MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	Biomass based steam generation project at Raichur, India
Reference number of the project activity	Reference Number: 3926
Version number of the monitoring report	Version: 01
Completion date of the monitoring report	03/01/2013
Registration date of the project activity	25/12/2010
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 01 Duration of Monitoring Period: 01/01/2011 to 31/10/2012 (both dates included)
Project participant(s)	Shilpa Medicare Limited
Host Party(ies)	India (Ministry of Environment & Forests)
Sectoral scope(s) and applied methodology(ies)	**Sectoral Scope:** 01 Energy industries (renewable - / non-renewable sources) **Applied Methodology:** AMS-I.C. ver. 16 - Thermal energy production with or without electricity
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	

Year	Days	t CO_2e
01/01/2011 to 31/12/2011 (both dates included)	365	35,188
01/01/2012 to 31/10/2012 (both dates included)	305	29,403
Total	670	64,591

Year	Emission Reduction (tCO_2e)
01/01/2011 to 31/12/2011	12,546
01/01/2012 to 31/10/2012	11,976
Total	**24,522**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Established in 1987, Shilpa Medicare Limited produces and exports consistently high-quality active pharmaceutical ingredients, fine chemicals, intermediates, herbal products and specialty chemical products using sophisticated technology, meticulously following international specifications. Shilpa Medicare Limited (hereafter referred to as SML) has invested in a pharmaceutical manufacturing unit which is a modern state of art facility in Raichur district, one of the important districts in Karnataka. In this green field unit SML has installed a biomass based steam generation facility of a capacity of 16.0 TPH to meet the process energy requirements of the thermal energy intensive pharmaceuticals manufacturing processes.

Plant details and commissioning history		
Sl. No.	**Rating of Boiler**	**Date of commissioning**
1	6TPH	19/11/2008
2	10TPH	20/11/2008
Total capacity	**= 16TPH**	

Purpose of the project activity:

The project activity involves installation of rice husk based boilers having combined capacity of 16TPH, which is providing thermal energy to meet the energy requirement of SML, Raichur. This project activity is resulting in avoidance of GHG emissions associated with generation of equivalent amount of steam in any carbon intensive fossil fuel (i.e. coal) based boiler unit which is the common practice in other similar industries.

Technology used:

Technology employed provides controlled biomass based combustion facility to generate steam which is getting utilized in the process plant. The technology is clean as compared to the conventional fossil fuel based system and environmentally sustainable.

A.2. Location of project activity

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Village:-Chicksugur
District:- Raichur
State:- Karnataka
Latitude:- 16°12′ N
Longitude:- 77° 20′ E

Fig:- Indicative Map showing the Project Location

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Govt. of India, Ministry of Environment and Forests (MoEF)	Shilpa Medicare Limited (SML)	No

A.4. Reference of applied methodology

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1. Referring to the UNFCCC CDM website, the approved baseline and monitoring methodology applied to the small-scale project activity is "AMS. I. C. *Thermal energy for the user with or without electricity*"(Version 16, EB 51: Valid from 18 Dec 09 to 10 Jun 10).

2. Tool for the demonstration and assessment of additionality(EB 39,Annex 10)

3. Guidance on the Assessment of Investment Analysis: (EB51, Annex 58, paragraph 16).

A.5. Crediting period of project activity

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Type of crediting period	Start Date of the crediting period	Length of the crediting period	Monitoring period considered
Fixed	01/01/2011	10yrs	01/01/2011 to 31/10/2012 (both dates included)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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Under the project activity SML have installed two biomass based boiler having capacity of 6.0 TPH and 10.0 TPH, each of which generates steam at 10.54 kg/ cm² (g). Steam generated from the biomass fired boiler is being supplied to the bulk drug manufacturing process. Thus it has resulted in avoidance of GHG emissions associated with combustion of fossil fuel for steam generation in fossil fuel fired boiler plant of equivalent capacity. Technology employed provides controlled combustion facility that uses the calorific value of biomass to generate steam and utilizes it in the process plant. In terms of the safe and sound technology, the technology provider is experienced in this field. The boilers are being checked by the boiler inspector in regular interval insuring that its operation is safe.

