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

CONSOLIDATED MONITORING REPORT

Title of the Programme of Activities	"Promotion of Biomass Based Heat Generation Systems in India"
Reference number of the Programme of Activities	PoA 4041[1]
Version number of the consolidated monitoring report	4.0
Completion date of the consolidated monitoring report	12/12/2012
Registration date of the Programme of Activities	12/01/2011
Monitoring period number and duration of this monitoring period	Monitoring Period Number 1 Duration: 12/01/2011 to 31/08/2012 (First and Last days included)
Coordinating/managing entity	Thermax Sustainable Energy Solutions Ltd.
Project participant(s)	1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft
Host Party(ies)	India
PoA boundary	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / non renewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the included CPA - DD(s)	53,831 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	9,591 tCO_2e
Number of CPA(s) included as on last date of this monitoring period	17 (till 31/08/2012)

[1] http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/OQEHR16A3SIV48T2PDKF0MWJ7G5YNU/view

Details of CPAs included as on last date of this monitoring period (till 31/08/2012)

Sr.no.	UNFCCC REF No.	CPA Titile	Name of the CPA operator	Date of Inclusion	Start Date of Crediting Period
1	4041-0001	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 001)	Foods and Inns Limited	12/01/2011	12/01/2011
2	4041-0002	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 002)	Ramdevbaba Solvent Private Limited	23/03/2012	31/03/2012
3	4041-0003	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 011)	Mega Solvent Extractions Limited	23/03/2012	31/03/2012
4	4041-0004	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 003)	Srinivasa Soya Private Limited	30/04/2012	01/05/2012
5	4041-0005	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 004)	LACTOSE (INDIA) LIMITED	30/04/2012	01/05/2012
6	4041-0006	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 006)	Sneha Farms Private Limited	30/04/2012	01/05/2012
7	4041-0007	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 007)	Swadisht Oils (P) Limited	30/04/2012	01/05/2012
8	4041-0008	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 008)	Mantora Oil Products Limited	30/04/2012	01/05/2012
9	4041-0009	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 005)	Growel Feeds Private Limited	31/05/2012	01/06/2012
10	4041-0010	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 009)	Vallabh Textiles Company Limited	31/05/2012	01/06/2012
11	4041-0011	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 010)	Shree GRG Oil Mill	31/05/2012	01/06/2012
12	4041-0012	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 012)	KOPRAN LIMITED	29/06/2012	01/07/2012
13	4041-0013	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 013)	SHREE SITA EDIBLES PRIVATE LIMITED	29/06/2012	01/07/2012
14	4041-0014	"Promotion of Biomass Based Heat Generation Systems in	Kapil Solvex Pvt. Ltd.	29/06/2012	01/07/2012

		India" (CPA Number 014)			
15	4041-0015	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 015)	SKOL BREWERIES LIMITED	29/06/2012	01/08/2012
16	4041-0016	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 016)	Navadurga Enterprises Private Limited	31/07/2012	01/08/2012
17	4041-0017	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 017)	Shrinivasa Agro Foods Pvt. Ltd.	30/08/2012	01/09/2012

Emission reduction details of the CPAs in the monitoring period

Sr. No	UNFCCC REF No. of the included CPA(s)	Estimated GHG emission reductions (tCO_2e) as per included CPA- DD	Achieved GHG emission reductions (tCO_2e) in the monitoring period
1	4041-0001	8,524	912
2	4041-0002	5,289	2,624
3	4041-0003	4,650	675
4	4041-0004	4,705	---*
5	4041-0005	1,198	467
6	4041-0006	1,319	398
7	4041-0007	5,738	773
8	4041-0008	5,275	---*
9	4041-0009	3,200	1,202
10	4041-0010	3,323	---*
11	4041-0011	3,259	1,969
12	4041-0012	893	491
13	4041-0013	2,797	77
14	4041-0014	1,878	---*
15	4041-0015	1,079	3
16	4041-0016	700	---*
17	4041-0017	0	---*

Note

* Monitoring report not submitted as CME is not claiming any CERs for these CPAs in the current monitoring period. For these CPA(s), CME will not be claiming any CERs for the monitoring period number 1 in subsequent verification(s).

List of Monitoring reports for CPA(s) being proposed for verification for this monitoring period

Sr.no.	Appendix No.	UNFCCC REF No.	CPA Titile	Monitoring Report version / date	Start date of emission reduction in this monitoring period
1	Appendix-1	4041-0001	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 001)	4.0; 12/12/2012	12/01/2011
2	Appendix-2	4041-0002	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 002)	4.0; 12/12/2012	31/03/2012
3	Appendix-3	4041-0003	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 011)	4.0; 12/12/2012	31/03/2012
4	Appendix-4	4041-0005	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 004)	4.0; 12/12/2012	01/05/2012
5	Appendix-5	4041-0006	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 006)	4.0; 12/12/2012	01/05/2012
6	Appendix-6	4041-0007	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 007)	4.0; 12/12/2012	01/05/2012
7	Appendix-7	4041-0009	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 005)	4.0; 12/12/2012	01/06/2012
8	Appendix-8	4041-0011	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 010)	4.0; 12/12/2012	01/06/2012
9	Appendix-9	4041-0012	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 012)	4.0; 12/12/2012	01/07/2012
10	Appendix-10	4041-0013	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 013)	4.0; 12/12/2012	01/07/2012
11	Appendix-11	4041-0015	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 015)	4.0; 12/12/2012	01/08/2012

Appendix-1

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

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 001)
Reference number of the project activity	CPA 4041-0001[2]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	12/01/2011 (Inclusion Date of CPA in Registered PoA No.4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (first and last days included) Start date of emission reduction in this monitoring period: 12/01/2011
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. Foods and Inns Limited
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	8,524 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	912 tCO_2e

[2] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=N1UVKCLWBFRI429JYHGP76XQEZD03A

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 4 TPH biomass residues (biomass briquettes) fired boiler at Foods and Inns Limited for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 4 TPH Combipac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 10.54 kg/cm^2 and has an external water walled furnace with Horizontal fixed grate. The steam generated from the boiler is utilised in the thermal processing of seasonal fruits like Mango, Guava, Papaya, Tomato etc.

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
PoA-4041 0001	Foods and Inns Limited	Boiler - 4 TPH (From and At 100^{0}C)	05/05/2008	12/01/2011	12/01/2011

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 12/01/2011 to 31/08/2012 (first and last days included) is 912 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
PoA-4041 0001	Foods and Inns Limited	Gat no. 340, Village- Gonde, Taluka- Sinnar, District- Nasik 422606, Maharashtra, India.	19˚47’20” North 74˚04’00” East	India

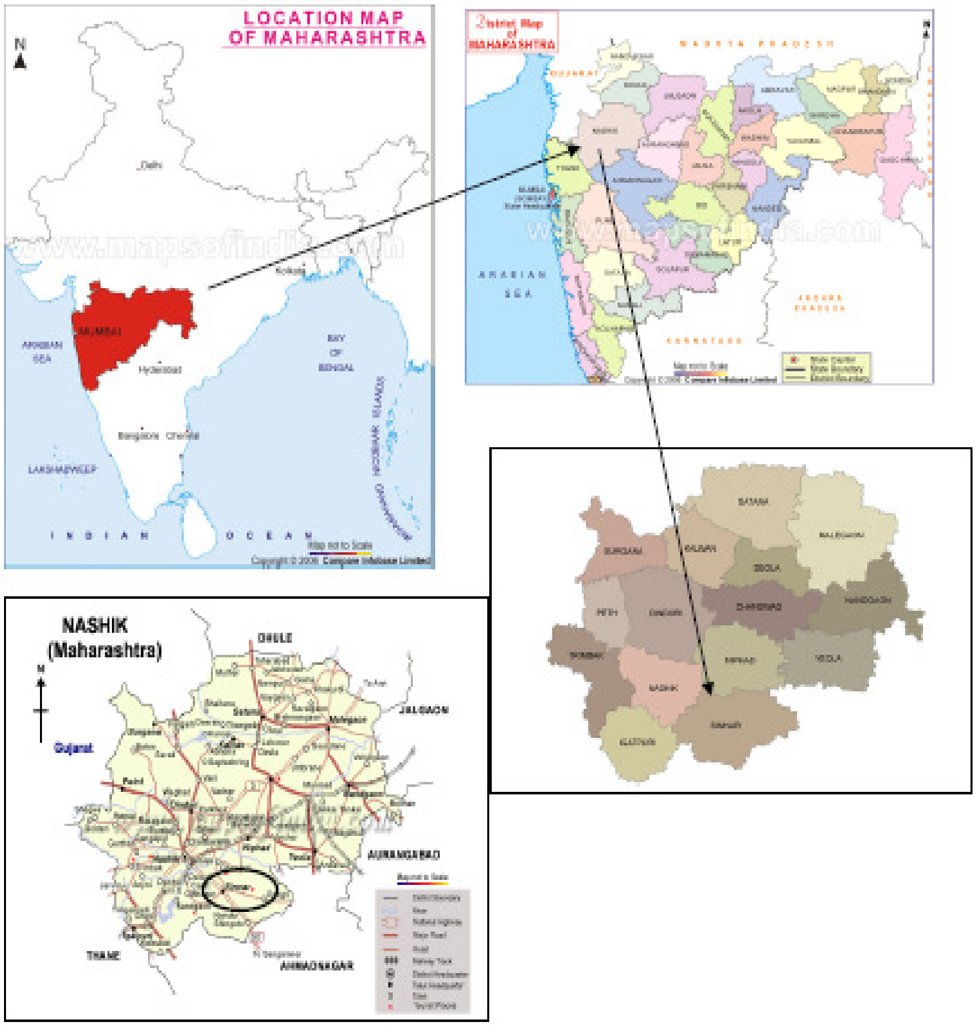


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment

(boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [3]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[4]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[5]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[6]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[7]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[8]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 12/01/2011

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

[3] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[4] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[5] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[6] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[7] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[8] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	**Description**
CPA Number	001
CPA Operator	Foods And Inns Limited
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler
Equipment capacity	Installation of biomass fired boiler having rated steam Generation Capacity of 4 Tonnes per Hour (TPH)
Boiler Make	Thermax Limited
Boiler Model	Combipac
Maximum working pressure	10.54 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	4 TPH From and At 100^0C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Biomass Briquettes)
Type of fuel firing	Manual
Furnace type	External Water walled furnace with Horizontal fixed grate
Boiler Number	CPD40/10.54/15
Commissioning date	05/05/2008

The boiler consists of mainly the following parts:
1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently Biomass briquettes as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection, water preheating system, flue gas discharge, ash discharge, electrical systems, equipment safeties & controls

The CPA operator has utilized biomasses for heat generation i.e. Biomass Briquettes, which is in compliance with definition of renewable biomass as per “Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii.**Actual operation of the CPA during this monitoring period:**
The project is currently operational as per the monitoring plan and is implemented in compliance with the registered CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the CPA like equipment retrofitting, Capacity addition etc. [9]

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the registered monitoring plan during this monitoring period

B.2.2. Corrections

There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

[9] The boiler was not operational for 269days out of 598 days in this monitoring period due to unavailability of fruits

B.2.3. Permanent changes from registered monitoring plan or applied methodology
There are no permanent changes from the registered monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by separate temperature measuring instrument
3	Steam Pressure	Directly measured by separate pressure measuring instrument
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meters
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments (sr. no. 1 to 4) are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data has been transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \text{ X } 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

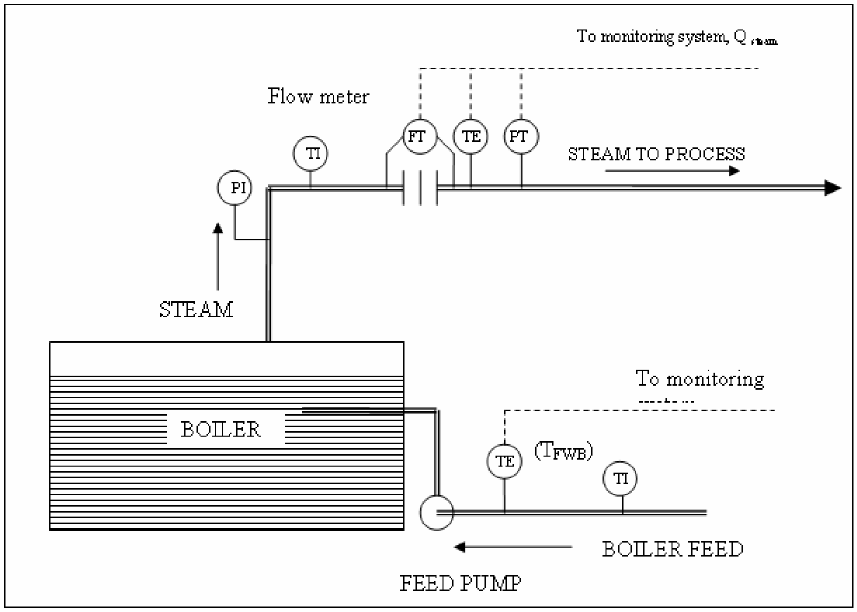


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Duly calibrated weigh Bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,\,k}$/ $Q_{ob,\,i}$

b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$

c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k}+ \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i}+ \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However no fossil fuel was used in this project activity for the monitoring period.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator). This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system.The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

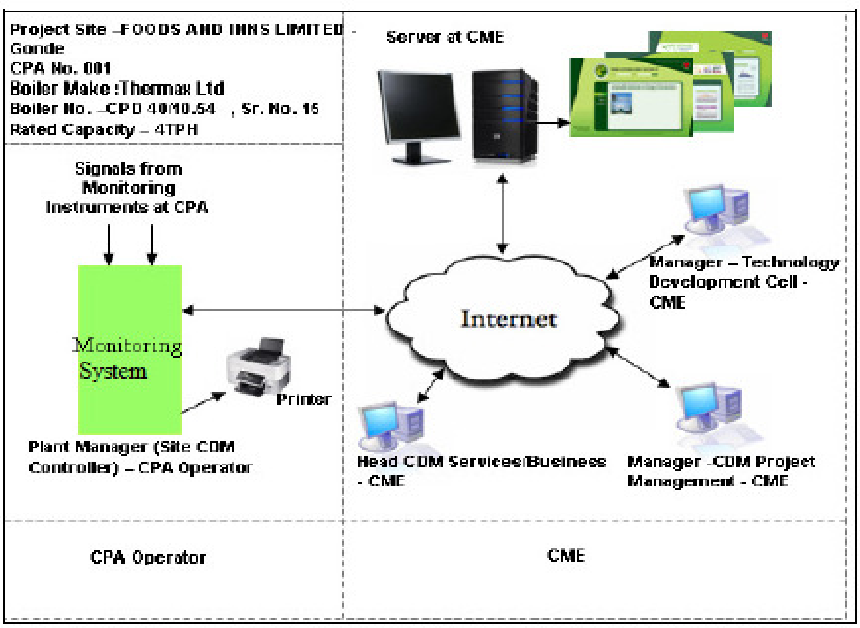


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

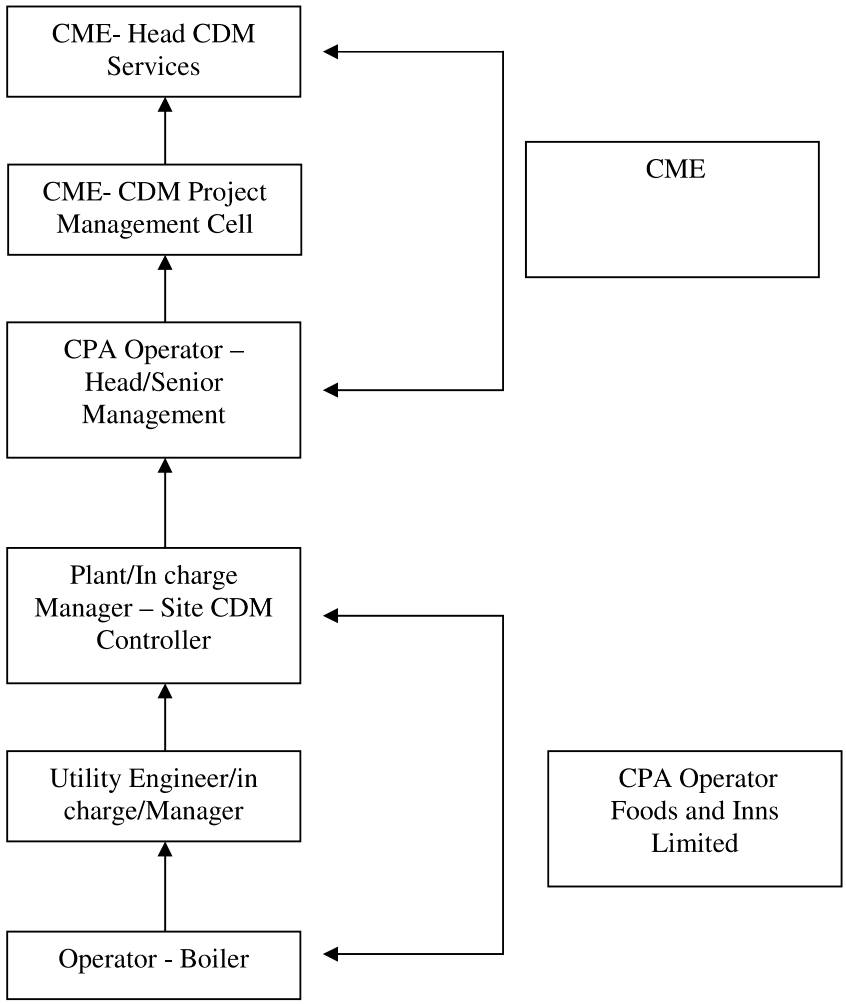


Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator – Foods And Inns Limited

Key operational roles	**CPA Management Responsibilities**
Head/Senior Management -	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM services for final reporting into emission reduction sheet • Quarterly performance review
Plant/In charge/Manager (Site CDM Controller)	• Performance Review- Monthly • Verification/review of data • Internal audits • Review of corrective actions
Utility Engineer/In charge/ Manager	• Verifying & archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipments • Implementation of corrective action

Operators – Boiler	• Recording/Collection of data • Daily logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i.e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation**.**

