meters. Weighbridge undergoes maintenance as per defined industry standards. This data can be cross checked against purchase receipts and inventory data. Belt weigher will be calibrated once in a year and logbook will be maintained at site. Any uncertainty like inconsistency/discrepancy of data parameters will be dealt with various corrective actions. These will be reported along with its time of occurrence, possible reasons and duration. Uncertainty with metering (if any difference between recording of Main meter and Check meter) will be dealt jointly both by project proponent and CSEB representative. Corrective actions will be undertaken after identification of reason for such uncertainty.

The monitoring protocol requires RREL to monitor the following GHG Performance parameters for estimating the emissions reductions from Biomass based power plant:

- Gross generation of electricity
- Auxiliary consumption of electricity.
- Net electricity generation
- Fuel consumption (1) for biomass (2) for Fossil Fuel (Coal)

The metering system for the Power plant consist of

- External Metering System of CSEB for metering the net export of power (Main meter).
- External metering system of CSEB for metering total generation.
- In house metering system of RREL (for metering the generation of power, auxiliary consumption, export to or through CSEB grid)
- Biomass consumption in the boiler to be tallied with the store issuance of the biomass and purchase invoices.
- Fossil fuel consumption in the boiler to be tallied with the store issuance of the fossil fuel and purchase invoices.

#### Roles and Responsibilities:

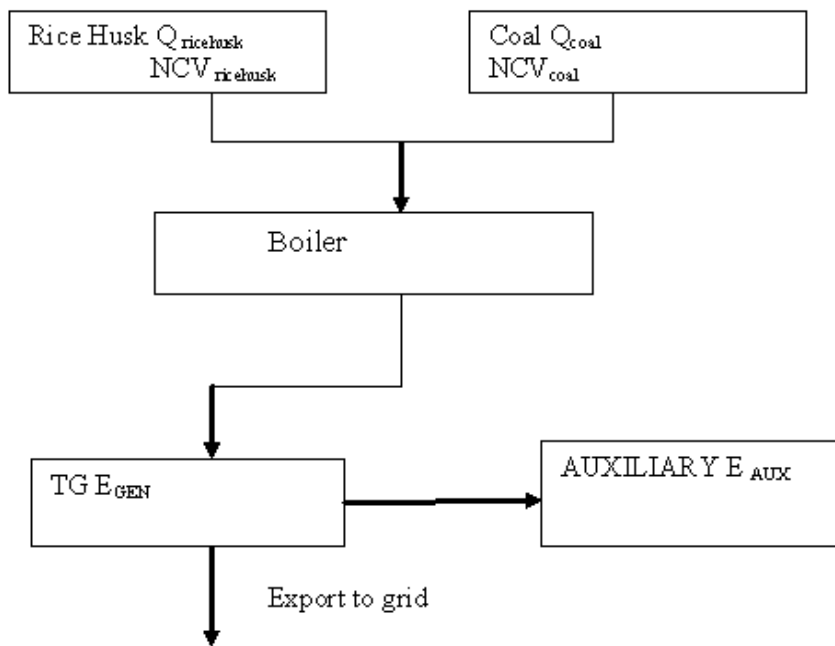
1. Shift Engineer (Operations): Responsible for reporting hourly and eight hourly data of the biomass and coal consumption, steam generation. The report is then sent to Manager (O&M)
2. Manager (O&M) : Responsible for reviewing the monitored parameters on hourly and eight hourly based and presenting through a daily executive summary report, duly signed by himself, to the General Manager (Plant).
3. Shift Engineer (Electrical): Responsible for taking shift wise meter reading for electricity generation, Auxiliary consumption Export to the Grid and pre-operation of the Shift Report. The report is then sent to the Manager (E&I) for his review on daily basis.
4. Manager (E&I): Responsible for reviewing the monitored parameters shift-wise and presenting through a daily executive summary report, duly signed by himself, to the General Manager (Plant).
5. General Manager (Plant): Responsible for summarizing data of Electrical, Mechanical, Process (/operation) Departments and report the same to the Vice President (Power) and CMD (RREL) on daily basis.
6. CSEB Personnel: Responsible for monitoring the total power generated by RREL and certifying the same jointly with RREL on a monthly basis, for making the payment electricity received by the CSEB grid.