Technology Details:

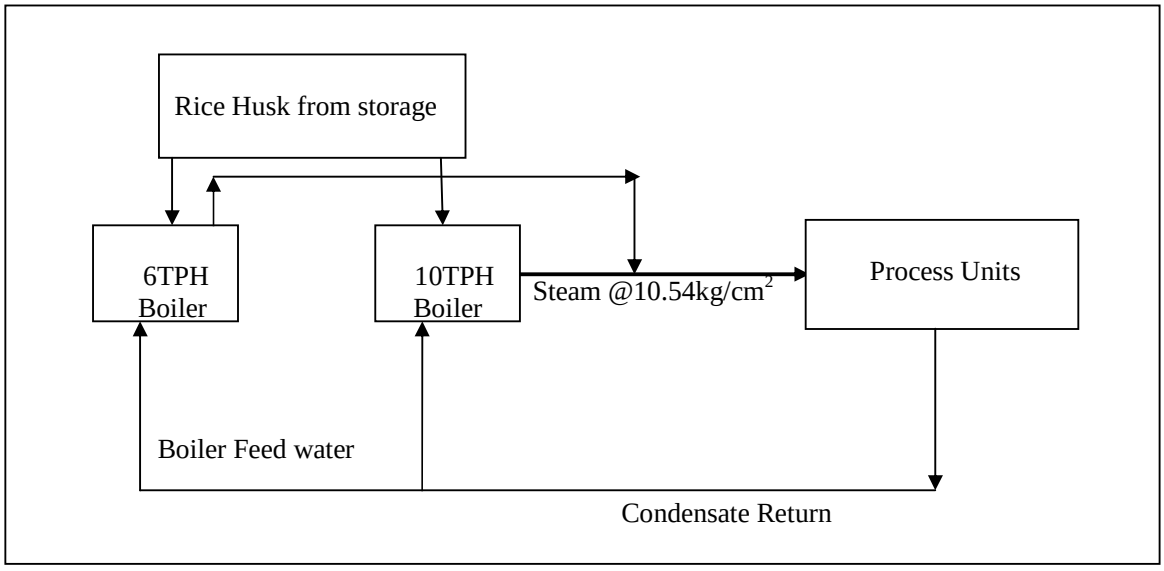
In this project activity, both boilers are rice husk fired having horizontal multi-tubular shell. These multi tubes are smoke tube type with water wall furnace. These boilers have capacity to produce 6.0 TPH and 10.0TPH steam @ 10.54 kg/ cm² (g). The steam is sent for use in the process.

Steam Generation unit

The boiler is supplied by Thermax Limited, India and the technical details of the boiler system are provided here below.

Type of boiler	Horizontal multi-tubular shell type smoke tube with water wall furnace
Model	CPFD-60
Number of Boilers	1
Boiler Capacity	6.0 TPH
Boiler Steam Outlet pressure	10.54 kg/cm²g
Boiler thermal efficiency on GCV as per B.S. 845	
Design Code	IBR 1950 with latest amendments
Mode of firing	Over bed firing
Ash removal mode	Manual

Type of boiler	Horizontal multi tubular shell type smoke tube with water wall furnace
Model	CPFD-100
Number of Boilers	1
Boiler Capacity	10.0TPH
Boiler Steam Outlet pressure	10.54 kg/cm² g
Boiler thermal efficiency on GCV as per B.S. 845	
Design Code	IBR 1950 with latest amendments
Mode of firing	Over bed firing
Ash removal mode	Manual



B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology
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No temporary deviations from registered monitoring plan or applied methodology

B.2.2. Corrections
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No corrections have been made

B.2.3. Permanent changes from registered monitoring plan or applied methodology
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No permanent deviations from registered monitoring plan or applied methodology

B.2.4. Changes to project design of registered project activity
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No changes have been made to the project design of registered project activity

B.2.5. Changes to start date of crediting period
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The monitoring period being considered in this monitoring report is from 01/01/2011 to 31/10/2012. And start date of the crediting period has been considered from 01st Jan, 2011 in the registered PDD, hence no change is required to start date of crediting period.

B.2.6. Types of changes specific to afforestation or reforestation project activity
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Not Applicable.