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	4 (value applicable for the Project activity as per CPA 001)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per paragraph 18 (c) of the applied methodology (as per the registered CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 001)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). (Sourced from included CPA-DD)
Value(s) applied	75.5 (value applicable for the Project activity as per CPA 001)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass within 50 km radial distance
Source of data	Third Party Survey report
Value(s) applied	33.77 (value applicable for the Project activity as per CPA 001)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the registered CPA-DD

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in registered CPA-DD)
Value(s) applied	NEWNE grid – 0.80 (value applicable for the Project activity as per CPA 001)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption". As mentioned in registered CPA-DD
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 001)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{LE,l,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption for biomass processing, outside Project boundary
Source of data	Declaration by biomass supplier / Technical specification of electricity consumption for biomass processing.
Value(s) applied	38.91
Purpose of data	Project Emission calculation
Additional comment	As per the registered CPA-DD, electricity consumption factor for processing of biomass briquette production will be obtained during the first periodic verification from the equipment supplier. This factor is then to be multiplied with the quantity of biomass consumed during the monitoring period to arrive at the value of electricity consumed for processing of biomass for the monitoring period. Accordingly, declaration has been submitted by the briquette suppliers stating the electricity consumption @ 0.035 MWh/ton and the electricity consumption is calculated by multiplying this with quantity of biomass consumed i.e., 1111.63 tonnes. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in registered CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 001)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in registered CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in registered CPA-DD
Value(s) applied	0.00428 for Biomass residues 0.00437 for Imported coal (Indonesian) 0.00441 for Indian Coal (value applicable for the Project activity as per CPA 001)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	5,235.04[10]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{steam}
Unit	°C
Description	Steam Temperature at MSSV (Main steam stop valve) outlet
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	177.54[11]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[10] For the data and calculations, kindly refer Emission reduction spread sheet
[11] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	P_{steam}
Unit	kg/cm^{2}g
Description	Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	9.22[12]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{FWB}
Unit	^oC
Description	Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	65.55[13]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

[12] For the data and calculations, kindly refer Emission reduction spread sheet
[13] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	$h_{,y}$
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	1458
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/plant record
Value(s) of monitored parameter	8.96
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass stored has been recorded on the first day of the monitoring period and kept as an opening balance in log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation

Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/plant record
Value(s) of monitored parameter	1111.32
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass briquettes have been measured on Weighbridge outside the plant premise at each delivery. The weighbridge slip with delivery note/invoice has been obtained from the fuel supplier and has been mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	Calibration conducted for the weigh bridge in the year 2010-11 is valid till 16/06/2011 and the subsequent calibration was carried out on 30/06/2011. Hence maximum permissible error (+1.6%) of the instrument has been applied to the measured values from 17/06/2011 to 29/06/2011. The calculation is done as follows:

Date	Actual Biomass Briquette Quantity (Tonnes)	Corrected Biomass Briquette Quantity (Tonnes) Corrected value = actual value + (actual value x 1.6/100)
17-06-2011	10.44	10.61
18-06-2011	7.67	7.79
18-06-2011	10.21	10.37
20-06-2011	9.8	9.96
20-06-2011	31.05	31.55
20-06-2011	9.825	9.98
21-06-2011	9.555	9.71
21-06-2011	9.18	9.33
25-06-2011	9.74	9.90
29-06-2011	10.54	10.71

This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/plant record
Value(s) of monitored parameter	8.65
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic and Paper mode. Monitoring: Biomass briquettes has been measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/plant record
Value(s) of monitored parameter	1111.63
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	This has been verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes

Description	Quantity of stored fuel type fossil i on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel delivery note obtained from the fuel supplier
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.

Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i} = FC_{j,PJ,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$ Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	The quantity of coal consumed will be cross checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 09/08/2012
Value(s) of monitored parameter	15.39
Monitoring equipment	---

Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by paper mode. Monitoring: Analysis from accredited or certified independent agency according to relevant national/international standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by paper mode. Monitoring: Annual Analysis report.

Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	%
Description	Moisture content of the biomass residues
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$NCV_{i,y}$
Unit	TJ/Gg or GJ/t
Description	Weighted average net calorific value of the fuel type i in year y
Measured/Calculated /Default	Calculated or Measured

Source of data	<table><tr><th>Data source</th><th>Conditions for using the data source</th></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr><tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr><tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr></table>
Value(s) of monitored parameter	Not applicable as no fossil fuel is consumed in this monitoring period
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Analysis by an independent agency.
Calculation method (if applicable)	---
QA/QC procedures	If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted. $NCV_i = NCV_{j,y}$ i is the fuel type combusted in process j during the year y.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$FC_{i,j,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed in a process j during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	0 (No fossil fuel type i consumed in a process j during monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	NA

QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book
Value(s) of monitored parameter	38.51
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set or Fossil fuel based power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	1.24
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0001 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data will be archived by Electronic/Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation

Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	105.13
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	112
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note.
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,c,y}$
Unit	km
Description	Average round trip distance (from and to) between the biomass fuel supply sites and the site of biomass processing in year y
Measured/Calculated /Default	Calculated
Source of data	Data / declaration from supplier
Value(s) of monitored parameter	65.28
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	-
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,c,y}$
Unit	--
Description	Number of truck trips during the transportation of biomass to the biomass processing site in year y
Measured/Calculated /Default	Measured
Source of data	Data / declaration from supplier
Value(s) of monitored parameter	193
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	The CPA operator shall ensure provision of this parameter from the biomass supplier in the form of declaration. Monitoring Frequency: Continuous, at each trip
Calculation method (if applicable)	NA
QA/QC procedures	The data has been checked for consistency of the number of truck trips with quantity of biomass combusted
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$w_{C,i,y}$
Unit	%
Description	Weighted average mass fraction of carbon in fuel type i in year y
Measured/Calculated /Default	-

Source of data	-
Value(s) of monitored parameter	NA (No on-site consumption of fossil fuel by the project activity during this monitoring period. Hence not applicable)
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	Measurements should be undertaken in line with national or international fuel standards. The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
QA/QC procedures	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data	This is not used for emission reduction calculation
Additional comment	Applicable where Option A is used for the calculation of $COEF_{i,y}$.

<table>
<tr><td>Data/Parameter</td><td>$EF_{CO2,i,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/GJ</td></tr>
<tr><td>Description</td><td>Weighted average CO_2 emission factor of fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)</td></tr>
<tr><td>Monitoring equipment</td><td>NA</td></tr>
</table>

Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	For a) and b): Measurements should be undertaken in line with national or international fuel standards For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	Applicable where Option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.3. Implementation of sampling plan

No sampling plan needed over the monitoring period since 100% data are monitored and reported.

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

Q_{steam}	:	5235.04 Tonnes
H_s	:	663.21 kCal/Kg
H_w	:	65.55 kCal/Kg
$\eta_{BL,Thermal}$	:	100%
$EF_{FF,CO2}$	:	75.5tCO_2/TJ

Thus,

$EG_{thermal}$ $= 5235.04 * (663.21 – 65.55) *4.186 \text{ X } 10^{-6}$

$= 13.097$ TJ

Hence;

$BE_{thermal,CO_2,y}$ $= (13.097 /100 \%) * 75.5$

$= 988.82$ tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO_2/MWh for NEWNE grid

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$ = 38.51 MWh
$EF_{grid,CM,y}$ = 0.80 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 1.24 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 38.51* 0.80* (1+20/100) + 1.24*1.3* (1+20%)
= 38.90 tCO2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \text{ x } EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$$PE_{FC,j,y} = 0$$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 38.90 + 0$
$= 38.90\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

This part of leakage is not considered as the energy generating equipment currently being utilized is not transferred from outside the boundary of the Project activity

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

This project involves biomass briquettes. Hence leakage due to biomass processing is considered. As the average distance of biomass collection and transportation is less than 200 km, the resulting leakage from biomass collection and transportation is not considered. Thus leakage emission is calculated as follows:

Leakage Emissions due to processing of biomass for utilizing electricity:
Leakage Emissions due to processing of biomass for utilizing electricity is calculated using "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption"

$LE_{EC,y} = EC_{LE,l,y} * EF_{EL,l,y} * (1+TDL_{,l,y})$

Where,

$LE_{EC,l,y}$ Leakage emissions from electricity consumption in year *y* (tCO2/yr)
$EC_{ELl,y}$ Net increase in electricity consumption of source *l* in year *y* as a result of leakage (MWh/yr)
$EF_{EL,l,y}$ Emission factor for electricity generation for source *l* in year *y* (tCO2/MWh)
$TDL_{,l,y}$ Average technical transmission and distribution losses for providing electricity to source *l* in year *y*

As per the registered CPA-DD, electricity consumption factor for processing of biomass briquette production will be obtained during the first periodic verification from the equipment supplier. This factor is then to be multiplied with the quantity of biomass consumed during the monitoring period to arrive at the value of electricity consumed for processing of biomass for the monitoring period. Accordingly, declaration has been submitted by the briquette suppliers stating the electricity consumption @ 0.035 MWh/ton and the electricity consumption is calculated by multiplying this with quantity of biomass consumed i.e., 1111.63 tonnes.
Thus $EC_{LE,l,y}$ = 1111.63*0.035=38.91 MWh

Hence.
$LE_{EC,y}$ = 38.91*0.80*(1+20%)
= 37.35 tCO_2e

So the leakage emission is,
$LE_y = LE_{EC,y} + LE_{collection,y} + LE_{transportation,\ y}$
= 37.35+0+0
= 37.35 tCO_2e

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

The emission reductions have been calculated as per paragraph 30 of the methodology.
$\mathbf{ER_y = BE_y - PE_y - LE_y}$

Where,
ER_y = Emission reduction in year y (tCO_2e).
LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year *y* (tCO_2e).

Therefore; $ER_y = BE_y - PE_y - LE_y$
= 988.82 – 38.90 – 37.35

= **912 tCO_2e** (rounded down value)

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)
Total	988.82	38.90	37.35	912

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)	8,524*	912

* As per the registered CPA-DD, the estimated emission reductions are 5,203 tCO_2e/year. Since as the monitoring period is from 12/01/2011 to 31/08/2012 i.e. 598 days (first and last days included), ex-ante emissions have been calculated accordingly for this monitoring period considering 365 days of operation in a year (5,203/365*598 = 8,524)

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

The achieved emission reductions are lower than the ex-ante value of emission reductions in the registered CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0001: Instrument Details

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy /Class	Calibration Date	Calibration Frequency	Calibration Validity
Quantity of steam supplied in year y, (Q_{steam})	Steam Flow meter	Siemens	N1-W728-9026162	± 2%	20/09/2010, 20/04/2011, 20/04/2012	Yearly*	19/04/2013
Average Steam Temperature at MSSV (Main steam stop valve) outlet during year,(T_{steam})	RTD	Eureka	082783	Class B	02/07/2010, 20/04/2011, 20/04/2012	Yearly*	19/04/2013
Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year (P_{steam})	Pressure Transmitter	Siemens	A2B/W61 35512	±2%	20/09/2010, 20/04/2011, 20/04/2012	Yearly*	19/04/2013
Average Feed Water Temperature at inlet of boiler (T_{FWB})	RTD	Eureka	13141	Class B	02/07/2010, 20/04/2011, 20/04/2012	Yearly*	19/04/2013
Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Dual source Energy Meter	Cologicx	DS-10-10-0029	Class I	01/01/2011, 01/01/2012	Yearly**	31/12/2012
Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k}$,)	Weigh Bridge No.1	Endeavour	161200	Class III	17/06/2010, 30/06/2011, 21/06/2012	Yearly***	20/06/2013
Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

*As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy.

Appendix-2

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 002)
Reference number of the project activity	CPA 4041-0002[14]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	23/03/2012 (Inclusion Date of CPA in Registered PoA No.4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA Monitoring Period Number 1 Monitoring Period : 31/03/2012 to 31/08/2012 (Both days included) Start date of emission reduction in this monitoring period : 31/03/2012
Project participant(s)	Project participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA operator: 1. Ramdevbaba Solvent Private Limited
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	5,289 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	2,624 tCO_2e

[14] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=N1UVKCLWBFRI429JYHGP76XQEZD03A

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 12 TPH biomass residues (Rice Husk) fired boiler at Ramdevbaba Solvent Private Limited for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 12 TPH Fluidpac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 17.5 kg/cm^2 and has in bed tubes with refractory furnace. The steam generated from the boiler is utilised in Thermal Processing of various seeds like soyabean, groundnut, cotton seed, linseed, castor seed etc. for the production of oil and De Oiled Cake (DOC).

(c) Relevant dates for the component project activity:

UNFCCC ref no.	**Name of the CPA operator**	**Technology details**	**Date of Commissioning**	**Date of Inclusion**	**Start Date of Crediting Period**
PoA-4041 0002	Ramdevbaba Solvent Private Limited	Boiler - 12 TPH (From and At 100^{0}C)	17/04/2010	23/03/2012	31/03/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 31/03/2012 to 31/08/2012 (first and last days included) is 2,624 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	**Name of the CPA operator**	**Location of CPA**	**Geographic Coordinate**	**Host Party (ies)**
PoA-4041 0002	Ramdevbaba Solvent Private Limited	Gat no. 171 & 141, Armori road, Bramhapuri, District-Chandrapur, 441206, Maharashtra, India.	20°36'7.41" N 79°52'32.87" E	India

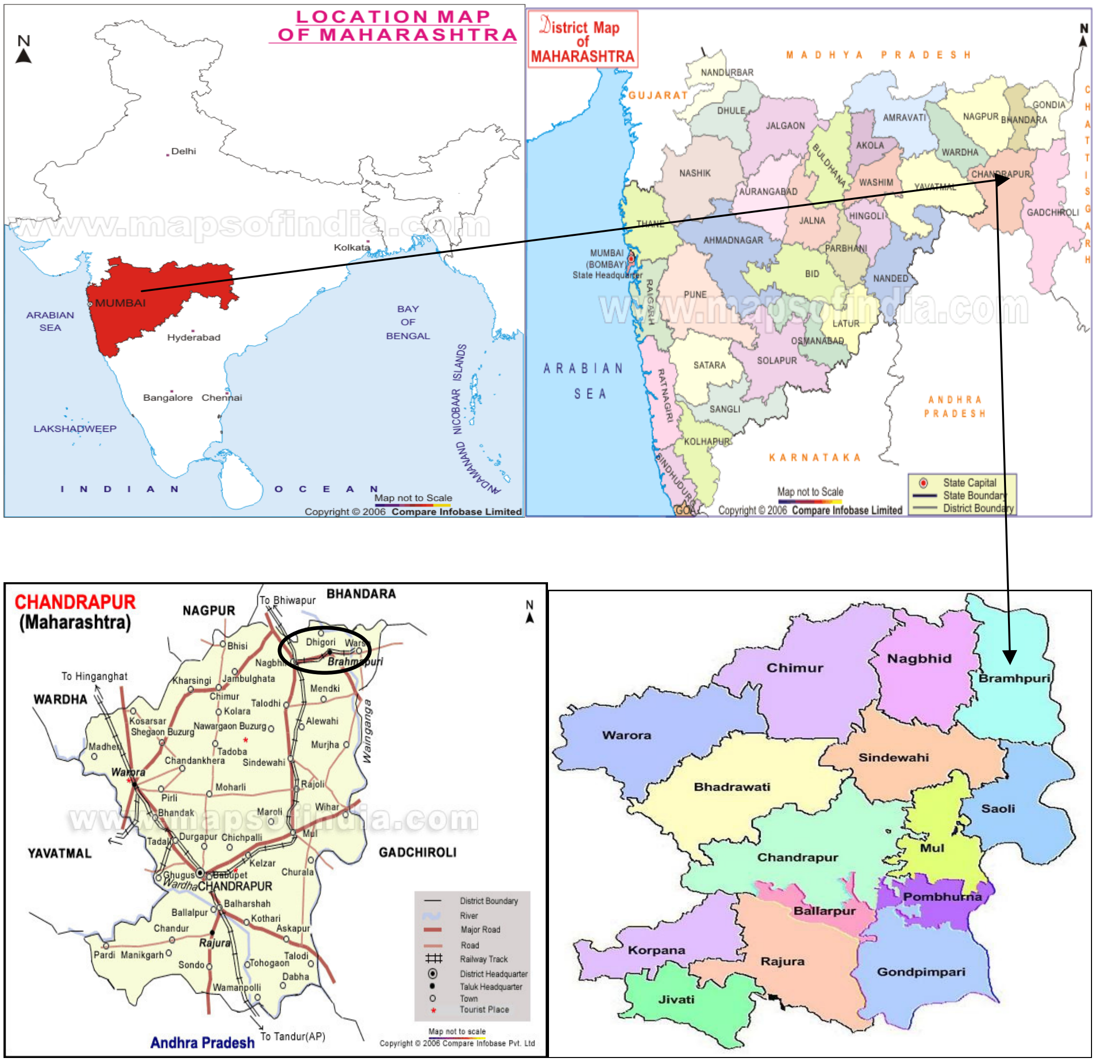


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [15]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[16]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[17]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[18]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[19]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[20]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 31/03/2012

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

[15] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[16] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[17] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[18] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[19] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[20] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	**Description**
CPA Number	002
CPA Operator	Ramdevbaba Solvent Private Limited
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler
Capacity of Equipment	Installation of 12 Tonnes per Hour (TPH) biomass fired boiler
Boiler Make	Thermax Limited
Boiler Model	Fluidpac
Maximum working pressure	17.5 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	12 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Rice husk)
Type of fuel firing	Automatic
Furnace type	In bed tubes with refractory
Boiler Number	MTFH120B/17.5/10
Commissioning date	17/04/2010

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently Biomass briquettes as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge, electrical systems, equipment safeties & controls.

The CPA operator has utilized biomasses for heat generation i.e. Rice Husk, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms" – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

iii.**Actual operation of the CPA during this monitoring period:**
The project is currently operational as per the monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the CPA like equipment retrofitting, Capacity addition etc[21].

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the included monitoring plan during this monitoring period

[21] Boiler was not operational for 19 days out of 154 days in this monitoring period due to plant shut down because of raw material unavailability and regular maintenance.