#### Emergency Preparedness Plan

The total power generating system of power plant is equipped with an “Automatic Alarming System” which helps the operators to take necessary preventive actions before any kind of non-functioning of the power plant results. RREL will be having fire fighting system in place. In addition RREL shall have standard procedures for tackling emergencies arising from Blackout, Low boiler drum level/ low feed water level, Load throw off, Boiler Tube leakage, Boiler tripping at alarm systems.

Qualified and trained people monitor the parameters and emission reduction calculations .In the complete implementation and monitoring plan, RREL is the sole agency responsible for implementation and monitoring

The team is well diversified and experienced and undergoes training related to the CDM activities on a regular basis. Internal as well as external trainers are invited to impart training to the concerned personnel from the team.



**Figure 1** Line Diagram showing monitoring points



**SECTION D. Data and parameters monitored**

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**D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors**

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<b>Data / Parameter:</b>	EF <sub>y</sub>
<b>Data unit:</b>	tCO <sub>2</sub> /MWh
<b>Description:</b>	the weighted average emission factor in current generation mix for the electricity displacement due to the project activity during the year y in tons CO <sub>2</sub> / MWh
<b>Source of data used:</b>	Western Region Annual Report 2004-05; Review of Performance of Thermal Power Station 2004-05, 2003-04, 2002-03, 1997-98 of CEA; Review of Performance of Hydel Power Station 2003-04, 2002-03 of CEA; General Review of 2005 & 2002-03 CEA; Nuclear Power Corporation Report; Tariff Order for TPC-FY 2003-04 & FY 2004-05 for Trombay Power Station; Review of Performance of Thermal Power Station 2004-05 and General Review 2005 and General Review 2002-03 of CEA.
<b>Value (s):</b>	0.9664
<b>Indicate what the data are used for (Baseline/project/Leakage emission calculations)</b>	Baseline emission calculations
<b>Any comment:</b>	Simple Operating Margin and Build Margin weighted average yields Combined margin

<b>Data / Parameter:</b>	EF <sub>OM,y simple</sub>
<b>Data unit:</b>	<u>tCO<sub>2e</sub>/MWh</u>
<b>Description:</b>	CO <sub>2</sub> operating margin emission factor of the grid using 3 years average
<b>Source of data used:</b>	Western Region Annual Report 2004-05; Review of Performance of Thermal Power Station 2004-05, 2003-04, 2002-03, 1997-98 of CEA;
<b>Value (s):</b>	1.09428
<b>Indicate what the data are used for (Baseline/project/Leakage emission calculations)</b>	Baseline emission calculations
<b>Any comment:</b>	Simple Operating Margin calculated ex ante once during validation

<b>Data / Parameter:</b>	$F_{i,j,y}$
Data unit:	<u>tonnes</u>
Description:	The amount of fuel $i$ (in tonnes) consumed by relevant power sources $j$ in years $y$ .
Source of data used:	Western Region Annual Report 2004-05; Review of Performance of Thermal Power Station 2004-05, 2003-04, 2002-03, 1997-98 of CEA; Review of Performance of Hydel Power Station 2003-04, 2002-03 of CEA; General Review of 2005 & 2002-03 CEA; Nuclear Power Corporation Report; Tariff Order for TPC-FY 2003-04 & FY 2004-05 for Trombay Power Station; Review of Performance of Thermal Power Station 2004-05 and General Review 2005 and General Review 2002-03 of CEA.
Value (s):	NA
Indicate what the data are used for (Baseline/project/Leakage emission calculations)	Baseline emission calculations
Any comment:	Used for calculation of simple OM and BM obtained from Western Region Grid report /CEA documents once during validation ex-ante.

<b>Data / Parameter:</b>	COEF <sub>ij,y</sub>				
<b>Data unit:</b>	t CO2/t of fuel				
<b>Description:</b>	CO2 emission coefficient of fuel <sub>i</sub> (t CO2/t of fuel), taking into account the carbon content of fuel used by relevant power source <sub>j</sub> and the percent oxidation of the fuel in year(s)				
<b>Source of data used:</b>	Revised IPCC guidelines, Vol.3				
<b>Value (s):</b>	<b>Fuel</b>	<b>NCV(TJ/t)</b>	<b>OXDi</b>	<b>EF<sub>CO2</sub> (tCO2/TJ)</b>	<b>Calculation for EF<sub>CO2</sub> (tCO2/TJ)</b>
	Coal	0.01998	0.98	96.07	(26.2 (carbon content factor for sub.bit. Coal X 44/12)
<b>Indicate what the data are used for (Baseline/project/Leakage emission calculations)</b>	Baseline emission calculations				
<b>Any comment:</b>	Used for calculation of simple OM and BM, Ex- ante once during validation				