SECTION C. Description of monitoring system
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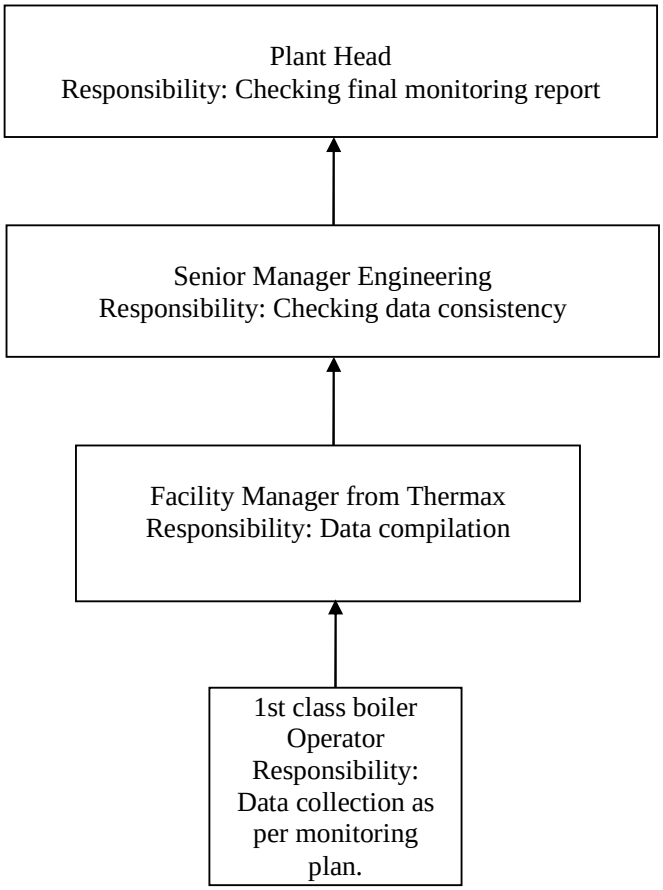
The data monitoring involves:

1. Monitoring the steam generation in the project activity
2. Monitoring of biomass consumption
3. Monitoring of fossil fuel consumption
4. Monitoring of temperature and pressure of the steam at the boiler outlet
5. Monitoring of data related to transportation.

The data has been monitored as mentioned in section B.7.1 of the registered PDD. SML has a very robust data management system called EffiMax 300 supplied by Forbes Marshall Pvt. Ltd. Data related to steam generation, steam pressure and temperature has been monitored by EffiMax.

The data from EffiMax has been stored in soft copy format in the plant computers. All the meters have been calibrated at least once a year to ensure proper functioning and calibration reports will be made available during verification. Also the data will be kept for the entire crediting period and for two years after it.

Operational & Management Structure:
The operational and management structure of the team who are directly related to the project is basically consists of four levels as follows:



Specific responsibilities of the above said team are as follows:

- Maintaining Logs for amount of steam generated in the boiler plant.
- Maintaining Logs for temperature and pressure of steam generated in the boiler plant.
- Calibration of measuring instruments once in a year
- Keep a track of any changes in the meters.
- Prepare the monthly monitoring report.
- Reviewing the monthly monitoring report.
- Internal audit for CDM project in every six months

SECTION D. Data and parameters
D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_2e / TJ
Description	CO2 emission factor per unit of energy of the fuel that would have been used in the baseline plant
Source of data	http://www.natcomindia.org/pdfs/chapter2.pdf. - National Communication of India.
Value(s) applied	95.81 (Non-coking Indian coal has been considered as the baseline fuel).
Purpose of data	This data been used to calculate baseline emission
Additional comment	Value will be updated as per any revisions made in NATCOM value during the crediting period.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	Efficiency of plant using fossil fuel that would have been used in the absence of the project activity.
Source of data	Tool to determine the baseline efficiency of thermal or electric energy generation systems
Value(s) applied	84% - (Highest of the operational efficiency of similar specification as mentioned in the offer letter of two boiler manufacturer.)
Purpose of data	This data been used to calculate baseline emission
Additional comment	Two boiler manufacturer quotations were used to arrive at the aforesaid value

Data/Parameter	$EF_{CO2,truck}$
Unit	tCO_2e/Km
Description	CO_2 emission factor of truck used for transportation (tCO2e/Km)
Source of data	This is a derived value
Value(s) applied	0.00054
Purpose of data	This data has been used to calculate the leakage emission
Additional comment	This data is derived from standard values, taken from authentic sources. The values used are: • Mileage of diesel trucks: 5 Km/Lt (Taken from IPCC 2006, Vol 2, Ch3) • NCV of diesel: 43.0 TJ/KT(Taken from IPCC 2006, Vol 2 Ch1) • CO2 emission factor of diesel: 74.1 tCO2e/TJ (Taken from IPCC2006,Vol 2 Ch1) • Density of diesel: 0.84 kg/Lt (Taken from IOCL, a Government of India, company)

Data/Parameter	**Biomass surplus availability**
Unit	%
Description	Surplus biomass (type/s used in the project activity) availability in the region
Source of data	Based on report from Bhagwat Technologies and Energy Conservation Pvt. Ltd.
Value(s) applied	58.0
Purpose of data	
Additional comment	The data is used from third party assessment report.