B.2.2. Corrections
There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology
There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meter
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments (Sr no 1 to 4) are connected to a monitoring system comprising of computer for local data acquisition & computation. This data gets transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \text{ X } 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes

H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

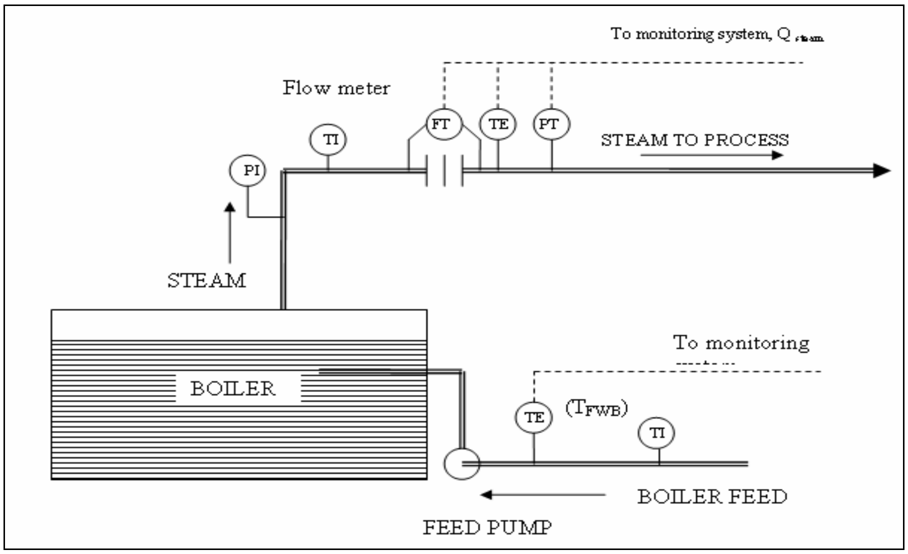


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid Power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Duly calibrated weigh Bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,k}$/ $Q_{ob,i}$
b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$
c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However no fossil fuel was used in this project activity for the monitoring period.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator). This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system. The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

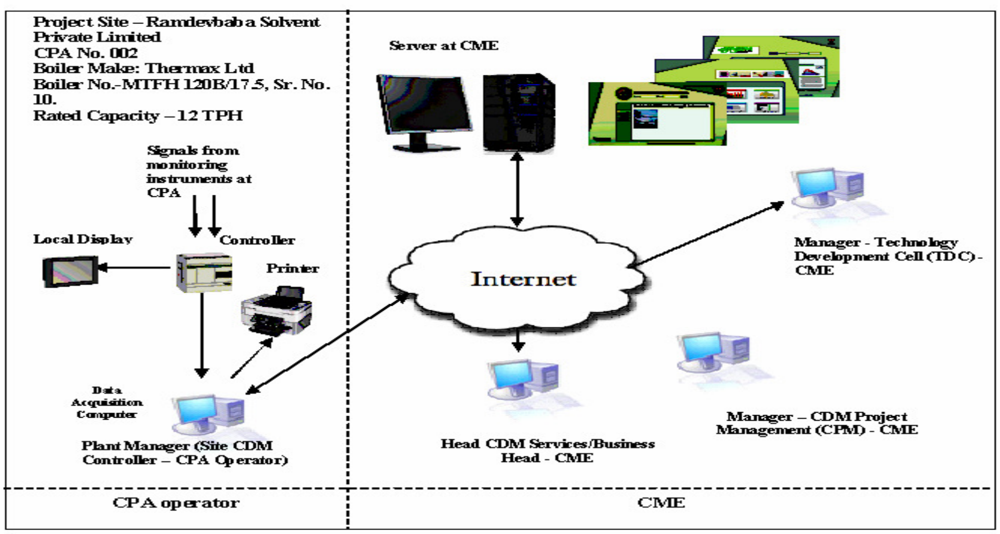


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

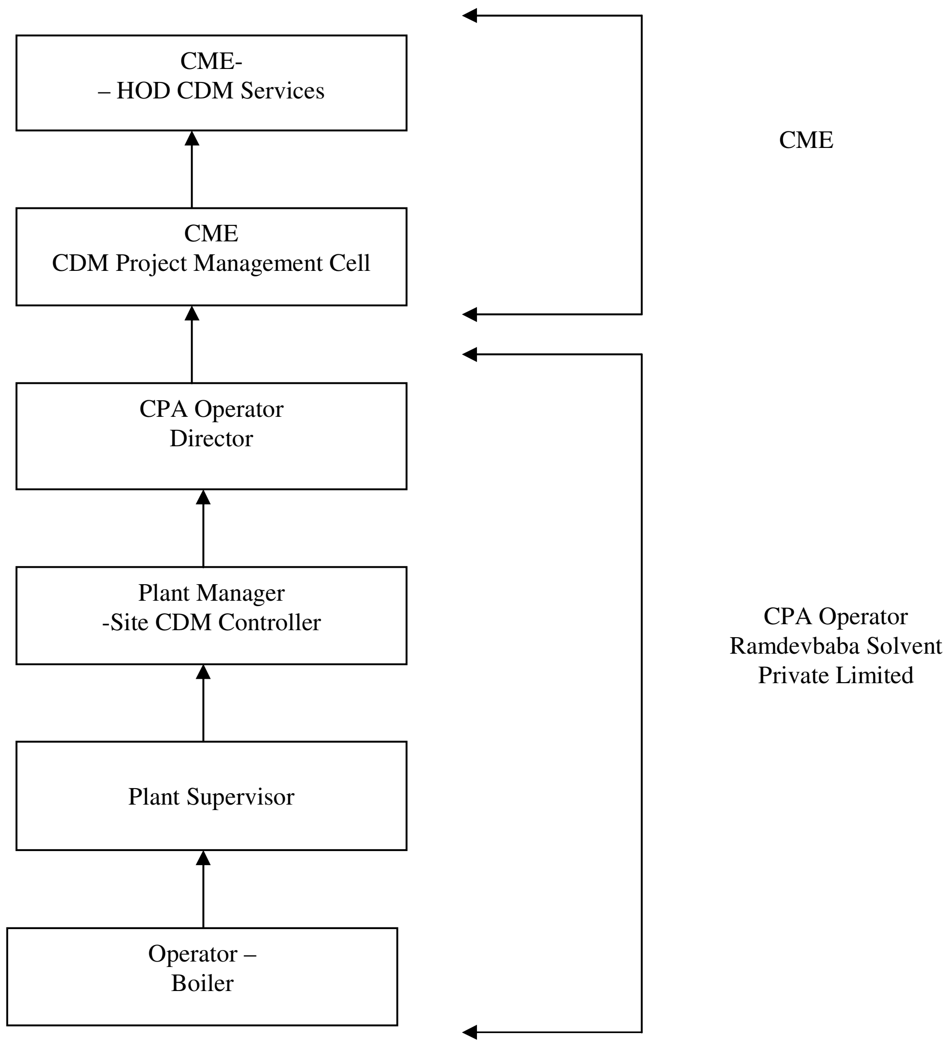


Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator – Ramdevbaba Solvent Private Limited

Key operational roles	**CPA Management Responsibilities**
Director – CPA Operator	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM Services for final reporting into emission reduction sheet. • Quarterly Performance Review
Plant Manager (site CDM Controller)	• Performance review -Monthly • Verification / review of data • Internal audits • Review of corrective actions

Plant Supervisor	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipments • Implementation of corrective action
Operators – Boiler	• Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i.e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation.

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	12 (value applicable for the Project activity as per CPA 002)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Recorded /Manufacturer's specification
Value(s) applied	Default value of 100% is considered as per para 18 (c) of the applied methodology (as per the included CPA-DD)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower value has been chosen in conservative manner. (Sourced from included CPA-DD)
Value(s) applied	89.5 (value applicable for the Project activity as per CPA 002)
Purpose of data	Baseline Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass
Source of data	Third Party Survey report
Value(s) applied	26.90 (value applicable for the Project activity as per CPA 002)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA DD.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	NEWNE grid – 0.80 (value applicable for the Project activity as per CPA 002)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 002)
Purpose of data	Project Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the registered CPA DD. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 002)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in registered CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	Indian Coal – 0.004186 (in case of Indian Coal is used) Rice husk – 0.004235 (value applicable for the Project activity as per CPA 002)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied

Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	12,046.63[22]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	195.91[23]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^2g

[22] For the data and calculations, kindly refer Emission reduction spread sheet
[23] For the data and calculations, kindly refer Emission reduction spread sheet

Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	13.20[24]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{FWB}
Unit	^oC
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	61.86[25]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

[24] For the data and calculations, kindly refer Emission reduction spread sheet
[25] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	h,y
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	2617
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	29.995
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived electronic and paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in plant record
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge slip, Log Book / Plant record
Value(s) of monitored parameter	3031.84
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and paper mode. Monitoring: Biomass delivery note obtained from the fuel supplier.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/plant record
Value(s) of monitored parameter	40.48
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: measured at the end of the day
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/plant record
Value(s) of monitored parameter	3021.36
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	This has been verified with the help of steam generation and steam to fuel ratio
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes
Description	Quantity of stored fuel type fossil i on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel delivery note obtained from the fuel supplier
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i} = FC_{j,PJ,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$ Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	The quantity of fossil fuel consumed can be cross checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Laboratory Analysis report by external agency dated 20/08/2012.
Value(s) of monitored parameter	13.63
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by paper mode. Monitoring: Analysis from accredited or certified independent agency according to relevant national/international standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	%
Description	Moisture content of the biomass residues

Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$NCV_{i,y}$
Unit	TJ/Gg or GJ/t
Description	Weighted average net calorific value of the fuel type i in year y
Measured/Calculated /Default	Calculated or Measured
Source of data	<table><tr><th>Data source</th><th>Conditions for using the data source</th></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr><tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr><tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr></table>
Value(s) of monitored parameter	Not applicable as no fossil fuel is consumed in this monitoring period
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Analysis by an independent agency.

Calculation method (if applicable)	---
QA/QC procedures	If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted. $NCV_i = NCV_{j,y}$ i is the fuel type combusted in process j during the year y.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$FC_{i,j,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed in a process j during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	0 (No fossil fuel type i consumed in a process j during monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	102.24
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA

QA/QC procedures	Measured by calibrated energy meter.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set or Fossil fuel based power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	2.88
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0002 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	20.96
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier

QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	472
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note.
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$EF_{CO2,i,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/GJ</td></tr>
<tr><td>Description</td><td>Weighted average CO_2 emission factor of fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)</td></tr>
<tr><td>Monitoring equipment</td><td>NA</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data Archiving: Data will be archived by Paper mode.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>For a) and b): Measurements should be undertaken in line with national or international fuel standards
For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For c): Review appropriateness of the values annually
For d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures</td><td>Applicable where Option B is used.
For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

D.3. Implementation of sampling plan
No sampling plan needed over the monitoring period since 100% data are monitored and reported.

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 X 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (Kcal/kg)

Q_{steam} : 12,046.63Tonnes
H_s : 666.13 kCal/Kg
H_w : 61.86 kCal/Kg
$\eta_{BL,Thermal}$: 100%
$EF_{FF,CO2}$: 89.5tCO_2/TJ

Thus,
$EG_{thermal}$ = 12,046.63* (666.13- 61.86) *4.186 X 10^{-6}
= 30.47 TJ

Hence;
$BE_{thermal,CO_2,y}$ = (30.47 /100 %) * 89.5
= 2,727.23 tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:

Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,s

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO_2/MWh for NEWNE grid.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$ = 102.24 MWh
$EF_{grid,CM,y}$ = 0.80 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 2.88 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 102.24* 0.80* (1+20/100) + 2.88*1.3* (1+20/100)
= 102.64 tCO_2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$

$= 102.64 + 0$

$= 102.64$ tCO_2e

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.
As per the clarification given in the foot note for paragraph 29 of methodology, 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.

The energy generating equipment currently being utilised is not transferred from outside the boundary of the project activity. Biomass (Rice Husk) consumed in the project activity is not transported to the project site over a distance of more than 200 km. Hence leakage is considered to be zero.

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$\mathbf{ER_y = BE_y – PE_y – LE_y}$

Where,

ER_y = Emission reduction in year y (tCO_2e).

LE_y = Leakage in year y (tCO_2e).

PE_y = Project emissions in year *y* (tCO_2e).

Therefore; $ER_y = BE_y – PE_y – LE_y$

$= 2727.23 - 102.64 – 0$

= **2,624 tCO_2e** (rounded down value)

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)
Total	2727.23	102.64	0	2,624

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

Item	Values estimated in ex-ante calculation of registered CPA-DD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	5,289*	2,624

*As per the included CPA-DD, the estimated emission reductions are 12,536 tCO_2e/year. Since the monitoring period is from 31/03/2012 to 31/08/2012 i.e. 154 days (first and last days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (12,536/365*154 = 5,289)

E.6. Remarks on difference from estimated value in registered CPA-DD

The achieved emission reductions are lower than the ex-ante value of emission reductions in the registered CPA-DD. Hence there is no excess of emission reductions to report.

Annex-1_4041-0002: Instrument Details

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy /Class	Calibration Date	Calibration frequency	Calibration Validity
Quantity of steam supplied in year y , (Q_{steam})	Steam Flow Meter	Endress + Hauser	E400D320000	±2.3%	25/04/2011	Once in 3 years*	24/04/2014
Average Steam Temperature at MSSV (Main steam stop valve) outlet during year, (T_{steam})	RTD	Endress + Hauser	E400D320000	Class A	25/04/2011	Once in 3 years*	24/04/2014
Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year, (P_{steam})	Pressure Transmitter	Endress + Hauser	C 907D501052	±2%	13/3/2012	Yearly**	12/03/2013
Average Feed Water Temperature at inlet of boiler, (T_{FWB})	RTD	Endress + Hauser	11050626	Class B	13/3/2012	Yearly**	12/03/2013
Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Dual Energy Meter	HPL-SOCOMEC Pvt. Ltd.	1K 162128	CLASS 1.0	6/3/2012	Yearly***	5/3/2013
Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k,}$)	Weigh Bridge	Metler Toledo	2730260001	Class-III	23/2/2012	Yearly****	22/2/2013
Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

* Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

**** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy..

Appendix-3

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 011)
Reference number of the project activity	CPA 4041-0003[26]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	23/03/2012 (Inclusion Date of CPA in Registered PoA No.4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (first and last days included) Start date of emission reduction in this monitoring period: 31/03/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. Mega Solvent Extractions Limited
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	4,650 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	675 tCO_2e

[26] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=W604YP71ETQMKGZAR5F2VHO9LCSIB3

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 8 TPH biomass fired boiler at Mega Solvent Extraction Limited for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 8 TPH Combipac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 17.5kg/cm^2 and a screw feeder is used to feed the fuel which is rice husk for this project activity. The steam generated from the boiler is utilised in the plant process such as for oil extraction from rice bran, production of crude oil and de-oiled cake.

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
PoA-4041 0003	Mega Solvent Extractions Limited	Boiler - 8 TPH (From and At 100^{0}C)	26/12/2009	23/03/2012	31/03/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 31/04/2012 to 31/07/2012 (first and last days included) is 675 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
PoA-4041 0003	Mega Solvent Extractions Limited	S. No. 462/B/3, Village – Kakkiralapally, Wardhannapet Mandal, District Warangal 506 310, Andhra Pradesh, India	17^0 49’43”N 79^0 35’ 19”E	India

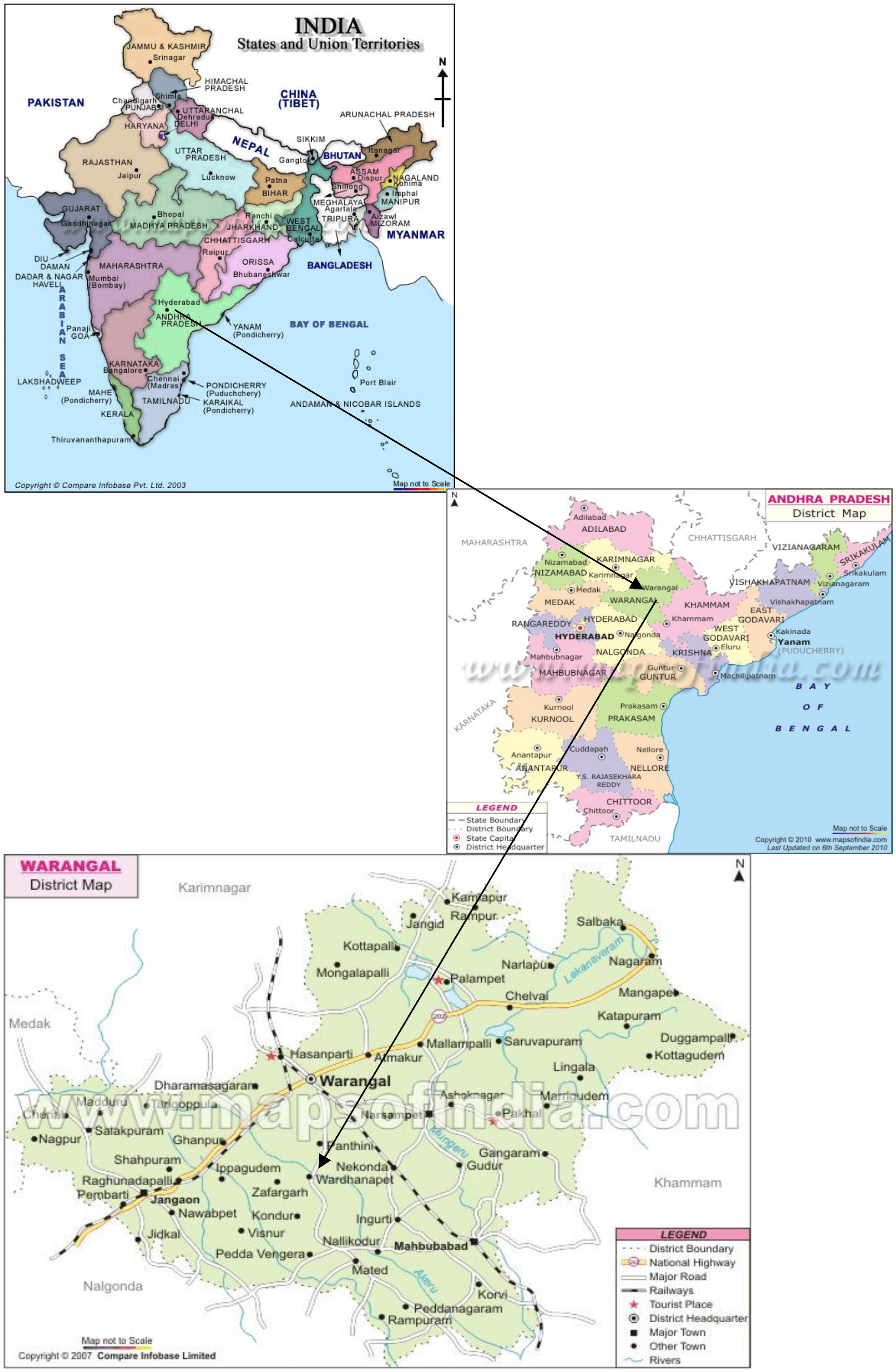


Fig.A.2.1 Physical Location of the project activity

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [27]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[28]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[29]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[30]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[31]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[32]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 31/03/2012

Length of the crediting period: 10 Years

[27] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[28] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[29] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[30] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[31] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[32] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	**Description**
CPA Number	011
CPA Operator	Mega Solvent Extractions Limited
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler
Equipment capacity	Installation of biomass (Rice husk) fired boiler having rated steam generation capacity of 8 tonnes per hour (TPH)
Boiler Make	Thermax Limited
Boiler Model	Combipac
Maximum working pressure	17.5 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	8 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residue (hereinafter referred as Rice husk)
Type of fuel firing	Screw feeder
Furnace type	Refractory lined furnace with water wall
Boiler Number	CPFD 80/17.5/13
Commissioning date	26/12/2009

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently Biomass briquettes as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge, electrical systems, equipment safeties & controls.