<b>Data / Parameter:</b>	GEN <sub>j,y</sub>
<b>Data unit:</b>	<u>MWh</u>
<b>Description:</b>	Electricity (MWh) delivered to the grid by sources j .
<b>Source of data used:</b>	Western Region Annual Report 2004-05; Review of Performance of Thermal Power Station 2004-05, 2003-04,2002-03, 1997-98 of CEA; Review of Performance of Hydel Power Station 2003-04, 2002-03 of CEA; General Review of 2005 & 2002-03 CEA; Nuclear Power Corporation Report; Tariff Order for TPC-FY 2003-04 & FY 2004-05 for Trombay Power Station; Review of Performance of Thermal Power Station 2004-05 and General Review 2005 and General Review 2002-03 of CEA.
<b>Value (s):</b>	NA
<b>Indicate what the data are used for (Baseline/project/Leakage emission calculations)</b>	Baseline emission calculations
<b>Any comment:</b>	Used for calculation of simple OM, Ex ante once during validation

<b>Data / Parameter:</b>	EFCO <sub>2</sub>
Data unit:	tCO <sub>2</sub> /TJ
Description:	Carbon dioxide emission factor of coal
Source of data used:	<a href="http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php">http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php</a>
Value (s)	96.07
Indicate what the data are used for (Baseline/project/Leakage emission calculations)	Project emission calculation
Additional comment:	

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

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<b>Data / Parameter:</b>	E <sub>GEN</sub>
Data unit:	MWh /month
Description:	Total electricity generated at the Plant
Measured /Calculated /Default:	<b>Measured (m),</b> Online measurement
Source of data:	Plant record
Value(s) of monitored parameter:	95401.08 (The value is for 01/04/2010 to 31/12/2010) 70736.00 (The value is for 01/01/2011 to 31/12/2011)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please refer Appendix - 1
Measuring/ Reading/ Recording frequency:	Continuously/ month
Calculation method (if applicable):	N.A
QA/QC procedures applied:	MONITORING LOCATION: The data will be monitored from energy meters at plant and DCS. Manager In-charge would be responsible for calibration of the meters. The data is archived in Electronic/paper form for a period of credit + 2 years.

<b>Data / Parameter:</b>	E <sub>AUX</sub>
Data unit:	MWh /month
Description:	Auxiliary electricity Consumption at the Plant
Measured /Calculated /Default:	<b>Measured (m),</b> Online measurement
Source of data:	Plant record
Value(s) of monitored parameter:	8177.53 (The value is for 01/04/2010 to 31/12/2010) 6410.40 (The value is for 01/01/2011 to 31/12/2011)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please refer Appendix - 1
Measuring/ Reading/ Recording frequency:	Continuously/ month
Calculation method (if applicable):	N.A
QA/QC procedures applied:	MONITORING LOCATION: The data will be monitored from energy meters at plant and DCS. Manager In-charge would be responsible for calibration of the meters. The data is archived in Electronic/paper form for a period a credit + 2 years.



<b>Data / Parameter:</b>	$E_{\text{NET}}$ (Calculated)
Data unit:	MWh /month
Description:	Net electricity generated from small-scale project activity
Measured /Calculated /Default:	Calculated
Source of data:	Plant record
Value(s) of monitored parameter:	87224.20 (The value is for 01/04/2010 to 31/12/2010) 64325.60 (The value is for 01/01/2011 to 31/12/2011)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please refer Appendix - 1
Measuring/ Reading/ Recording frequency:	Continuously /month
Calculation method (if applicable):	$E_{\text{GEN}} - E_{\text{AUX}}$
QA/QC procedures applied:	MONITORING LOCATION: The data will be monitored from energy meters at plant and DCS. Manager In-charge would be responsible for calibration of the meters. The data is archived in Electronic/paper form for a period a credit + 2 years.