Data/Parameter	**SEC_{ff}**
Unit	TJ /MWh
Description	Specific energy consumption of boiler when fired with coal
Source of data	Calculated from boiler efficiency with sub-bituminous coal, energy generated by the boilers and NCV of the fossil fuel from the supplier, enthalpy of saturated steam at boiler outlet pressure.
Value(s) applied	Coal - 0.004286 (fixed *ex-ante*)
Purpose of data	
Additional comment	The above value is calculated based on the boiler default efficiency; the output enthalpy is taken from the steam tables for saturated steam at the boiler operating pressure and the NCV value is the IPCC default value at the upper limit of the uncertainty at 95% confidence interval as provided in table 1.2 of Chapter 1 of Volume 2 of 2006 IPCC Guidelines on National GHG Inventories.

Data/Parameter	**$SEC_{biomass}$**
Unit	TJ /MWh
Description	Specific energy consumption of boiler when fired with biomass (rice husk)
Source of data	Calculated from manufacturer supplied boiler efficiency with rice husk, energy generated by the boilers and NCV of the rice husk from the supplier, enthalpy of saturated steam at boiler outlet pressure.
Value(s) applied	Rice husk - 0.004390 (fixed *ex-ante*)
Purpose of data	
Additional comment	The above value is calculated based on the boiler efficiency (highest value) as supplied by the boiler manufacturer; the output enthalpy is taken from the steam tables for saturated steam at the boiler operating pressure and the NCV value is taken from supplier quotation.

D.2. Data and parameters monitored

Data/Parameter	**$EG_{thermal,y}$**
Unit	TJ
Description	Net quantity of steam/heat (thermal energy) supplied by the project activity during the year y
Measured/Calculated /Default	Calculated
Source of data	In house plant record.
Value(s) of monitored parameter	Year: Steam/Heat supplied by the project activity in TJ 01/01/2011 to 31/12/2011: 110 01/01/2012 to 31/10/2012: 105 **Total Heat Supplied: 215**
Monitoring equipment	Steam flow meter
Measuring/Reading/ Recording frequency	The steam quantity of steam and pressure of steam would be collated on a monthly basis
Calculation method (if applicable)	The thermal energy has been calculated from total steam ($\mathbf{Q_{steam, y}}$) supplied by the boiler to the process multiplied by the enthalpy of the steam. The enthalpy of the steam generated has been taken based on saturated steam condition and its corresponding pressure.
QA/QC procedures	The necessary QA/QC has been ensured by annual calibration of steam flow meters, pressure sensors.
Purpose of data	This data has been used to calculate the baseline emission reduction
Additional comment	Data will be maintained both in hardcopy and soft copy format for the crediting period + 2 years.

Data/Parameter	$EF_{CO2,Coal}$
Unit	tCO2e / GJ
Description	Weighted average CO_2 emission factor of Coal
Measured/Calculated /Default	Default
Source of data	IPCC default value at the upper limit of the uncertainty at 95% confidence interval. The data source selected is an official and authentic source. This is selected as per the guidance given in "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" for the calculation of project emission.
Value(s) of monitored parameter	0.100
Monitoring equipment	-
Measuring/Reading/ Recording frequency	-
Calculation method (if applicable)	-
QA/QC procedures	Any revision of the IPCC Guidelines has been taken into account
Purpose of data	This data has been used to calculate the baseline emission reductions
Additional comment	Sub-bituminous coal has not been fired during the crediting period being considered. It was suppose to be fired during emergencies only.

Data/Parameter	NCV_{Coal}
Unit	GJ/ton
Description	Weighted average net calorific value of Coal
Measured/Calculated /Default	Default
Source of data	IPCC default value at the upper limit of the uncertainty at 95% confidence interval. The data source selected is an official and authentic source. This is selected as per the guidance given in "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" for the calculation of project emission.
Value(s) of monitored parameter	26.0 (Value for Sub-bituminous coal, as provided in table 1.2 of Chapter 1 of Vol 2 of 2006 IPCC Guidelines on National GHG Inventories)
Monitoring equipment	-
Measuring/Reading/ Recording frequency	-
Calculation method (if applicable)	-
QA/QC procedures	Any revision of the IPCC Guidelines has been taken into account
Purpose of data	This data has been used to calculate the baseline emission reductions
Additional comment	Sub-bituminous coal has not been fired during the crediting period being considered. It was suppose to be fired during emergencies only.