The CPA operator has utilized biomasses for heat generation i.e. Rice Husk, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the project activity during this monitoring period:**

The project is currently operational as per the registered monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events

occurred during the monitoring period, which affects the monitoring plan of the project activity like equipment retrofitting, Capacity addition etc.[33]

B.2. Post registration changes
B.2.1. Temporary deviations from registered monitoring plan or applied methodology
There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections
There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology
There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument and field instrument integral to steam flow meter.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meters
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data has been transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of Project activity.

[33] Boiler was not operational for 38days out of 154 days in this monitoring period due to plant shut down

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal}$ = Q_{steam} * (H_s - H_w)* 4.186 X 10^{-6}
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

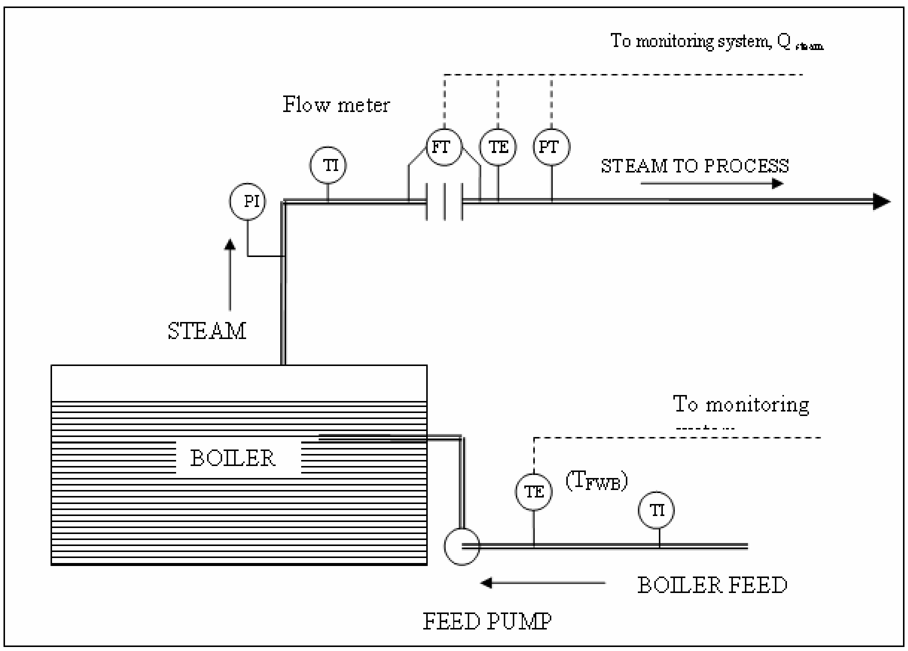


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is mentioned in the logbook.

Duly calibrated weigh bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,\,k}$/ $Q_{ob,\,i}$

b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$

c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However no fossil fuel was used in this project activity for the monitoring period.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator) . This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system.The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

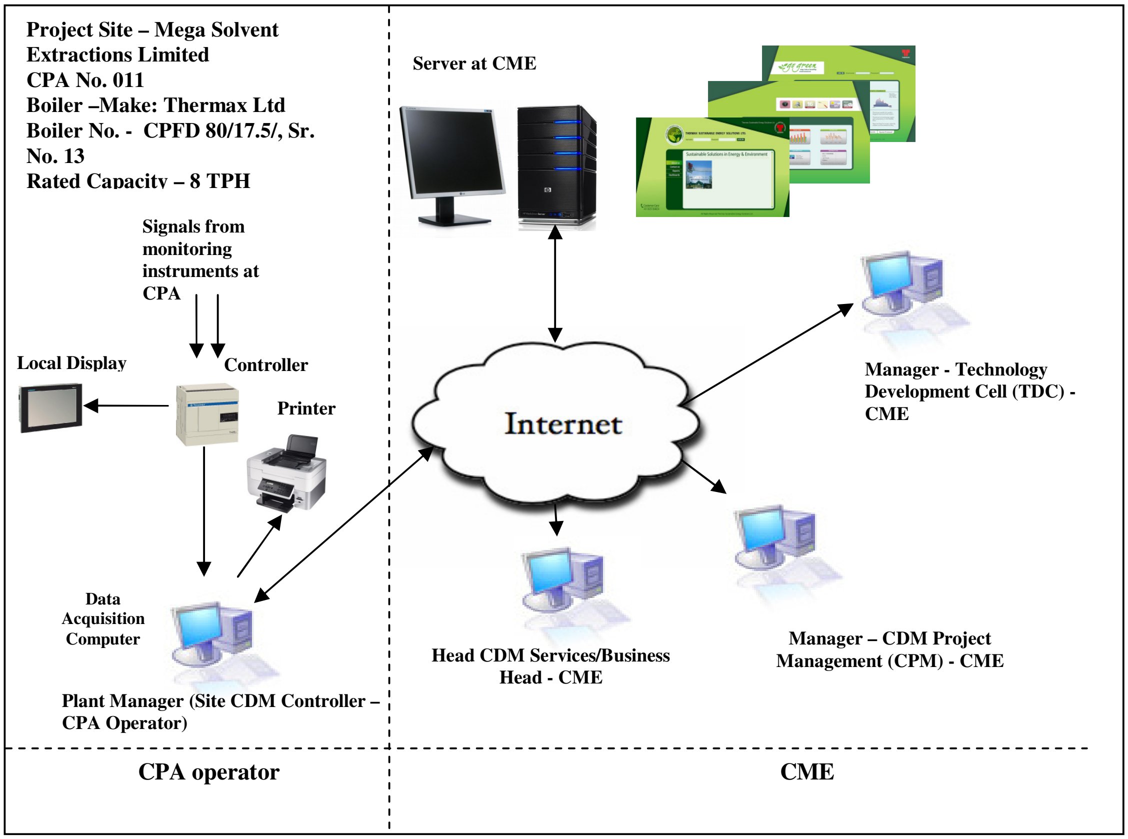
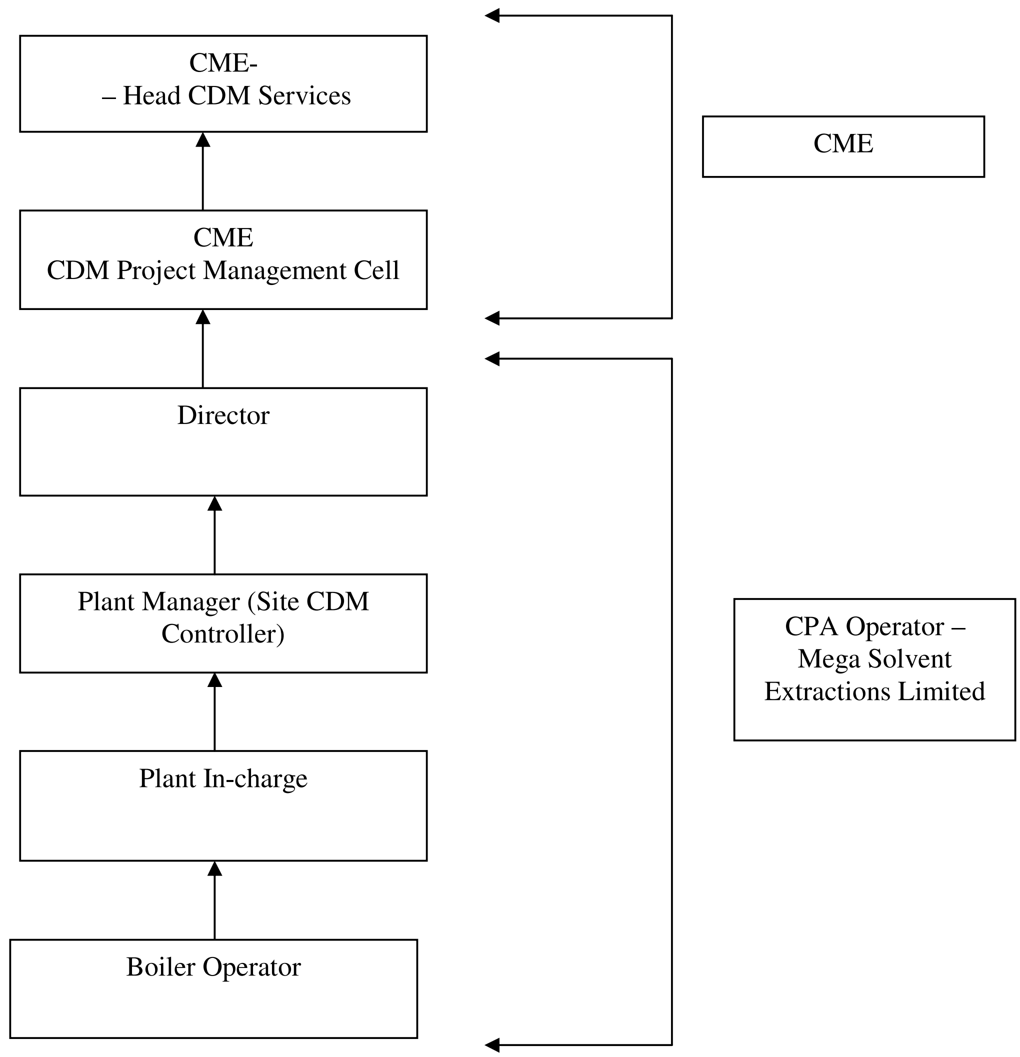


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.



<u>Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator – Mega Solvent Extractions Limited</u>

Key operational roles	• **CPA Management Responsibilities**
Director	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM Services for final reporting into emission reduction sheet. • Quarterly Performance Review
Plant Manager (Site CDM Controller)	• Performance review -Monthly • Verification / review of data • Internal audits • Review of corrective actions

Plant In-charge	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipments • Implementation of corrective action
Boiler – Operator	• Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i.e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation.

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Not used for emission reduction calculation
Value(s) applied	8 (value applicable for the Project activity as per CPA 011)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per para 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 011)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower values have been chosen in conservative manner. (Sourced from included CPA-DD)
Value(s) applied	89.5 (value applicable for the Project activity as per CPA 011)
Purpose of data	Baseline Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass within 50 km radial distance
Source of data	Third Party Survey report at the beginning of crediting period
Value(s) applied	77.7 (value applicable for the Project activity as per CPA 011)
Purpose of data	Leakage Emission calculation

Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	Southern Grid – 0.86 (value applicable for the Project activity as per CPA 011)
Purpose of data	Project Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per " Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 011)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 011)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y

Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	0.004260 – For Rice Husk 0.004186 - Indian Coal (in case of Indian Coal is used) (value applicable for the Project activity as per CPA 011)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	3,254.40[34]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{steam}
Unit	°C

[34] For the data and calculations, kindly refer Emission reduction spread sheet

Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	182.39[35]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^{2}g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	10.94[36]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[35] For the data and calculations, kindly refer Emission reduction spread sheet
[36] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{FWB}
Unit	^{o}C
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	66.84[37]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	h,y
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	1211
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-

[37] For the data and calculations, kindly refer Emission reduction spread sheet

Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	18.25
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	866.85
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass delivery note obtained from the fuel supplier.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	82.72
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log book/Plant record.
Value(s) of monitored parameter	802.38
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	This has been verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes
Description	Quantity of stored fuel type fossil i on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel delivery note obtained from the fuel supplier
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i} = FC_{j,PJ,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$ Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	This can be cross checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 17/03/2012
Value(s) of monitored parameter	11
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data will be archived annually by paper mode. Monitoring: Analysis from accredited or certified independent agency according to relevant national/international standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	%
Description	Moisture content of the biomass residues
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter shall be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average has been calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	NA
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Unit</td><td>TJ/Gg</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of the fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated or Measured</td></tr>
<tr><td>Source of data</td><td>
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>---</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>---</td></tr>
<tr><td>QA/QC procedures</td><td>If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted.
$NCV_i = NCV_{j,y}$
i is the fuel type combusted in process j during the year y.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$FC_{i,j,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed in a process j during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	--
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book
Value(s) of monitored parameter	52.07
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set or Fossil fuel based power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book
Value(s) of monitored parameter	0
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0003 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data will be archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	AVD_{y}
Unit	km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Measured
Source of data	Plant record
Value(s) of monitored parameter	10.74
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Plant record.
Value(s) of monitored parameter	183
Monitoring equipment	--
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note.
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$EF_{CO2,i,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/GJ</td></tr>
<tr><td>Description</td><td>Weighted average CO_2 emission factor of fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)</td></tr>
</table>

Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	For a) and b): Measurements should be undertaken in line with national or international fuel standards For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	Applicable where Option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.3. Implementation of sampling plan
No sampling plan needed over the monitoring period since 100% data are monitored and reported.

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \text{ X } 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (Kcal/kg)

H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (Kcal/kg)

Q_{steam} : 3,254.40Tonnes
H_s : 664.66 kCal/Kg
H_w : 66.84 kCal/Kg
$\eta_{BL,Thermal}$: 100%
$EF_{FF,CO2}$: 89.5tCO_2/TJ

$EG_{thermal}$ $= 3,254.40 * (664.66 - 66.84) *4.186 \times 10^{-6}$
$= 8.144$ TJ

Hence;

$BE_{thermal,CO_2,y}$ $= (8.144 /100 \%) * 89.5$
= 728.89 tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of “Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion”;
- CO_2 emissions from electricity consumption by the Project activity using the latest version of “Tool to calculate baseline, Project and/or leakage emissions from electricity consumption”;
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the “Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)” (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

<u>Scenario A: Electricity consumption from the grid</u>

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y}= EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.86 tCO_2/MWh for Southern grid

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$$PE_{EC,y} = EC_{PJ,j,y}*EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y}*EF_{EL,j,y} * (1+TDL_{j,y})$$

Where;

$EC_{PJ,j,y}$ = 52.07 MWh
$EF_{grid,CM,y}$ = 0.86 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 0 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 52.07 * 0.86* (1+20/100) + 0*1.3* (1+20%)
= **53.74 tCO_2e**

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$

$= 53.74 + 0$

$= \mathbf{53.74\ tCO_2e}$

E.3. Calculation of leakage

As per paragraph 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

Leakage is thus considered to be zero as the energy generating equipment currently being utilised is not transferred from outside the boundary of the Project activity and Biomass (Rice Husk) consumed in the project activity is not transported to the Project site over a distance of more than 200 km.

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$\mathbf{ER_y = BE_y - PE_y - LE_y}$

Where,

ER_y = Emission reduction in year y (tCO_2e).
LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year *y* (tCO_2e).