<b>Data / Parameter:</b>	$E_{NET}$ (Measured by CSEB export meter at the export terminal)
Data unit:	MWh /month
Description:	Net electricity generated from small-scale project activity
Measured /Calculated /Default:	<b>Measured (m),</b> Online measurement
Source of data:	Plant record
Value(s) of monitored parameter:	87022.56 (The value is for 01/04/2010 to 31/12/2010) 64172.88 (The value is for 01/01/2011 to 31/12/2011)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please refer Appendix - 1
Measuring/ Reading/ Recording frequency:	Continuously /month
Calculation method (if applicable):	N.A
QA/QC procedures applied:	MONITORING LOCATION: The CSEB export meter at the export terminal. The CSEB will be regularly checking the calibration of the meter.

<b>Data / Parameter:</b>	Qi
Data unit:	Tonnes/day
Description:	Consumption of fuel <sub>i</sub> quantity for project activity (1) Biomass (Rice husk); (2) Fossil fuel i.e. Coal
Measured /Calculated /Default:	Measured
Source of data:	Plant record
Value(s) of monitored parameter:	<ol style="list-style-type: none"> <li>1. Biomass (Rice husk) 88396.00 (The value is for 01/04/2010 to 31/12/2010) 70031.00 (The value is for 01/01/2011 to 31/12/2011)</li> <li>2. Fossil fuel (Coal) 29297.00 (The value is for 01/04/2010 to 31/12/2010) 18514.00 (The value is for 01/01/2011 to 31/12/2011)</li> </ol>
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emissions Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please refer Appendix - 1
Measuring/ Reading/ Recording frequency:	Daily
Calculation method (if applicable):	N.A
QA/QC procedures applied:	MONITORING LOCATION: The data will be measured and monitored by Stock Register/incoming receipts.. The data is archived in Electronic/paper form for a period a credit + 2 years.

<b>Data / Parameter:</b>	NCV <sub>i</sub>
Data unit:	10 <sup>-3</sup> TJ/t
Description:	Calorific value of fuel <sub>i</sub> used for project activity (1) Biomass (Rice husk); (2) Fossil fuel i.e. Coal
Measured /Calculated /Default:	Calculated
Source of data:	Plant record
Value(s) of monitored parameter:	1. Biomass (Rice husk) 13.01 (The value is for 01/04/2010 to 31/12/2010) 13.02 (The value is for 01/01/2011 to 31/12/2011) 2. Fossil fuel (Coal) 11.18 (The value is for 01/04/2010 to 31/12/2010) 11.39(The value is for 01/01/2011 to 31/12/2011)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emissions Calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Please refer Appendix - 1
Measuring/ Reading/ Recording frequency:	Daily
Calculation method (if applicable):	N.A
QA/QC procedures applied:	The calorific value is calculated by govt. Recognized / or external laboratory

<b>D.3. Data and parameters used to calculate leakage emissions</b>
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Leakage : Nil

<b>D.4. Other relevant data and parameters</b>
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Nil

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

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$EF_y$  is the weighted average emission factor in current generation mix for the electricity displaced due to the project activity during the year y in tons CO<sub>2</sub> / MWh. (refer to page No. 57 of registered PDD)

$$= 0.9664 \text{ t CO}_2 / \text{MWh}$$

#### **BASELINE EMISSION:**

$$\begin{aligned} ER_{\text{electricity, y}} &= EG_y \times EF_y \\ &= 147992.18 \times 0.9664 \\ &= 143019.64 \text{ t CO}_2\text{e} \end{aligned}$$

Where:

$ER_{\text{electricity}}$  are the emission reductions due to displacement of electricity during the year y tons of CO<sub>2</sub>.  
 $EF_y$ : is the weighted average emission factor in current generation mix for the electricity displacement due to the project activity during the year y in tons CO<sub>2</sub> / MWh. = 0.9664 t CO<sub>2</sub>/ MWh  
 $EG_y$  : is the net electricity supplied to or through CSEB grid

### E.2. Project emissions calculation

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#### **PEFF<sub>y</sub> (PROJECT EMISSION)**

$$\begin{aligned} PEFF_y &= Q_i \times NCV \text{ (of coal)} \times EF_{CO_2} \times OXID_i \\ PEFF_y &= 47811.00 \times 11.12 \times 96.07 \times 10^{-3} \times 0.98 \\ PEFF_y &= 50066.22 \text{ tCO}_2\text{e} \end{aligned}$$

Where  $Q_i$  = Quantity of Coal consumed during the period. (in Tonnes)