<table>
<tr><td>Data/Parameter</td><td>$Q_{steam,y}$</td></tr>
<tr><td>Unit</td><td>Tonnes</td></tr>
<tr><td>Description</td><td>Total quantity of steam produced in the project activity during the year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>In house plant record</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><td>Year</td><td>Steam Generation (in MT)</td></tr>
<tr><td>01/01/2011 to 31/12/2011</td><td>39,871</td></tr>
<tr><td>01/01/2012 to 31/10/2012</td><td>38,029</td></tr>
<tr><td>Total Steam Generation</td><td>77,899</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Steam Flow Meter</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data is recorded continuously and hourly records have been collated into daily steam generation figure.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>The daily steam generation values have been used to calculate the monthly steam generation and monthly steam generation data has been aggregated to arrive at the yearly steam generation data.</td></tr>
<tr><td>QA/QC procedures</td><td>The meter used for measurement is under the purview of the SML and necessary QA/QC has been ensured by periodic calibration, carried out with respect to national standards once in a year. Details of flow meter and calibration has been provided below:-
<u>Meter Details</u>
<table>
<tr><td>Particulars</td><td>Steam Flow Meter</td></tr>
<tr><td>Make</td><td>Forbes Marshall</td></tr>
<tr><td>Range</td><td>0-6000Kg/Hour</td></tr>
<tr><td>Model Number</td><td>VFM 5097K</td></tr>
</table>
<u>Calibration Details</u>
<table>
<tr><td>Calibration date</td><td>Calibration due date</td></tr>
<tr><td>25.01.2010</td><td>24.01.2011</td></tr>
<tr><td>24.01.2011</td><td>23.01.2012</td></tr>
<tr><td>24.01.2012</td><td>23.01.2013</td></tr>
</table>
<u>Meter Details</u>
<table>
<tr><td>Particulars</td><td>Steam Flow Meter</td></tr>
<tr><td>Make</td><td>Forbes Marshall</td></tr>
<tr><td>Range</td><td>0-10000Kg/Hour</td></tr>
<tr><td>Model Number</td><td>VFM 5097K</td></tr>
</table>
<u>Calibration Details</u>
<table>
<tr><td>Calibration date</td><td>Calibration due date</td></tr>
<tr><td>25.01.2010</td><td>24.01.2011</td></tr>
<tr><td>24.01.2011</td><td>23.01.2012</td></tr>
<tr><td>24.01.2012</td><td>23.01.2013</td></tr>
</table>
</td></tr>
<tr><td>Purpose of data</td><td>This data has been used to calculate the actual emission reductions</td></tr>
<tr><td></td><td>Data will be maintained both in hardcopy and soft copy format for the crediting period + 2 years.</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>$P_{steam,y}$</td></tr>
<tr><td>Unit</td><td>kg/cm^2g</td></tr>
<tr><td>Description</td><td>Average pressure of steam at the boiler outlet during the year y.</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>In house plant record.</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><td>Year</td><td>Steam Pressure(kg/cm^2g)</td></tr>
<tr><td>01/01/2011 to 31/12/2011</td><td>8.94</td></tr>
<tr><td>01/01/2012 to 31/10/2012</td><td>9.21</td></tr>
<tr><td>Average Steam Pressure</td><td>9.07</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Electronic Pressure Sensor</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>The data is recorded continuously. Average daily steam pressure is then collated into monthly data which is used for the determination of steam enthalpy.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>The daily steam pressure data has been used to calculate the average monthly steam pressure.</td></tr>