Therefore; $\mathbf{ER_y = BE_y - PE_y - LE_y}$
$\mathbf{ER_y = 728.86\text{-}53.74\text{-}0}$
= 675 tCO_2e (rounded down value)

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)
Total	728.89	53.74	0	675

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

Item	Values estimated in ex-ante calculation of registered CPA-DD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	4,650*	675

*As per the included CPA-DD, the estimated emission reductions are 11,022 tCO_2e/year. Since the monitoring period is from 31/03/2012 to 31/08/2012 i.e. 154 days (both days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (11,022/365*154 = 4,650)

E.6. Remarks on difference from estimated value in registered CPA-DD

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0003: Instrument Details

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Accuracy /Class	Calibration Date	Calibration frequency	Calibration Validity
Quantity of steam supplied (Q_{steam})	Steam Flow Meter	Endress+hauser	E8010620000	±2.3%	13/10/2011	Once in 3 years*	12/10/2014
Average Steam Temperature (T_{steam})	RTD	Endress+hauser	E8010620000	Class A	13/10/2011	Once in 3 years*	12/10/2014
Average Steam Pressure (P_{steam})	Pressure Transmitter	Endress+hauser	E8002C21129	±0.15%	22/08/2011	Once in 3 years*	21/08/2014
Average Feed Water Temperature (T_{FWB})	RTD	Endress+hauser	E8007F142EA	Class A	13/10/2011	Once in 3 years*	12/10/2014
Auxiliary Electricity Consumption from Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$)	Energy Meter	Conzerv	203352/18503-2610	Class 1.0	19/02/2012	Yearly**	18/02/2013
$Q_{ob,k}$ (Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site) $Q_{np,k}$ (Quantity of subsequent delivery of fuel type k biomass at the Project site) $Q_{in,k}$ (Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site)	Weigh Bridge	Essae Digitronics Private Limited	950084373	Class III	25/03/2012	Yearly***	24/03/2013

* Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy

Appendix-4

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 004)
Reference number of the project activity	CPA 4041-0005[38]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	30/04/2012 (Inclusion Date of CPA in Registered PoA 4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (both days included) Start date of emission reduction in this monitoring period: 01/05/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. LACTOSE (INDIA) LIMITED
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	1,198 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	467 tCO_2e

[38] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=5V890IQW7DP1JLU4EAY6HNO2S3CZRK

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of a 3 TPH biomass residues (Biomass Briquette) fired boiler at LACTOSE (INDIA) LIMITED for meeting their in house thermal energy requirement thereby replacing the existing fossil fuel fired equipment. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 3 TPH, Multipac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 10.54 kg/cm^2 and has horizontal fixed grate furnace. The steam generated from the boiler is utilised in the lactose powder manufacturing plant, tablet manufacturing plant and in liquid manufacturing plant for manufacturing various syrups like Atarax, Zycof and Nootropil and used as heat input to the 425 TR VAM(Vapour Absorption Machine)

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
CPA-4041 0005	LACTOSE (INDIA) LIMITED	Boiler – 3 TPH (At 100^{0}C)	30/08/2009	30/04/2012	01/05/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/05/2012 to 31/08/2012 (both days included) is 467 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
CPA-4041 0005	LACTOSE (INDIA) LIMITED	Survey No.5, 6 & 7, Village-Poicha (Rania), Taluka- Savli, District- Vadodara, Gujarat-391780.	22°28’31.86” North, 73°6’24.11” East	India

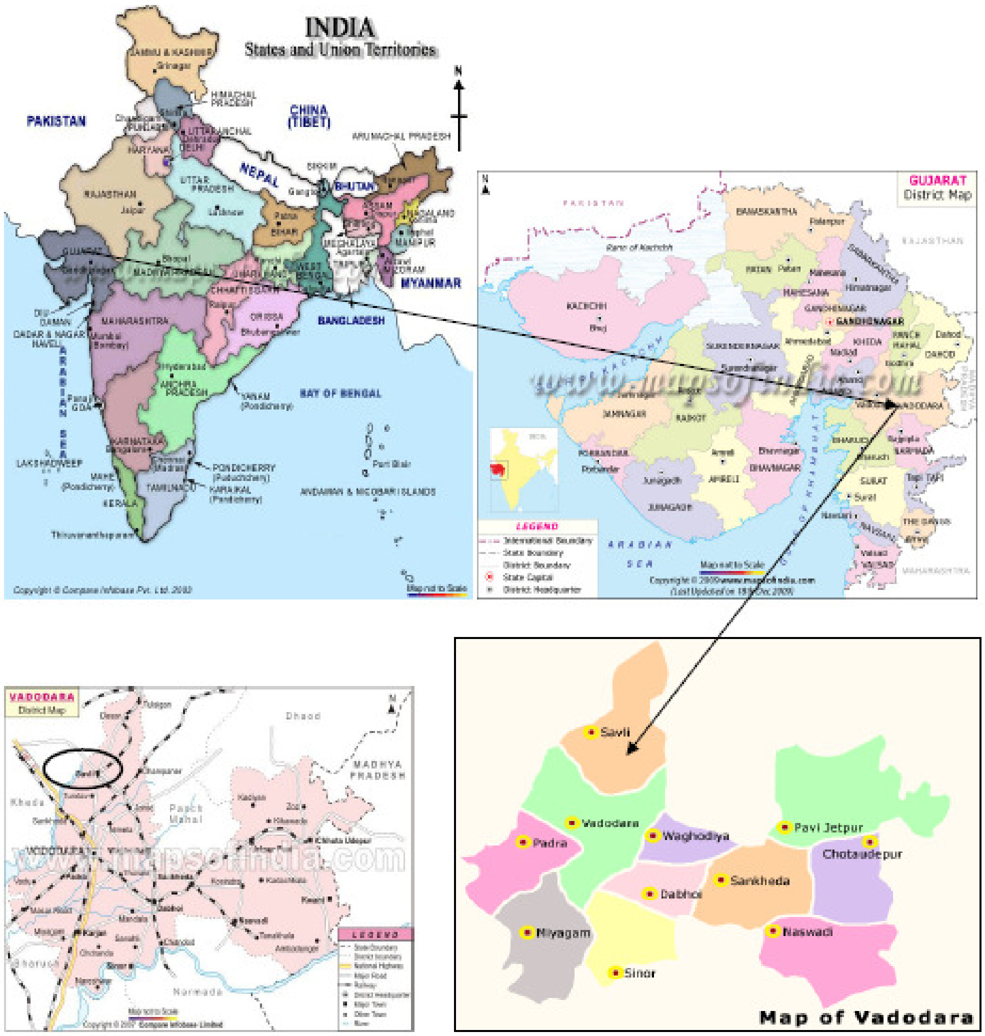


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No

Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [39]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[40]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[41]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[42]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[43]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[44]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/05/2012

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

[39] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[40] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[41] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[42] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[43] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[44] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	Description
CPA Number	004
CPA Operator	LACTOSE (INDIA) LIMITED
Project Scenario	Biomass fired thermal energy generation as a replacement of existing fossil fuel fired equipment.
Type of equipment	Boiler
Equipment capacity	Installation of biomass fired boiler having rated steam generation capacity of 3 tonnes per hour (TPH)
Boiler Make	Thermax Limited
Boiler Model	Multipac
Maximum working pressure	10.54 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	3 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Biomass Briquettes)
Type of fuel firing	Manual
Furnace type	Horizontal fixed grate
Boiler Number	IFB30D/10.54/53
Commissioning date	30/08/2009

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently Biomass briquettes as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge, electrical systems, equipment safeties & controls.

The CPA operator has utilized biomass for heat generation i.e. Biomass Briquettes, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms – Version -07

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the project activity during this monitoring period:**
The project is currently operational as per the registered monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the CPA like equipment retrofitting, Capacity addition etc. [45]

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the included monitoring plan during this monitoring period

[45] The boiler was not operational for 18days out of 123 days in this monitoring period due to plant shut down

B.2.2. Corrections

There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity

There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period

There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meter
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments (Sr no 1 to 4) are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data gets transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal}$ = $Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$

$EG_{thermal}$ = Net quantity of heat supplied by the Project activity

Q_{steam} = Quantity of steam supplied in Tonnes

H_s = Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

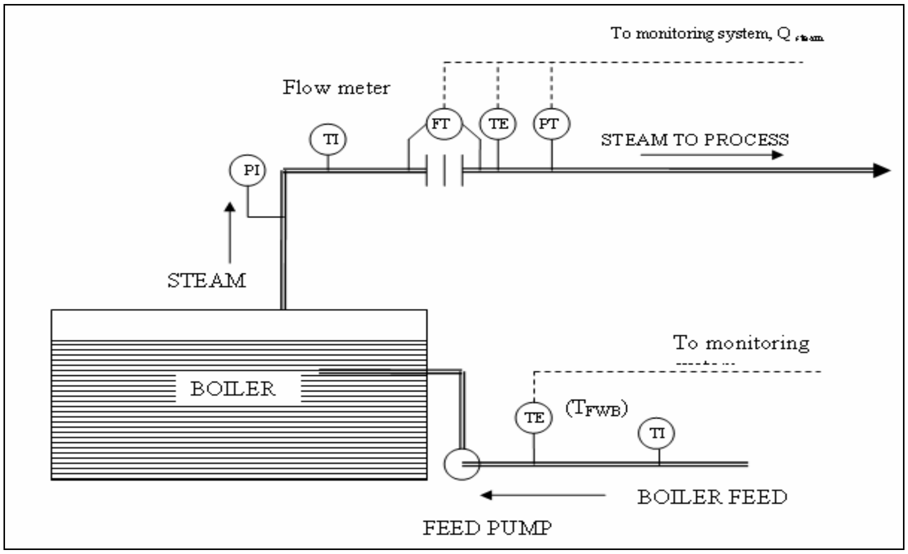


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid power (Diesel Generator).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the outside the Project boundary. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Dully calibrated weigh bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,\,k}$/ $Q_{ob,\,i}$
b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$
c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However there was no fossil fuel used the during this monitoring period for this project activity

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator) This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system.The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

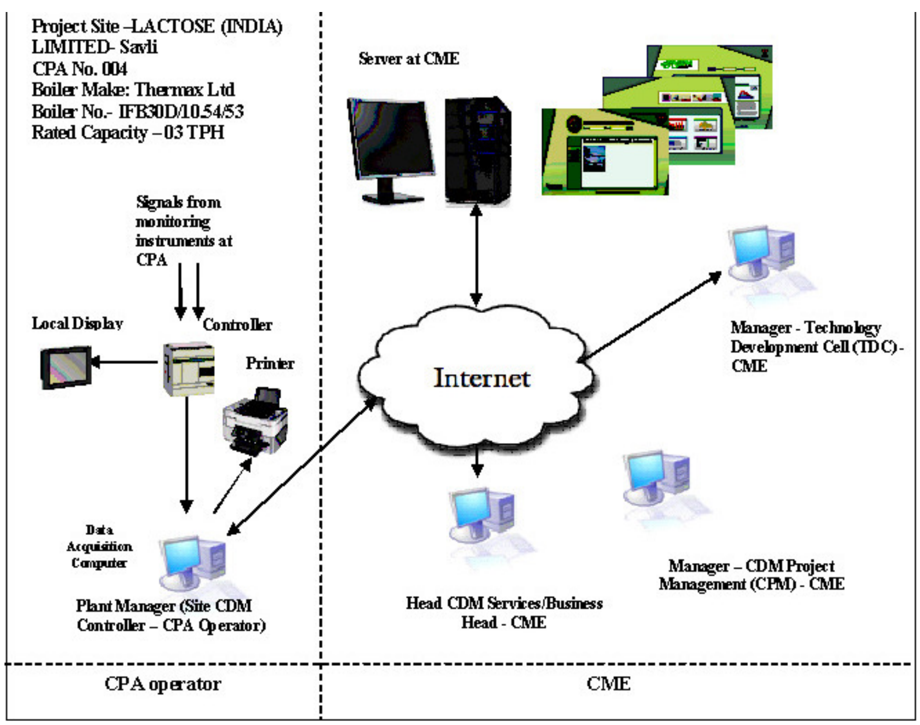


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

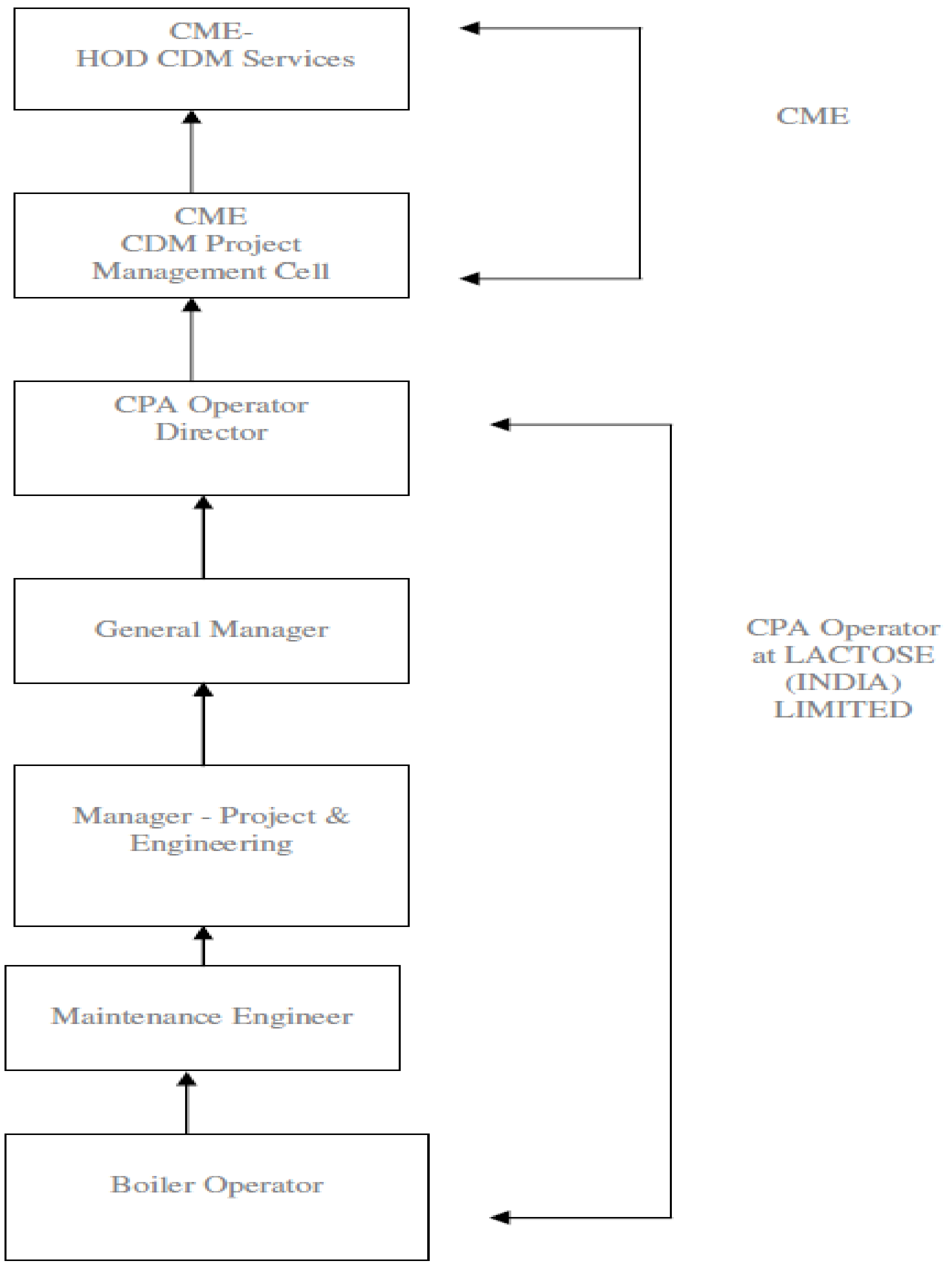


Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator

Key operational roles	CPA Management Responsibilities
Director- CPA operator	• Overall Responsibilities of Operation & Management of Project
Plant Manager (site CDM Controller)	• Performance review –Monthly • Verification / review of data • Internal audits • Review of corrective actions
Plant Supervisor	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipments • Implementation of corrective action
Operator – Boiler	• Operation and Maintenance of boiler • Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i.e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation.

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	3 (value applicable for the Project activity as per CPA 004)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per para 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 004)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower values has been chosen in conservative manner (Sourced from included CPA-DD)
Value(s) applied	75.5 (value applicable for the Project activity as per CPA 004)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass
Source of data	Independent Survey report
Value(s) applied	65.5 (value applicable for the Project activity as per CPA 004)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	0.80 - NEWNE Grid (value applicable for the Project activity as per CPA 004)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption". (As mentioned in included CPA-DD)
Value(s) applied	0.4 (value applicable for the Project activity as per CPA 004)
Purpose of data	Project Emission calculation
Additional comment	The electricity consumption source is a Project electricity consumption source and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is greater than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s). However, Project activity is replacement project, hence default value i.e. 0.4 tCO2/MWh is considered for the calculation of project emissions as the auxiliary load of baseline plant is greater than the auxiliary load of the Project activity. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{LE,l,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption for biomass processing, outside project boundary.
Source of data	Declaration by biomass supplier / Technical specification of electricity consumption for biomass processing.
Value(s) applied	21.06 (value applicable for the Project activity as per CPA 004)
Purpose of data	Project Emission calculation
Additional comment	As per the included CPA-DD, electricity consumption factor for processing of biomass briquette production will be obtained during the first periodic verification from the equipment supplier. This factor is then to be multiplied with the quantity of biomass consumed during the monitoring period to arrive at the value of electricity consumed for processing of biomass for the monitoring period. Accordingly, declaration has been submitted by the briquette supplier Vivek Industries stating the electricity consumption @ 0.035 MWh/ton and the electricity consumption is calculated by multiplying this with quantity of biomass consumed i.e., 601.81 tonnes. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 004)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)

Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MW
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	Biomass briquettes - 0.004417 Furnace oil – 0.003913 (value applicable for the Project activity as per CPA 004)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	2,658.69[46]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[46] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	161.90[47]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^2g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	5.82[48]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[47] For the data and calculations, kindly refer Emission reduction spread sheet
[48] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{FWB}
Unit	^oC
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	50.54[49]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	h,y
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	2109
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA

[49] For the data and calculations, kindly refer Emission reduction spread sheet

QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/plant record
Value(s) of monitored parameter	52.30
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later. To be checked whether the calibration is required to be conducted or not

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge, Log Book / Plant record.
Value(s) of monitored parameter	609.85
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass briquettes have been measured on Weighbridge outside the plant premise at each delivery. The weighbridge slip with delivery note/invoice has been obtained from the fuel supplier and has been mentioned in the log book.
Calculation method (if applicable)	NA

QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/plant record
Value(s) of monitored parameter	60.345
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: has been measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/plant record
Value(s) of monitored parameter	601.81
Monitoring equipment	--
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	The quantity of biomass briquettes consumed can be cross checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	This is not used for emission reduction calculation

Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 20/08/2012.
Value(s) of monitored parameter	15.95
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by paper mode. Monitoring: Analysis from accredited or certified independent agency according to relevant national/international standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	% water
Description	Moisture content of the biomass residues
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. However since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$NCV_{i,y}$
Unit	TJ/Gg or GJ/t
Description	Weighted average net calorific value of the fuel type i in year y
Measured/Calculated /Default	Calculated or Measured
Source of data	<table><tr><th>Data source</th><th>Conditions for using the data source</th></tr><tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr><tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr><tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr><tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr></table>
Value(s) of monitored parameter	Not applicable as no fossil fuel is consumed in this monitoring period
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Analysis by an independent agency.
Calculation method (if applicable)	---
QA/QC procedures	If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted. $NCV_i = NCV_{j,y}$ i is the fuel type combusted in process j during the year y.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$FC_{i,j,y}$
Unit	Lit
Description	Quantity of fossil fuel (Furnace oil) type i consumed in a process j during the year y
Measured/Calculated /Default	Calculated

Source of data	Log book/Plant record
Value(s) of monitored parameter	--
Monitoring equipment	
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	The consumption of furnace oil is measured in liters (Dip Stick Method) and converted to tones by considering density of furnace oil.
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	11.15
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	PP has replaced the energy meter on 10/09/2012 as the meter installed was not functional since 31/08/2012. Thus the reading for 31/08/2012 was calculated based on the emergency preparedness plan specified in the included CPA-DD which states that the energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i. e. Failure hours*Electrical connected load*Grid emission factor. Thus for 31/08/2012, it is calculated as 24hrs*18.07kW*0.8 tCO_2/MWh. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	0.96
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0005 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data has been archived by Electronic/Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	300
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	51
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	--
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note.
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,c,y}$
Unit	km
Description	Average round trip distance (from and to) between the biomass fuel supply sites and the site of biomass processing in year y
Measured/Calculated /Default	Calculated
Source of data	Data / declaration from supplier
Value(s) of monitored parameter	71.06
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	-
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,c,y}$
Unit	--
Description	Number of truck trips during the transportation of biomass to the biomass processing site in year y
Measured/Calculated /Default	Measured

Source of data	Data / declaration from supplier
Value(s) of monitored parameter	123
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	The CPA operator shall ensure provision of this parameter from the biomass supplier in the form of declaration. Monitoring Frequency: Continuous, at each trip
Calculation method (if applicable)	NA
QA/QC procedures	The data has been checked for consistency of the number of truck trips with quantity of biomass combusted
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$w_{C,i,y}$
Unit	%
Description	Weighted average mass fraction of carbon in fuel type i in year y
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	NA (No on-site consumption of fossil fuel by the project activity during this monitoring period. Hence not applicable)
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	Measurements should be undertaken in line with national or international fuel standards. The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
QA/QC procedures	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data	This is not used for emission reduction calculation
Additional comment	Applicable where Option A is used for the calculation of $COEF_{i,y}$.