$NCV$  = NCV of Coal consumed during the period (in TJ/t)

$EF_{CO_2}$  = Emission Factor for Coal in terms of CO<sub>2</sub> (in Tonnes) per TJ as per IPCC default value = 96.07 t/TJ

$OXID_i$  = Oxidation factor of Coal as per IPCC default value = 0.98

### E.3. Leakage calculation

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Leakage: Nil

### E.4. Emission reductions calculation / table

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In the emissions reductions calculation, the net electricity supplied to the grid  $E_{NET}$  is capped to a maximum value of 13.23 MW as per the power purchase agreement made with the state electricity board (CSEB) dated 14.10.2006 and tariff order dated 11.11.2005. A declaration in this regard is attached by the project participant dated 07.04.2008. . Please refer appendix 2 for the emission reduction table.

**EMISSION REDUCTIONS:**

$$ER_y = ER_{\text{electricity}, y} - PEFF_y$$

$$ER_y = 143019.64 - 50066.22$$

$$ER_y = 92953.42 \text{ t CO}_2\text{e}$$

Where:

$ER_y$ : are the emissions reductions of the project activity during the year y in tons of  $\text{CO}_2$ .

$PEFF_y$ : Project Emission arising out of combustion of fossil fuel (Coal) due to co-firing.

<b>E.5. Comparison of actual emission reductions with estimates in the CDM-PDD</b>
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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)	97076 t CO <sub>2</sub> e	92953 t CO <sub>2</sub> e

<b>E.6. Remarks on difference from estimated value in the PDD</b>
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Difference from estimated value: 4.24 % decrease in CERs. The decrease in the CERs is due to higher shut down and higher usage of coal than estimated in the registered PDD.

## Appendix 1 Calibration Details

Sr · N o.	NAME OF EQUIPMENT	MAKE	SERIL NO.	LAST CALIBRATI ON	DUE CALIBRATI ON	Accura cy class
<b>AUX METER</b>						
	AUX METER	CONZE RV	EM6400,112491/3534- 0107	23/04/2009	22/04/2010	1.0
	AUX METER	CONZE RV	EM6400, 185279/3569- 3809	09/11/2009	09/10/2010	0.5S
	AUX METER	CONZE RV	EM6400, 206277/10694-3710	16/09/2010	15/09/2011	0.5S
	AUX METER	CONZE RV	EM6400, 206277/10689-3710	09/10/2011	09/09/2012	0.5S
<b>GENERATION METER</b>						
	GENERATION METER	SEMS	CSE37723	03/07/2009	03/06/2010	0.5
	METER CHANGED AT - 09/03/2010 NEW METER - MAKE SEMS, SERIL NO. - WBB04253					
	GENERATION METER	SEMS	WBB04253	03/06/2010	03/05/2011	0.5s
	METER CHANGED AT - 01/04/2011 NEW METER - MAKE SEMS, SERIL NO.- CSE37723					
	GENERATION METER	SEMS	CSE37723	30/03/2011	29/03/2012	0.5s
<b>EXPORT METER</b>						
	FOR 33 KV LINE EXPORT METER					
	MAIN EXPORT METER	SEMS	APM05041( ABT	25/11/2009	24/11/2010	0.2S



			METER )			
	MAIN EXPORT METER	SEMS	APM05041( ABT METER )	25/01/2011	24/01/2012	0.2S
	NEW METER FITTED IN KOTARA ROAD FOR EXPORT. AT 07/04/2009. NEW METER - MAKE SEMS, SERIL NO. - CSE29182					
	S NO. CSE29182 ( CSEB END KOTRA ROAD)					
	EXPORT METER ( KOTARA ROAD)	SEMS	CSE29182	26/03/2009	25/03/2010	0.2s
	EXPORT METER ( KOTARA ROAD)	SEMS	CSE29182	24/11/2009	23/11/2010	0.2S
	EXPORT METER ( KOTARA ROAD)	SEMS	CSE29182	25/01/2011	24/01/2012	0.2s
	EXPORT METER ( KOTARA ROAD)	SEMS	CSE29182	27/12/2011	26/12/2012	0.2S
	<b>BELT WEIGHER</b>					
	BELT WEIGHER	ACME	AWBS100	14/11/2009	13/11/2010	0.5% +/-
	BELT WEIGHER	ACME	AWBS101	14/11/2010	13/11/2011	0.5% +/-
	BELT WEIGHER	ACME	AWBS100	30/03/2011	29/03/2012	0.5% +/-