<tr><td>QA/QC procedures</td><td>The meter used for measurement is under the purview of the SML and necessary QA/QC has been ensured by periodic calibration, carried out with respect to national standards once in a year. The meter and calibration details are provided below:
<u>Meter Details(for 6TPH boiler)</u>
<table>
<tr><td>Particulars</td><td>Pressure Gauge</td></tr>
<tr><td>Make</td><td>Gluck</td></tr>
<tr><td>Range</td><td>0-25kg/cm^2g</td></tr>
<tr><td>Accuracy</td><td>±1%of full scale</td></tr>
<tr><td>Least Count</td><td>0.25 kg/cm^2</td></tr>
</table>
<u>Calibration Details((for 6TPH boiler)</u>
<table>
<tr><td>Calibration date</td><td>Calibration due date</td></tr>
<tr><td>16.08.2010</td><td>15.08.2011</td></tr>
<tr><td>20.08.2011</td><td>19.08.2012</td></tr>
<tr><td>19.08.2012</td><td>18.08.2013</td></tr>
</table>
<u>Meter Details(for 10TPH boiler)</u>
<table>
<tr><td>Particulars</td><td>Pressure Gauge</td></tr>
<tr><td>Make</td><td>Gluck</td></tr>
<tr><td>Range</td><td>0-25kg/cm^2</td></tr>
<tr><td>Accuracy</td><td>±1%of full scale</td></tr>
<tr><td>Least Count</td><td>0.25 kg/cm^2</td></tr>
</table>
<u>Calibration Details((for 10TPH boiler)</u>
<table>
<tr><td>Calibration date</td><td>Calibration due date</td></tr>
<tr><td>16.08.2010</td><td>15.08.2011</td></tr>
<tr><td>20.08.2011</td><td>19.08.2012</td></tr>
<tr><td>19.08.2012</td><td>18.08.2013</td></tr>
</table>
</td></tr>
<tr><td>Purpose of data</td><td>This data has been used to calculate the steam enthalpy</td></tr>
<tr><td>Additional comment</td><td>Data will be maintained both in hardcopy and soft copy format for the crediting period + 2 years.</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>FC_{biomass,y}</td></tr>
<tr><td>Unit</td><td>Tonnes</td></tr>
<tr><td>Description</td><td>Amount of biomass used in the boiler in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Plant Records</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><td>Year</td><td>Biomass Consumption (in MT)</td></tr>
<tr><td>01/01/2011 to 31/12/2011</td><td>11,387</td></tr>
<tr><td>01/01/2012 to 31/10/2012</td><td>8,018</td></tr>
<tr><td>Total Biomass Consumption</td><td>19,405</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Solid fuel Metering System</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>The data will be monitored daily and the same will be collated into monthly biomass consumption.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>The monthly biomass procurement data has been used to calculate the biomass consumption data(Closing Reading-Opening Reading)</td></tr>
<tr><td>QA/QC procedures</td><td>The necessary QA/QC will be ensured by annual calibration of the metering system. The same data can be verified from the biomass procurement record. The calibration and meter details have been provided below:-
<u>Instrument Details</u>
<table>
<tr><td>Particulars</td><td>Electronic Lorry Weigh Bridge</td></tr>
<tr><td>Capacity</td><td>40000kg</td></tr>
<tr><td>Make</td><td>Jyothi</td></tr>
<tr><td>Serial Number</td><td>JET3623</td></tr>
<tr><td>Class</td><td>III</td></tr>
</table>
<u>Calibration Details</u>
<table>
<tr><td>Calibration date</td><td>Calibration due date</td></tr>
<tr><td>09-08-2010</td><td>08-08-2011</td></tr>
<tr><td>04-08-2011</td><td>03-08-2012</td></tr>
<tr><td>02-08-2012</td><td>01-08-2013</td></tr>
</table>
</td></tr>
<tr><td>Purpose of data</td><td>This data has been used to calculate the total biomass consumption</td></tr>
<tr><td>Additional comment</td><td>Data will be maintained both in hardcopy and soft copy format for the crediting period + 2 years.</td></tr>
</table>