Data/Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y

Measured/Calculated /Default	Calculated
Source of data	The following data sources may be used if the relevant conditions apply: **Data source** — **Conditions for using the data source** a) Values provided by the fuel supplier in invoices — This is the preferred source b) Measurements by the Project participants — If a) is not available c) Regional or national default values — If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances). d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories — If a) is not available
Value(s) of monitored parameter	NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	For a) and b): Measurements should be undertaken in line with national or international fuel standards For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	Applicable where Option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.3. Implementation of sampling plan

No sampling plan needed over the monitoring period since **100% data are monitored and reported**.

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

Q_{steam} : 2,658.69 Tonnes
H_s : 659.17 kCal/kg
H_w : 50.54 kCal/kg
$\eta_{BL,Thermal}$: 100%
$EF_{FF,CO2}$: 75.5 tCO_2/TJ

Thus,

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

$EG_{thermal}$ = 2,658.69 * (659.17- 50.54) *4.186 X 10^{-6}
= 6.774 TJ

Hence;

$BE_{thermal,CO_2,y}$ = (6.774 /100 %) * 75.5
= 511.41 tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the registered monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO_2/MWh for NEWNE grid

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 0.4 tCO_2/MWh if,

(a) The electricity consumption source is a baseline electricity consumption source; or
(b) The electricity consumption source is a Project electricity consumption source and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is greater than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$	= 11.15 MWh
$EF_{grid,CM,y}$	= 0.80 tCO_2/MWh
$TDL_{j,y}$	= 20 % (Default value)
$EC_{EL,j,y}$	= 0.96 MWh
$EF_{EL,j,y}$	= 0.4 tCO_2/MWh

$PE_{EC,y}$ = 1115* 0.80* (1+20/100) + 0.96*0.4* (1+20%)
= 11.17 tCO_2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 11.17 + 0$
$= 11.17\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity

This part of leakage is not considered as the energy generating equipment currently being utilized is not transferred from outside the boundary of the Project activity

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

This project involves biomass briquettes. Hence leakage due to biomass processing is considered. As the average distance of biomass collection and transportation is more than 200 km, the resulting leakage is also considered. Thus leakage emission is calculated as follows:

Leakage Emissions due to processing of biomass for utilizing electricity:
Leakage Emissions due to processing of biomass for utilizing electricity is calculated using "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption"

$LE_{EC,y} = EC_{LE,l,y} * EF_{EL,l,y} * (1+TDL_{,l,y})$

Where,

$LE_{EC,l,y}$ Leakage emissions from electricity consumption in year *y* (tCO2/yr)
$EC_{ELl,y}$ Net increase in electricity consumption of source *l* in year *y* as a result of leakage (MWh/yr)
$EF_{EL,l,y}$ Emission factor for electricity generation for source *l* in year *y* (tCO2/MWh)
$TDL_{,l,y}$ Average technical transmission and distribution losses for providing electricity to source *l* in year *y*

As per the included CPA-DD, electricity consumption factor for processing of biomass briquette production will be obtained during the first periodic verification from the equipment supplier. This factor is then to be multiplied with the quantity of biomass consumed during the monitoring

period to arrive at the value of electricity consumed for processing of biomass for the monitoring period. Accordingly, declaration has been submitted by the briquette supplier Vivek Industries stating the electricity consumption @ 0.035 MWh/ton and the electricity consumption is calculated by multiplying this with quantity of biomass consumed i.e., 601.81 tonnes.

Hence.

$LE_{EC,y}$ = 21.06*0.80*(1+20%)
= 20.22 tCO_2e

Leakage Emissions due to Transportation of collection of biomass to biomass processing site

Leakage Emissions due to transportation of collection of biomass to biomass processing site is calculated as below

$LE_{collection,y} = N_{c,y} * AVD_{c,y} * EF_{km,CO2}$

Where,

$LE_{collection,y}$	Leakage Emissions due to transportation of collection of biomass to biomass processing site
$N_{c,y}$	Number of truck trips for collecting loose biomass during the year y
$AVD_{c,y}$	Average round trip distance between the biomass fuel supply sites and biomass collection site during the year y
$EF_{km,CO2}$	Average CO_2 emission factor for the trucks measured during year y

Thus,

$LE_{collection,y}$ =123*71.06*0.0005152
= 4.503 tCO_2e

Leakage Emissions due to biomass Transportation of processed biomass to Project site

Leakage Emissions due to transportation of processed biomass to Project site is calculated as below-

$LE_{transportation,y} = N_{,y} * AVD_{,y} * EF_{km, CO2}$

Where:

$LE_{transportation}$	Leakage Emissions due to transportation of processed biomass to Project site
$N_{,y}$	Number of truck trips during the year y
$AVD_{,y}$	Average round trip distance (from and to) between the biomass fuel supply sites and the site of the Project plant during year y (km)
$EF_{km,CO2}$	Average CO_2 emission factor for the trucks measured during the year *y* (tCO_2/km)

Thus,

$LE_{transportation,y}$ = 51*300*0.0005152
= 7.883 tCO_2e

So the leakage emission is,

$LE_y = LE_{EC,y} + LE_{collection,y} + LE_{transportation, y}$
=20.22+4.503+7.883
=32.61 tCO_2e

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$$\mathbf{ER_y = BE_y - PE_y - LE_y}$$

Where,

ER_y = Emission reduction in year y (tCO_2e).

LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year *y* (tCO_2e).

Therefore; ER_y $= BE_y – PE_y – LE_y$
= 511.41 – 11.17 – 32.61
= **416 tCO_2e** (rounded down value)

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)
Total	511.41	11.17	32.61	467

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

Item	Values estimated in ex-ante calculation of registered CPA-DD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	1,198*	467

* As per the included CPA-DD, the estimated emission reductions are 3,557 tCO_2e/year. Since the monitoring period is from 01/05/2012 to 31/08/2012 i.e. 123 days (both days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (3,557/365*123 = 1,198).

E.6. Remarks on difference from estimated value in registered CPA-DD

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0005: Instrument Details

Sr. No.	Description monitoring parameters	Description Of Instrument	Make/Type/ Model	Sr. No./ Tag no.	Instrument Accuracy / Class	Calibration Date	Calibration frequency	Calibration Validity
1	Quantity of steam supplied in year y , (Q_{steam})	Steam Flow Meter	Endress & Hauser	E400D220000	±2.3%	25/04/2011	Once in 3 years*	24/04/2014
2	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year, (T_{steam})	RTD	Endress & Hauser	E400D220000	Class A	25/04/2011	Once in 3 years*	24/04/2014
3	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year, (P_{steam})	Pressure Transmitter	Endress & Hauser	C-907 DE 01052	±1%	6/10/2011	Yearly**	05/10/2012
4	Average Feed Water Temperature at inlet of boiler, (T_{FWB})	RTD	PT-100	TS/02	±2%	16/04/2012	Half Yearly***	15/10/2012
5	Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter	Entity (Energy Meter)	07-09-ENT-6744	0.5s	1/5/2012	Yearly****	30/04/2013
				08-09-ENT-383	0.5s	1/5/2012	Yearly****	30/04/2013
6	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k}$,)	Weigh Bridge	Jaypan	1103028-A	Class III	21/11/2011	Yearly*****	20/11/2012
	Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

*Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification,, CPA operator has chosen the calibration frequency as half yearly

**** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

***** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy.

Appendix-5

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 006)
Reference number of the project activity	CPA 4041-0006[50]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	30/04/2012 (Inclusion Date of CPA in Registered PoA No.4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (both days included) Start date of emission reduction in this monitoring period: 01/05/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. Sneha Farms Private Limited
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	1,319 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	398 tCO_2e

[50] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=1W04BLP79KGZ582MSUOHVD6QYJXATC

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 3 TPH biomass residues (Rice Husk) fired boiler at Sneha Farms Private Limited for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 3 TPH, Huskpac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 10.54 kg/cm^2 and has integral furnace with bubbling bed. The steam generated from the boiler is utilised in poultry feed processing and Palletizing.

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
PoA-4041 0006	Sneha Farms Private Limited	Boiler – 3 TPH (At 100^0C)	19/09/2010	30/04/2012	01/05/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/05/2012 to 31/08/2012 (both days included) is 398 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
PoA-4041 0006	Sneha Farms Private Limited	Survey No. 154, Village Chenjerla, Manakondur Mandal, District Karimnagar, Andhra Pradesh – 505469, India	18°21'15" N 79°14'41" E	India

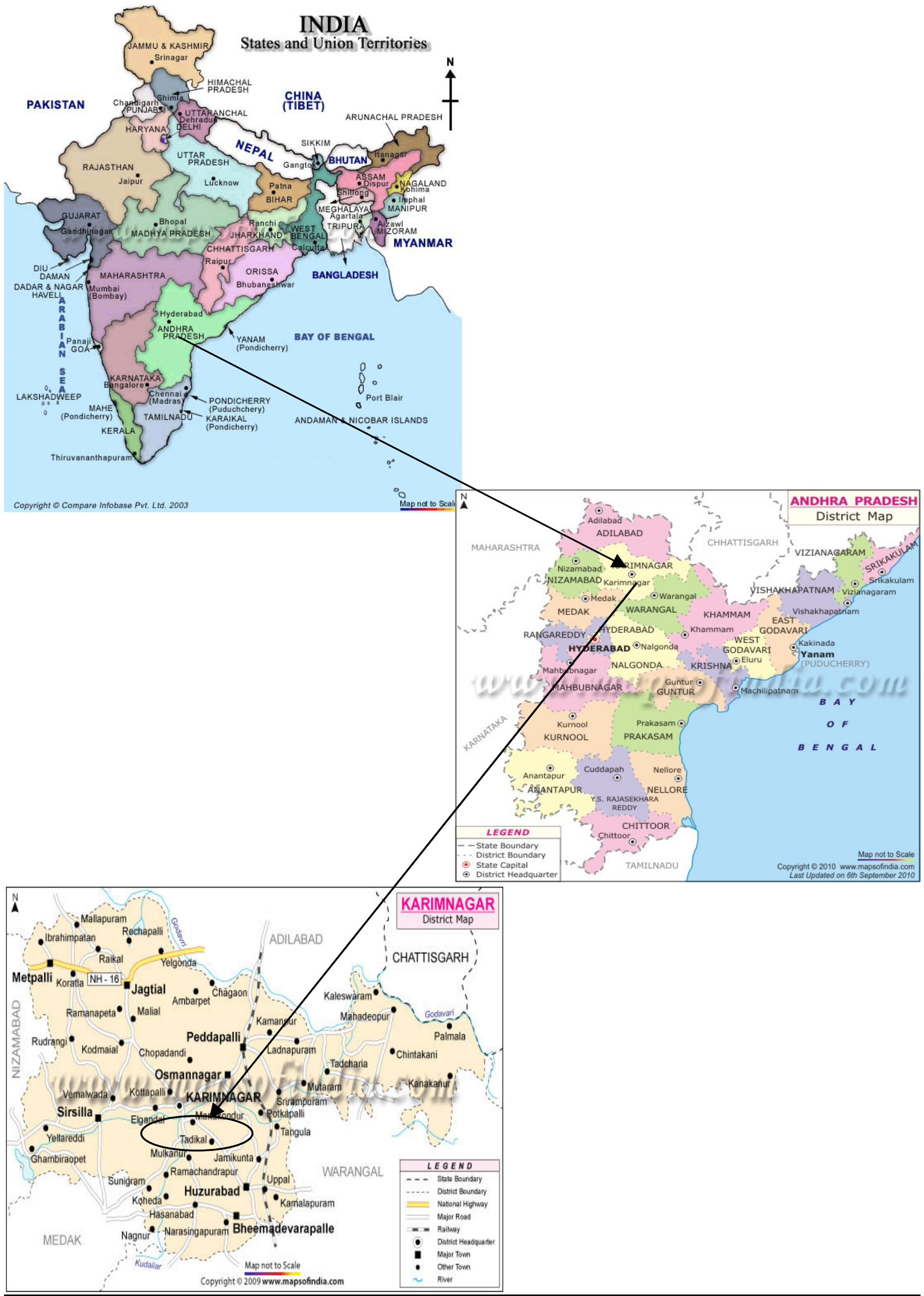


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity – Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [51]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[52]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[53]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[54]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[55]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[56]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/05/2012.

Length of the crediting period: 10 Years

51 http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
52 cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
53 http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
54 http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
55 http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
56 http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	Description
CPA Number	006
CPA Operator	Sneha Farms Pvt. Ltd.
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler
Equipment capacity	Installation of biomass fired (rice husk) boiler having rated steam Generation Capacity of 3 Tonnes per Hour (TPH)
Boiler Make	Thermax Limited Boiler Pressure part fabrication by M/s Akshay Dynamix, Pune
Boiler Model	Huskpac
Maximum working pressure	10.54 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	3 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Rice husk)
Type of fuel firing	Automatic
Furnace type	Integral furnace with bubbling bed
Boiler Number	HP30BB/10.54/51
Commissioning date	19/09/2010

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently a particular type of biomass fuel
3. Accessories- for various systems like water treatment, storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, flue gas discharge, ash discharge & handling, electrical systems, equipment safety & controls.

The CPA operator has utilized biomasses for heat generation i.e. Rice Husk, which is in compliance with definition of renewable biomass as per “Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the CPA during this monitoring period:**
The project is currently operational as per the monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring

period, which affects the monitoring plan of the project activity like equipment retrofitting, Capacity addition etc. [57]

B.2. Post registration changes
B.2.1. Temporary deviations from registered monitoring plan or applied methodology
There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections
There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology
There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meters
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data has been transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

[57] Boiler was not operational for 20days out of 123 days in this monitoring period due to plant shut down

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w)* 4.186 \times 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

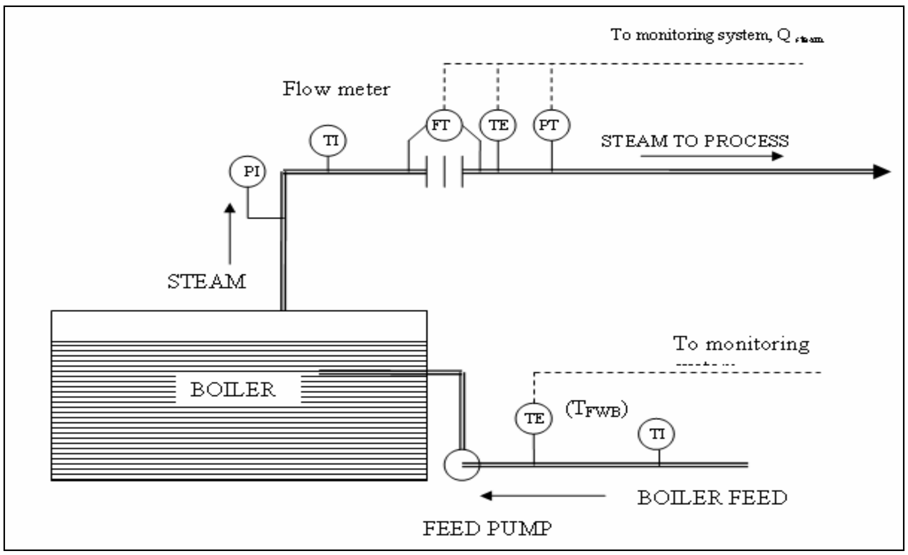


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site.The quanity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Certified Weigh Bridge has been used for this CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob, k}$

b. Each new delivery of biomass fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass fuel as $Q_{np,k}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$

c. The consumed biomass is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensure the practical method for monitoring biomass fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However no fossil fuel was used in this CPA for the monitoring period.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator). This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been be archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system.The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