Appendix 2 : ER Sheet

Month	Egen (in MWh)	Eaux (in MWh)	Enet as per export Meter of CSEB (MWh)	Power Import From CSEB (MWH)	Net Power Export (Export-Import) in MWh	Corrected Power Export for CER Calculation	Coal in Tonnes	Average NCV COAL in Tj/t	Total Heat COAL in Tj	PEFFy= Emission arised out of combustion of Coal due to co-firing in tCO2	Baseline Emission Reduction (ER electicity,y)	Net Emission Rduction (ERy) in tCO2e
Apr-10	10483.20	890.25	9545.52	0.00	9545.52	9252.40	3266.0	11.00	35929.27	3382.47	8941.52	5559.05
May-10	11265.48	973.95	10253.04	5.20	10247.84	9967.22	3729.00	10.67	39801.99	3747.30	9632.32	5885.02
Jun-10	9367.20	815.06	8483.76	35.60	8448.16	8346.94	3592.00	11.01	39531.16	3721.80	8066.48	4344.68
Jul-10	10969.68	891.73	10005.84	4.00	10001.84	9730.80	4138.00	11.22	46429.69	4371.29	9403.84	5032.55
Aug-10	6242.40	588.24	5687.76	84.40	5603.36	5551.04	3071.00	11.32	34762.26	3272.82	5366.83	2091.71
Sep-10	6340.92	581.15	5750.88	64.40	5686.48	5686.48	2490.00	11.57	28809.30	2712.36	5495.41	2783.06
Oct-10	11080.56	902.28	10140.72	0.00	10140.72	9843.12	4082.00	11.05	45099.52	4246.06	9512.39	5266.33
Nov-10	715.08	122.66	653.28	90.00	563.28	563.28	291.00	11.73	3413.43	321.37	544.35	222.98
Dec-10	0.00	46.02	0	73.20	-73.20	-73.20	0.00	0.00	0.00	0.00	-70.74	-70.74
Jan-11	9090.36	744.83	8322.72	47.20	8275.52	8134.47	2373.00	11.00	26100.94	2457.37	7861.15	5403.78
Feb-11	9817.80	772.47	9010.8	8.80	9002.00	8675.57	0.00	0.00	0.00	0.00	8384.07	8384.07
Mar-11	10028.40	848.89	9168.24	34.80	9133.44	8884.74	2265.00	11.00	24918.24	2346.02	8586.21	6240.19
Apr-11	9527.00	811.68	8689.92	18.40	8671.52	8523.43	986.00	11.00	10846.00	1021.10	8237.04	7215.94
May-11	8596.00	819.15	7742.88	47.60	7695.28	7695.28	9241.00	11.10	102575.10	9657.30	7436.72	-2220.58
Jun-11	4330.00	417.05	3950.88	69.20	3881.68	3841.99	119.00	11.00	1309.00	123.24	3712.90	3589.66
Jul-11	9728.00	865.13	8860.80	24.40	8836.40	8816.60	230.00	11.43	2628.90	247.51	8520.37	8272.86
Aug-11	9248.00	830.49	8361.60	8.80	8352.80	8305.53	3231.00	11.55	37318.05	3513.44	8026.46	4513.02
Sep-11	4964.00	506.99	4434	58.00	4376.00	4376.00	504.00	11.30	5695.20	536.20	4228.97	3692.77
Oct-11	7160.00	654.54	6498.96	44.80	6454.16	6407.02	2194.00	11.00	24134.00	2272.18	6191.75	3919.57
Nov-11	6701.00	610.82	6120.96	55.60	6065.36	5950.59	153.00	11.06	1692.18	159.32	5750.65	5591.33
Dec-11	10482.00	894.55	9512.88	0.00	9512.88	9512.88	1856.00	11.20	20787.20	1957.09	9193.25	7236.16
<b>Total</b>	<b>166137.08</b>	<b>14587.93</b>	<b>151195.44</b>	<b>774.40</b>	<b>150421.04</b>	<b>147992.18</b>	<b>47811.00</b>		<b>531781.41</b>	<b>50066.22</b>	<b>143019.64</b>	<b>92953</b>

\*Please refer attached MS excel sheet for more clarity on the calculations