Data/Parameter	**$FC_{coal,y}$**
Unit	Tonnes
Description	Amount of coal used in the boiler in year y
Measured/Calculated /Default	Measured
Source of data	Plant Records
Value(s) of monitored parameter	0.0
Monitoring equipment	Solid Fuel Metering System
Measuring/Reading/ Recording frequency	The data has been monitored daily and the same has been collated into monthly coal consumption.
Calculation method (if applicable)	The monthly coal procurement data has been used to calculate the coal consumption data(Closing Reading-Opening Reading)
QA/QC procedures	The necessary QA/QC has been ensured by annual calibration of the metering system. The same data can be verified from the coal procurement record.
Purpose of data	This data has been used to calculate the total coal consumption
Additional comment	Data will be maintained both in hardcopy and soft copy format for the crediting period + 2 years. Currently coal is not used in the boiler.

Data/Parameter	**AVD_y**
Unit	Km
Description	Average roundtrip distance per trip for transporting rice husk during the year y
Measured/Calculated /Default	Measured
Source of data	Distance as recorded from Standard Maps
Value(s) of monitored parameter	Year: Average roundtrip distance per trip (in Km) 01/01/2011 to 31/12/2011: 14(Raichur to Shilpa Medicare Plant) 01/01/2012 to 31/10/2012: 14 (Raichur to Shilpa Medicare Plant)
Monitoring equipment	Not applicable
Measuring/Reading/ Recording frequency	Once in a year.
Calculation method (if applicable)	Maximum distance of biomass source from the power plant has been used for estimation of leakage.
QA/QC procedures	The distance data has been taken from Google map[1].
Purpose of data	To calculate leakage emission.
Additional comment	Data has been maintained in the log sheet along with the same in the spreadsheet (electronic). Same data will be archived for a period of 2 years + end of crediting period.

[1] http://maps.google.co.in/

Data/Parameter	N_y
Unit	No. of trips/yr
Description	Number of truck trips required to transport rice husk to the project site, during the year y
Measured/Calculated /Default	Calculated
Source of data	Weigh bridge records
Value(s) of monitored parameter	Year: Number of truck trips 01/01/2011 to 31/12/2011: 1,063 01/01/2012 to 31/10/2012: 693 Total Biomass Consumption: 1,756
Monitoring equipment	Not applicable
Measuring/Reading/ Recording frequency	Monitoring Frequency: Daily Recording Frequency: Monthly
Calculation method (if applicable)	Based on the number of truck trips, the data has been collated into a monthly figure. Yearly figure has been calculated based on the monthly figure
QA/QC procedures	Fuel purchase invoices can be used to cross check the value.
Purpose of data	This data has been used to calculate the leakage emission
Additional comment	All data will be archived for a period of 2 years after the end of crediting period.

D.3. Implementation of sampling plan

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Not Applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

Baseline emissions: $BE_{thermal,CO2y}$

$$BE_{thermal,CO2y} = (EG_{thermal,y}/\eta_{BL,thermal}) * EF_{FF,CO_2}$$

Where:-

$BE_{thermal,CO2y}$ =Baseline emission during the year y, tCO_2e

$EG_{thermal,y}$ =Net quantity of steam/heat supplied by the project activity during the year y, in TJ

$\eta_{BL,thermal}$ =Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity. The baseline efficiency value is a fixed *ex ante* parameter.

EF_{FF,CO_2}= CO_2 emission factor per unit of energy of the fuel (i.e. non-coking coal) that would have been used in the baseline plant (tCO2e /TJ). The value of emission factor per unit of energy of the fuel is a fixed *ex ante* parameter.

Year	$EG_{thermal,y}$ *(TJ)*
01/01/2011 to 31/12/2011	110
01/01/2012 to 31/10/2012	105
Total Steam/Heat Supplied by the project activity	215

From the table above, the baseline emissions have been calculated as follows:-

$BE_{thermal,\ CO2,y}$=(215/0.84)*95.81=24,522 tCO_2e----------*Equation 1*

Yearwise Baseline Emission:

Data / Parameter:	$EG_{thermal,y}$	$EF_{FF,CO2}$	$\eta_{BL,thermal}$	$BE_{thermal,CO2,y} = (EG_{thermal,y}/\eta_{BL,thermal})*EF_{FFCO2}$
Description	**Net quantity of steam/heat supplied by the project activity during the year y, TJ.**	**CO2 emission factor per unit of energy of the fuel (i.e. non-coking coal) that would have been used in the baseline plant in (tCO2e /TJ).**	**Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.**	**Baseline emission during the year y, tCO2e**
Data unit	**TJ**	**tCO_2e/TJ**	**%**	**tCO_2e**
01-01-2011 to 31/12/2011	110	95.81	84.00%	12,546
01-01-2012 to 31/10/2012	105	95.81	84.00%	11,976
Total	**215**			**24,522**

E.2. Calculation of project emissions or actual net GHG removals by sinks

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Project Emission: $PE_{FC,y}$

$$PE_{FC,y}=FC_{coal,y}*NCV_{coal}*EF_{CO_2,coal}$$

Where:-

$PE_{FC,y}$= CO2 emissions from fossil fuel combustion during the year *y* (tCO2 / yr);
$FC_{coal,y}$= Quantity of Coal combusted during the year y (tonnes);
NCV_{coal}=Weighted average net calorific value of Coal (GJ/mass or volume unit)
$EF_{CO_2,coal}$= Weighted average CO2 emission factor of Coal (tCO2/GJ);