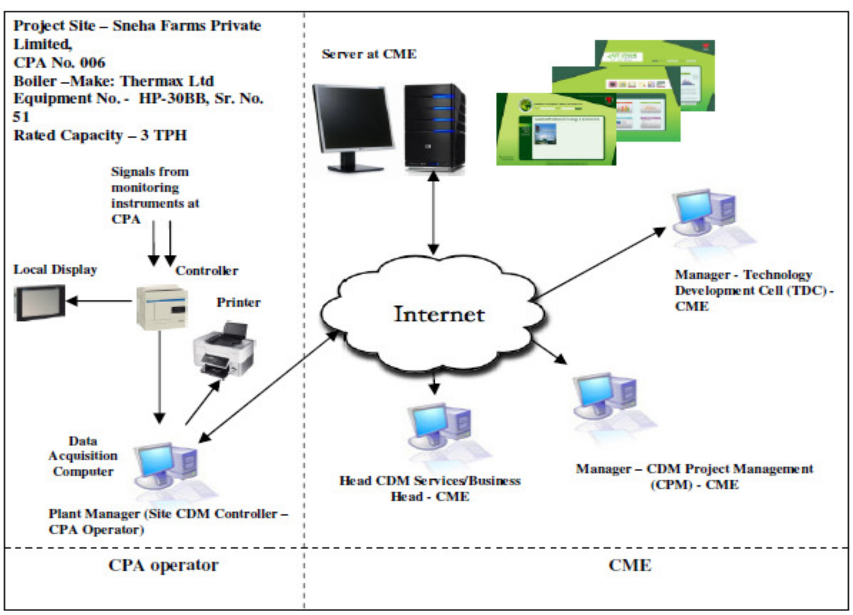


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

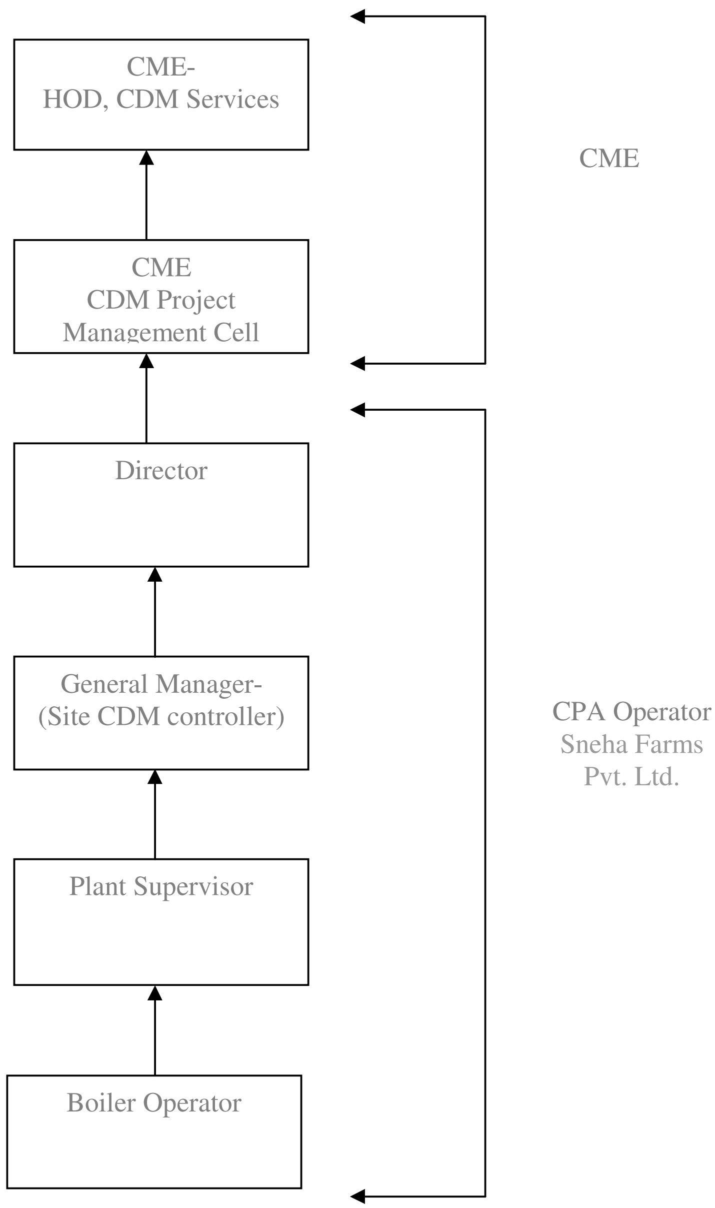


Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator

Key operational roles	**CPA Management Responsibilities**
Director	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM Services for final reporting into emission

	reduction sheet. • Quarterly Performance Review
General Manager (Site CDM Controller)	• Performance review -Monthly • Verification / review of data • Internal audits • Review of corrective actions
Plant Supervisor	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipments • Implementation of corrective action
Operator – Boiler	• Operation and Maintenance of Boiler • Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i. e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation.

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

The dual source energy meter for monitoring the Auxiliary Electricity Consumption of the Project activity from the Grid and off grid was installed only on 11/05/2012. Hence the auxiliary electricity consumption for the period 01/05/2012 to 10/05/2012 has been calculated based on the emergency preparedness plan detailed in section xii above.

SECTION D. Data and Parameters

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	3 (value applicable for the Project activity as per CPA 006)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per paragraph 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 006)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower values have been chosen in conservative manner. (Sourced from included CPA-DD)

Value(s) applied	89.5 (value applicable for the Project activity as per CPA 006)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass
Source of data	Independent Survey report
Value(s) applied	64.29 (value applicable for the Project activity as per CPA 006)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	0.86 -Southern Grid (value applicable for the Project activity as per CPA 006)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per " Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" . (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 006)
Purpose of data	Project Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y

Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517). (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 006)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	0.004286 – Rice husk (value applicable for the Project activity as per CPA 006)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	1889.38[58]

[58] For the data and calculations, kindly refer Emission reduction spread sheet

Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0006 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet during an year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	169.16[59]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^2g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement

[59] For the data and calculations, kindly refer Emission reduction spread sheet

Value(s) of monitored parameter	7.44[60]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{FWB}
Unit	^oC
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	38.24[61]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	h,y
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured

[60] For the data and calculations, kindly refer Emission reduction spread sheet
[61] For the data and calculations, kindly refer Emission reduction spread sheet

Source of data	On site measurement
Value(s) of monitored parameter	2019
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	41.62
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Biomass stored has been recorded on the first day of monitoring period and kept as an opening balance in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site

Measured/Calculated /Default	Measured
Source of data	Log Book and Plant record.
Value(s) of monitored parameter	658.67
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass has been measured on weigh bride inside the plant premise at each delivery. The weighbridge slip with delivery note/invoice has been obtained from the fuel supplier and has been mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Plant record.
Value(s) of monitored parameter	31.45
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and paper mode. Monitoring: Biomass has been measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period

Measured/Calculated /Default	Calculated
Source of data	Plant record.
Value(s) of monitored parameter	668.84
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg or GJ/t
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 14/05/2012
Value(s) of monitored parameter	11.50
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by Electronic and paper mode. Monitoring: Analysis from accredited agency according to relevant national standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-

Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by Electronic/Paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by Electronic and Paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	%
Description	Moisture content of the biomass residues
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly

Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by Electronic/Paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Unit</td><td>TJ/Gg or GJ/t</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of the fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated or Measured</td></tr>
<tr><td>Source of data</td><td>
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>---</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>---</td></tr>
</table>

QA/QC procedures	If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted. $NCV_i = NCV_{j,y}$ i is the fuel type combusted in process j during the year y.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	29.40
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	The dual source energy meter was installed only on 11/05/2012. Hence the auxiliary electricity consumption for the period 01/05/2012 to 10/05/2012 has been calculated based on the emergency preparedness plan as indicated in the included CPA-DD. It states that, the energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i. e. Failure hours*Electrical connected load*Grid emission factor. Failure hours are 109 hrs which is the actual running hours of the boiler. Electrical connected load is 30.20 kW as per the included CPA-DD and grid emission factor is 0.86 tCO_2e/MWh which is fixed ex ante at the time of validation. Thus, auxiliary energy meter for this period is calculated as: 109*30.2=3291.80 kWh. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set or Fossil fuel based power source) in a year y

Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	7.68
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0006 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data will be archived by Electronic/Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	90
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y

Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	69
Monitoring equipment	--
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Measured/Calculated /Default	Calculated
Source of data	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** a) Values provided by the fuel supplier in invoices / This is the preferred source b) Measurements by the Project participants / If a) is not available c) Regional or national default values / If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances). d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories / If a) is not available
Value(s) of monitored parameter	NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable).
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.

Calculation method (if applicable)	For a) and b): Measurements should be undertaken in line with national or international fuel standards For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	Applicable where Option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.3. Implementation of sampling plan

No sampling plan needed over the monitoring period since **100% data are monitored and reported**

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \text{ X } 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (Kcal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (Kcal/kg)

Q_{steam}	:	1,889.38 Tonnes
H_s	:	661.34 kCal/Kg
H_w	:	38.24 kCal/Kg
$\eta_{BL,Thermal}$	:	100%
$EF_{FF,CO2}$	:	89.5 tCO_2/TJ

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

$EG_{thermal}$ = 1,889.38 * (661.34- 38.24) *4.186 X 10^{-6}
= 4.93 TJ

Hence;

$BE_{thermal,CO_2,y}$ = (4.93 /100 %) * 89.5
= 441.06 tCO_2 e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.86 tCO_2/MWh (for Southern regional grid)

<u>Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):</u>

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y}*EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y}*EF_{EL,j,y} * (1+TDL_{j,y})$

Where;
$EC_{PJ,j,y}$ = 29.40 MWh
$EF_{grid,CM,y}$ = 0.86 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 7.68 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 29.40* 0.86* (1+20/100) + 7.68*1.3* (1+20%)
= 42.33 tCO_2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$$PE_{FC,j,y} = 0$$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 42.33 + 0$
$= 42.33\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

As per the clarification given in the foot note for paragraph 29 of methodology, 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.

The energy generating equipment currently being utilised is not transferred from outside the boundary of the Project activity. Biomass (Rice Husk) consumed in the project activity is not transported to the Project site over a distance of more than 200 km. Hence leakage is considered to be zero.

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$\mathbf{ER_y = BE_y - PE_y - LE_y}$

Where,

ER_y = Emission reduction in year y (tCO_2e).

LE_y = Leakage in year y (tCO_2e).

PE_y = Project emissions in year *y* (tCO_2e).

Therefore; ER_y $= BE_y - PE_y - LE_y$

$= 441.06 - 42.33 - 0$

= **398 tCO_2e** (rounded down value)

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)
Total	441.06	42.33	0	398

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)	1,319*	398

* As per the included CPA-DD, the estimated emission reductions are 3,917 tCO_2e/year. Since the monitoring period is from 01/05/2012 to 31/08/2012 i.e. 123 days (first and last days included), ex-ante emissions have been calculated on a pro-rata basis for this monitoring period considering 365 days of operation in a year (3,917/365*123 = 1,319).

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

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0006: Instrument Details

Description monitoring parameters	**Description Of Instrument**	**Make**	**Sr. No.**	**Instrument Accuracy /Class**	**Calibration Date**	**Calibration Frequency**	**Calibration Validity**
Quantity of steam supplied in year y, (Q_{steam})	Steam Flow Meter	Endress + Hauser	E8010720000	±2.3%	11/08/2011	Once in 3 year*	10/08/2014
Average Steam Temperature at MSSV (Main steam stop valve) outlet during year ,(T_{steam})	RTD	Endress + Hauser	E8010720000	Class A	11/08/2011	Once in 3 year*	10/08/2014
Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year (P_{steam})	Pressure Transmitter	Endress + Hauser	E8002D21129	±0.15%	22/08/2011	Once in 3 year*	21/08/2014
Average Feed Water Temperature at inlet of boiler (T_{FWB})	RTD	Endress + Hauser	E80081142EA	Class A	13/10/2011	Once in 3 year*	12/10/2014
Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Dual source Energy Meter	Schneider Electric Pvt. Ltd.	34120331355	Class 1.0	13/02/2012	Yearly**	12/02/2013
Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k}$,)	Weigh Bridge	Metler	2730090466	Class III	21/03/2012	Yearly***	20/03/2013
Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

*Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy.

Appendix-6

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 007)
Reference number of the project activity	CPA 4041-0007[62]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	30/04/2012 (Inclusion Date of CPA in Registered PoA No.4041)
Monitoring period number and duratin of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (first and last days included) Start date of emission reduction in this monitoring period: 01/05/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator 1. Swadisht Oils (P) Limited
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	5,738 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	773 tCO_2e

[62] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=S7ENUT8QG95POYLR6XKZ2IC3VBW1FH

SECTION F.

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 12 TPH biomass residues (Rice Husk) fired boiler at Swadisht Oils (P) Limited for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 12 TPH, Fluidpac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 17.5 kg/cm^2 and has fluidized bed combustor with refractory lining furnace. The steam generated from the boiler is utilised thermal processing of various seeds like castor seeds, soyabean, sunflower seeds etc. for the production of oil and de oiled cake (DOC)

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
PoA-4041 0007	Swadisht Oils (P) Limited	Boiler - 12 TPH (At 100^{0}C)	20/02/2009	30/04/2012	01/05/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/05/2012 to 31/08/2012 (first and last days included) is 773 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
PoA-4041 0007	Swadisht Oils (P) Limited	Village – Chiraura., Rania, District - Kanpur Dehat, Uttar Pradesh - 209304, India	26^{0}25’16.27”N 80^0 06’ 33.02”E	India

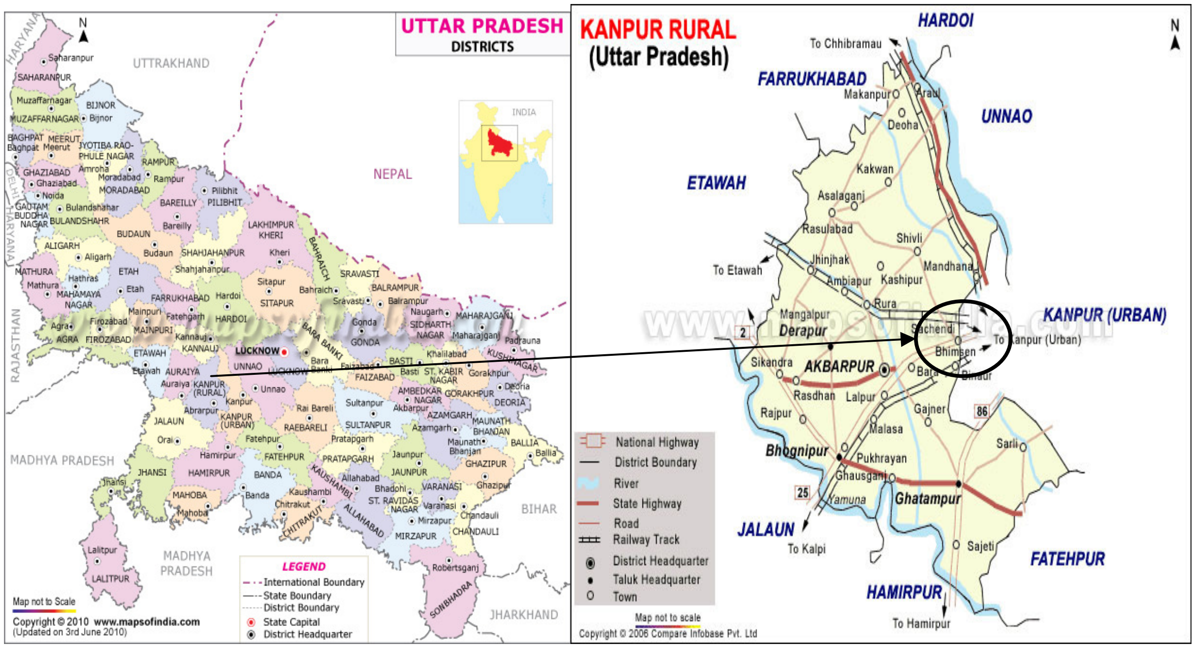


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity – Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [63]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[64]

[63] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[64] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf

Relevance Tools:

1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[65]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[66]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[67]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[68]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/05/2012

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	**Description**
CPA Number	007
CPA Operator	Swadisht Oils (P) Limited
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler
Equipment capacity	Installation of biomass fired (Rice husk) boiler having rated steam Generation Capacity of 12 Tonnes per Hour (TPH)
Boiler Make	Thermax Limited Boiler Pressure part fabrication by M/s Akshay Dynamix, Pune
Boiler Model	Fluidpac
Maximum working pressure	17.5 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	12 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Rice husk)
Type of fuel firing	Screw feeder
Furnace type	Fluidized bed combustor with refractory lining

[65] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[66] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[67] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[68] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Boiler Number	MTFH 120A/17.5/27
Commissioning date	20/02/2009

The boiler consists of mainly the following parts:
1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently Biomass briquettes as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge, electrical systems, equipment safeties & controls.

The CPA operator has utilized biomasses for heat generation i.e. Rice Husk, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the CPA during this monitoring period:**
The project is currently operational as per the monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the project activity like equipment retrofitting, Capacity addition etc. [69]:

B.2. Post registration changes
B.2.1. Temporary deviations from registered monitoring plan or applied methodology
There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections
There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology
There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

[69] The boiler was not operational for 86 days out of 123 days in this monitoring period due to plant shut down

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument or field instrument integral to steam flow meter.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meter
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments (Sr no 1 to 4) are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data gets transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal}$ = Q_{steam} * (H_s - H_w)* 4.186 X 10^{-6}
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

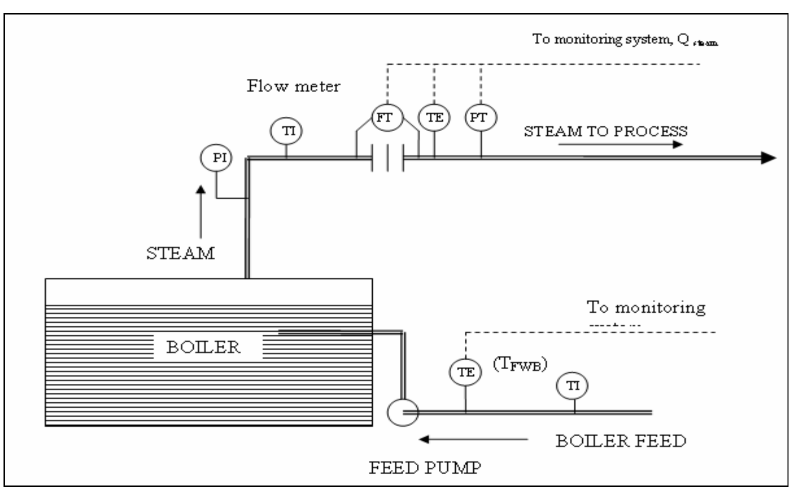


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Duly calibrated weigh bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob, k}$/ $Q_{ob, i}$

b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$

c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However there was no fossil fuel used during this monitoring period for this CPA.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator) This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system.The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required