As the project activity didn't use fossil fuel during the monitoring period being considered, hence the project emissions have been considered as zero. $PE_{FC,y}=0$----------*Equation 2*

E.3. Calculation of leakage

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Leakage Emission: LE_y

$LE_y = N_{truck,y} * AVD_y * EF_{CO_2,truck}$ ----------*Equation 3*

Where:-
LE_y= Leakage emission due to transportation of biomass residues to project site in year y, tCO2/yr
$N_{truck,y}$=Number of truck trips from the biomass source to the project plant in year y
AVD_y= Average roundtrip distance per trip for transporting rice husk during the year y, Km
$EF_{CO_2,truck}$=CO2 emission factor of truck used for transportation (tCO2e/Km)

As per Section B.6.3 of the registered PDD, *"leakage from biomass transportation is to be considered only for cases where biomass is transported over a distance of 200 km or more."* and based on the biomass surplus availability report biomass is available in plenty within a distance of 50 Km radius around the project site.

Symbols	Particulars & Units	Formula	Unit	Value for 2011	Value for 2012
$V_{mileage}$	Mileage of vehicle used		km/Lt diesel	5	5
D_{diesel}	Density of Diesel		kg/Lt	0.84	0.84
$NCV_{diesel,}$	NCV of HSD		TJ/Gg	43	43
			TJ/tonne	0.043	0.043
$EF_{CO2,Diesel}$	CO_2 emission factor of HSD		tCO_2/TJ	74.1	74.1
$EF_{CO2,truck}$	Emission Factor of truck used for transportation	(Ddiesel * NCVdiesel, * EFCO2,Diesel) / Vmileage	tCO_2e/Km	0.00054	0.00054
$N_{truck,y}$	Number of truck trips/year		trip/yr	1063	693
AVD_y	Average roundtrip distance per trip for transporting rice husk during year y		Km/trip	14	14
LE_y**	**Leakage during year y**		**tCO_2/yr**	**7.97**	**5.19**

As per Equation 3
LE_y= 0.00054*1063*14=7.97tCO_2/year----------*Leakage Emission for the year 2011*
LE_y=0.00054*693*14=5.19 tCO_2/year----------*Leakage Emission for the year 2012*

As per footnote 11 of AMS-I.C. version 16, *"If biomass residues are transported over a distance of more than 200 kilometres due to the implementation of the project activity then this leakage source attributed to transportation shall be considered, otherwise it can be neglected."* For ex ante estimation, leakage emission would be considered zero, based on the biomass surplus availability report, which proves biomass is available in plenty within a distance of 200 Km radius around the project site. However, for ex post calculation, emission due to biomass transportation would be monitored and neglected, only if the average distance for biomass transportation is lower than 200 kms.

It may be noted that for the aforesaid project activity, the average distance for biomass transportation is 14kms (which is lower than 200 kms). Hence the leakage emission for the project activity has been neglected.

Hence, $LE_y = 0$----------*Equation 4*

Emission Reduction: ER_y

$$ER_{thermal,CO2,y} = BE_{thermal,CO2,y} - PE_{FC,y} - LE_y$$

Where

$ER_{thermal,CO2,y}$=Emission reduction during the year y, tCO_2e.
$BE_{thermal,CO2,y}$=Base line emission during the year y, tCO_2e.
$PE_{FC,y}$= Project emission during the year y, tCO_2e
LE_y= Leakage, during the year y, tCO_2e

From equation 1, 2 and 4

$$ER_{thermal,CO2,y} = 24,522 - 0 - 0$$
$$= 24,522 tCO_2e$$

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_2e)	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
01/01/2011 to 31/12/2011	12,546	0	0	12,546
01/01/2012 to 31/10/2012	11,976	0	0	11,976
Total	**24,522**	**0**	**0**	**24,522**

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks(tCO_2e)	**64,591** (670 days equivalent of annually 35,188 emission reductions estimated in the registered PDD)	**24,522**

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

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The estimated emission reduction as per registered PDD is 64,591 tonnes of CO_2e, while the actual emission reduction have been calculated to be 24,522 tonnes of CO_2e.Hence the actual emission reduction value is lower than the estimated value due to the low PLF of the process plant i.e. the consumption point.

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History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
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