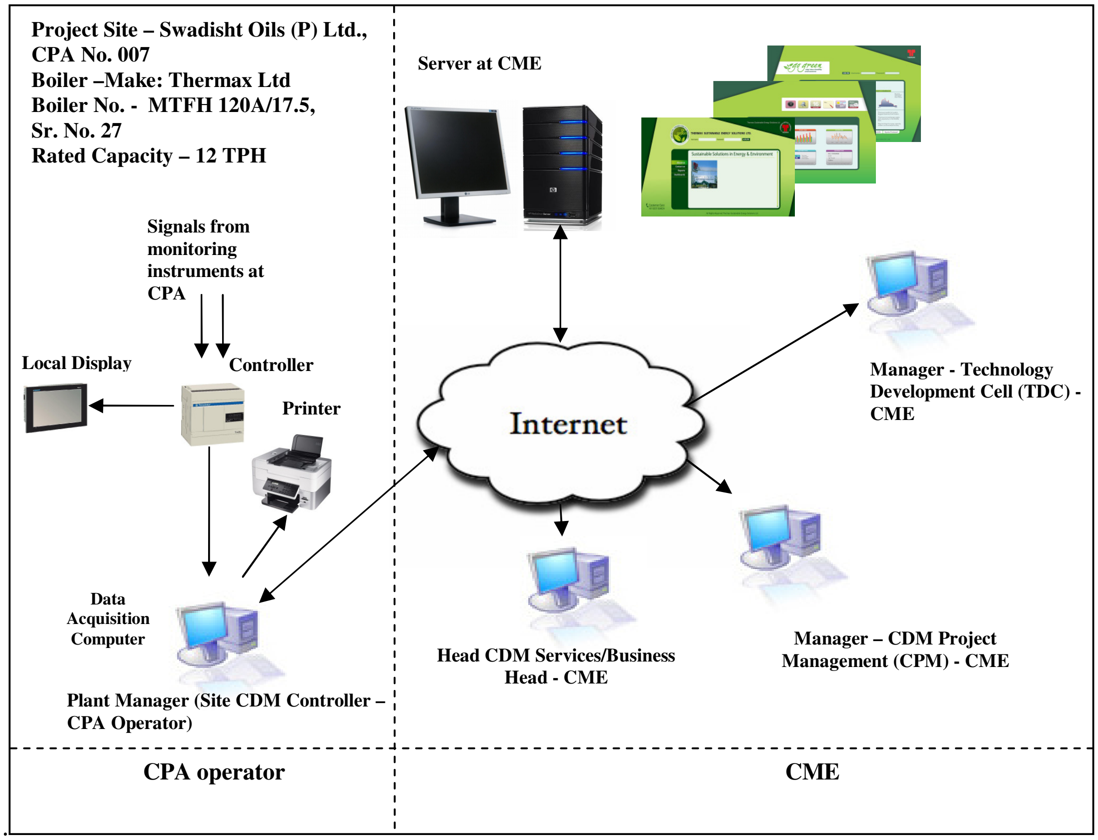


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

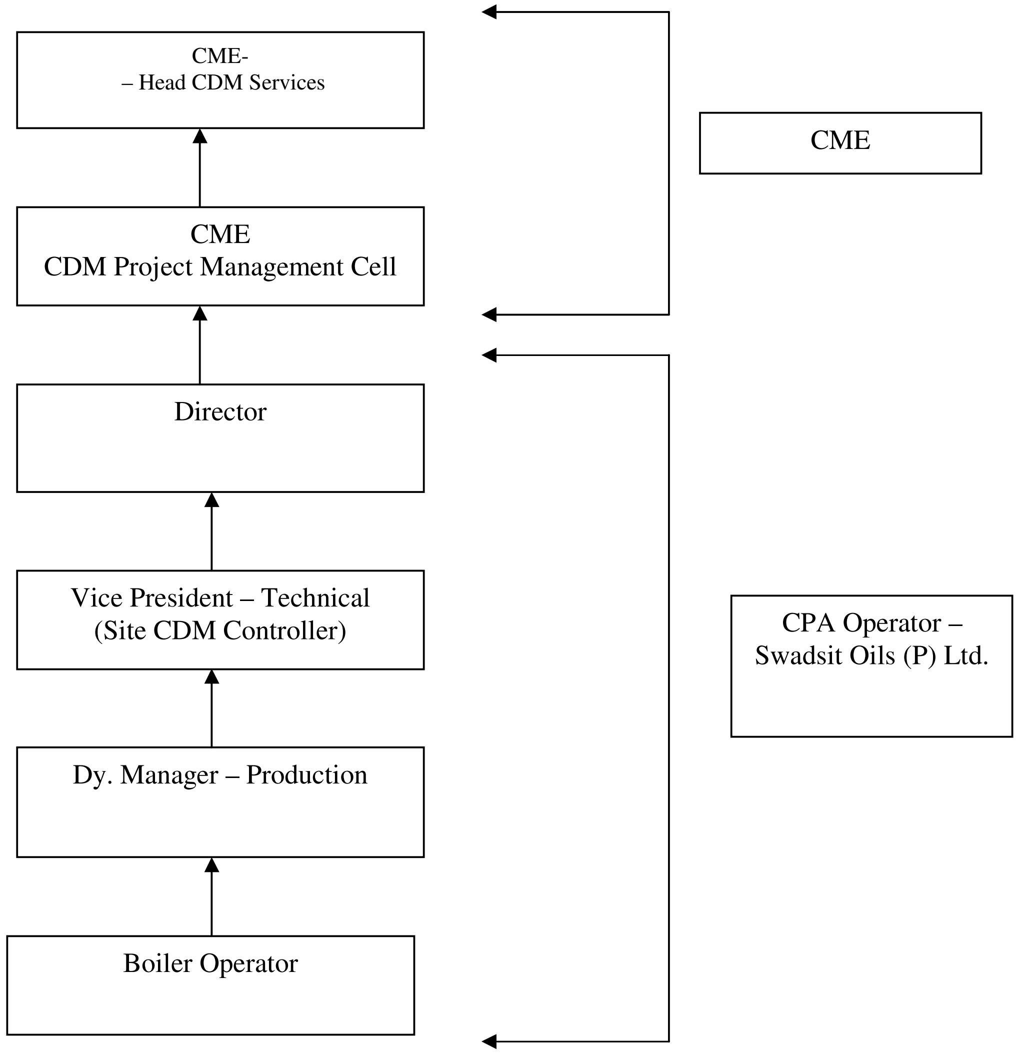


Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator

Key operational roles	• **CPA Management Responsibilities**
Director	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM Services for final reporting into emission reduction sheet. • Quarterly Performance Review
Vice President – Technical (Site CDM Controller)	• Performance review -Monthly • Verification / review of data • Internal audits • Review of corrective actions

Dy. Manager – Production	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipments • Implementation of corrective action
Boiler – Operator	• Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i.e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation**.**

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	12 (value applicable for the Project activity as per CPA 007)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per paragraph 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 007)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the Baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower value has been chosen in conservative manner. (Sourced from included CPA-DD)
Value(s) applied	89.5 (value applicable for the Project activity as per CPA 007)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass within 75 km radial distance
Source of data	Third Party Survey report at the beginning of crediting period
Value(s) applied	27.50 (value applicable for the Project activity as per CPA 007)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide. (As mentioned in included CPA-DD)
Value(s) applied	0.80 -NEWNE Grid (value applicable for the Project activity as per CPA 007)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption". (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 007)
Purpose of data	Project Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517). (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 007)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation

Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	Indian coal – 0.004186 (in case Indian coal is used) Rice husk - 0.004235 (value applicable for the Project activity as per CPA 007)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied during monitoring period
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	3571.99[70]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet

[70] For the data and calculations, kindly refer Emission reduction spread sheet

Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	187.38[71]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^2g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during monitoring period
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	11.14[72]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{FWB}
Unit	^oC
Description	Average feed Water Temperature at inlet of boiler during monitoring period

[71] For the data and calculations, kindly refer Emission reduction spread sheet
[72] For the data and calculations, kindly refer Emission reduction spread sheet

Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	56.59[73]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	h,y
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	1484
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[73] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the start date of this monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	405.61
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later. To be checked whether the calibration is required to be conducted or not

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Plant record.
Value(s) of monitored parameter	1990.70
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: rice husk have been measured on Weighbridge inside the plant premise at each delivery. The weighbridge slip with delivery note/invoice has been obtained from the fuel supplier and has been mentioned in the log book
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of this monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	348.32
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Has been measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log book/Plant record.
Value(s) of monitored parameter	2047.99
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes

Description	Quantity of stored fuel type fossil i on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel will be measured on Weighbridge outside the plant premise. The weighbridge slip with delivery note/invoice will be obtained from the fuel supplier and will be mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site

Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i} = FC_{j,PJ,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$ Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Calculated

Source of data	Analysis report of the biomass by external agency dated 09/05/2012.
Value(s) of monitored parameter	13.06
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been be archived annually by Paper mode. Monitoring: Analysis from accredited independent agency according to relevant national standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by Paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---

Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by Paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	%
Description	Moisture content of the biomass residues
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by Paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$NCV_{i,y}$
Unit	TJ/Gg or GJ/t
Description	Weighted average net calorific value of the fuel type i in year y
Measured/Calculated /Default	Calculated or Measured

<table>
<tr><td>Source of data</td><td>
<table>
<tr><td>Data source</td><td>Conditions for using the data source</td></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>---</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>---</td></tr>
<tr><td>QA/QC procedures</td><td>If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted.
$NCV_i = NCV_{j,y}$
i is the fuel type combusted in process j during the year y.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$FC_{i,j,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed in a process j during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	0 (No fossil fuel type i consumed in a process j during monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.

Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	28.89
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set power source)
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	8.30
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0007 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data has been archived by Electronic/Paper mode

Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	Km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	70.61
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	273
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing invoice / delivery note

Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Measured/Calculated /Default	Calculated
Source of data	The following data sources may be used if the relevant conditions apply: **Data source** — **Conditions for using the data source** a) Values provided by the fuel supplier in invoices — This is the preferred source b) Measurements by the Project participants — If a) is not available c) Regional or national default values — If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances). d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories — If a) is not available
Value(s) of monitored parameter	NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	For a) and b): Measurements should be undertaken in line with national or international fuel standards For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	Applicable where Option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.
Purpose of data	Project Emission Calculation

Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.3. Implementation of sampling plan

No sampling plan needed over the monitoring period since 100% data are monitored and reported

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

Q_{steam} : 3571.99 Tonnes
H_s : 664.81 kCal/Kg
H_w : 56.59 kCal/Kg
$\eta_{BL,Thermal}$: 100 %
$EF_{FF,CO2}$: 89.5 tCO_2/TJ

$EG_{thermal}$ = 3571.99 * (664.81-56.59) *4.186 X 10^{-6}
= 9.094 TJ

Hence;

$BE_{thermal,CO_2,y}$ = (9.094/100 %) * 89.5
= 813.95 tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

In this case, the following option has been considered at CPA level, as defined in the tool:

As per the included monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO2/MWh for NEWNE grid

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$ = 28.89 MWh
$EF_{grid,CM,y}$ = 0.80 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 8.30 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 28.89* 0.80* (1+20/100) + 8.30*1.3* (1+20/100)
= **40.68 tCO_2e**

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 40.68 + 0$
$= 40.68\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

As per the clarification given in the foot note for paragraph 29 of methodology, 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.

The energy generating equipment currently being utilised is not transferred from outside the boundary of the Project activity. Biomass (Rice Husk) consumed in the project activity is not transported to the Project site over a distance of more than 200 km. Hence leakage is considered to be zero.

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$\mathbf{ER_y = BE_y - PE_y - LE_y}$

Where,

ER_y = Emission reduction in year y (tCO_2e).
LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year *y* (tCO_2e).

Therefore; $ER_y = BE_y – PE_y –LE_y$
$= 813.95 -40.68 – 0$
$=$ **773 tCO_2e** (rounded down value)

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)
Total	813.95	40.68	0	773

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)	5,738*	773

* As per the included CPA-DD, the estimated emission reductions are 17,030 tCO_2e/year. Since as the monitoring period is from 01/05/2012 to 31/08/2012 i.e. 123 days (first and last days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (17,030/365*123 = 5,738).

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

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0007: Instrument Details

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy /Class	Calibration Frequency	Calibration Date	Calibration Validity
Quantity of steam supplied in year y, (Q_{steam})	Steam Flow Meter	Endress + Hauser	EC01F720000	±2.3 %	Once in 3 years*	11/01/2012	10/01/2015
Average Steam Temperature at MSSV (Main steam stop valve) outlet during year,(T_{steam})	RTD	Endress + Hauser	EC01F720000	Class A	Once in 3 Years*	11/01/2012	10/01/2015
Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year (P_{steam})	Pressure Transmitter	Endress + Hauser	EC175A01052	±0.5 %	Once in 3 Years*	23/11/2011	22/11/2014
Average Feed Water Temperature at inlet of boiler during monitoring period (T_{FWB})	RTD	Endress + Hauser	G-189	Class B	Yearly **	01/04/2012	31/03/2013
Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter	Schneider Electric	34120630706	Class 1.0	Yearly***	07/03/2012	06/03/2013
Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k}$,)	Weigh Bridge	Essae	95008311	Class-III	Yearly****	02/01/2012	01/01/2013
Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

* Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification
** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

**** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy.

Appendix-7

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 005)
Reference number of the project activity	CPA 4041-0009[74]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	31/05/2012 (Inclusion Date of CPA in Registered PoA 4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (both days included) Start date of emission reduction in this monitoring period: 01/06/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. Growel Feeds Private Limited
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	3,200 tCO_2e
Actul GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	1,202 tCO_2e

[74] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=GKM2BJ9UZC8F4EH0LQTW163AOXNDRY

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the Installation of biomass fired (Rice Husk) boilers having rated steam Generation Capacity of 6 Tonnes per Hour (TPH) and 8 TPH at Growel Feeds Private Limited for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of biomass fired thermal energy generation in Greenfield Projects and addition of renewable energy unit at an existing renewable energy facility by installing combipac boilers of 6 TPH and 8 TPH capacity manufactured by Thermax Limited. Both boilers are designed to operate at a maximum pressure of 10.54 kg/cm^2 and have an external water walled furnace with horizontal fixed grate furnace. The steam generated from the boilers is utilised for cooking and drying of the grains required for manufacturing the extruded floating fish seed.

(c) Relevant dates for the component project activity:

UNFCCC ref no.	**Name of the CPA operator**	**Technology details**	**Date of Commissioning**	**Date of Inclusion**	**Start Date of Crediting Period**
PoA-4041 0009	Growel Feeds Private Limited	Boiler- 6 TPH (From & At 100 ^{0}C)	27/01/2010	31/05/2012	01/06/2012
		Boiler- 8 TPH (From & At 100 ^{0}C)	25/03/2011	31/05/2012	01/06/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/05/2012 to 31/08/2012 (first and last days included) is 1,202 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	**Name of the CPA operator**	**Location of CPA**	**Geographic Coordinate**	**Host Party (ies)**
PoA-4041 0009	Growel Feeds Private Limited	Sy. No. 57, Village Chevuru, Sriharipuram Panchayat, Taluka Mudinepalli Mandal, District Krishna, State Andhra Pradesh 521325	16°25'25" North 81°09'29" East	India

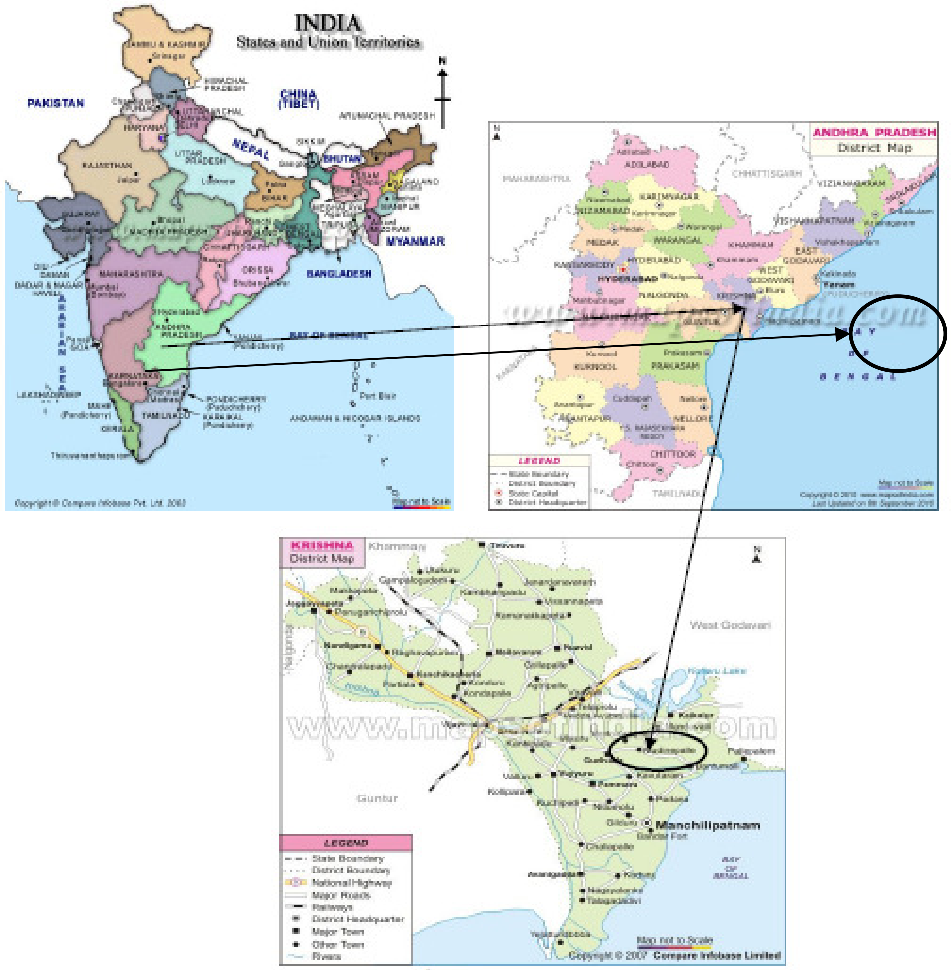


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boilers) displacing fossil fuel has been addressed as CPA and the Equipment (boilers) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [75]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[76]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[77]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[78]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[79]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[80]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/06/2012

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	Description
CPA Number	005
CPA Operator	Growel Feeds Private Limited
Project Scenario	Biomass fired thermal energy generation in Greenfield Projects and addition of renewable energy unit at an existing renewable energy facility

[75] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[76] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[77] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[78] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[79] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[80] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Type of equipment	Boiler
Equipment capacity	Installation of biomass fired boilers having rated steam generation capacity of 6 Tonnes per Hour (TPH) and 8 TPH
Boiler Make	Thermax Limited
Boiler Model	Combipac
Maximum working pressure	10.5 4 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	6 TPH and 8 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Rice husk)
Type of fuel firing	Automatic
Furnace type	External Water walled furnace with Horizontal fixed grate
Boiler Number	CPFD60/10.54/18 and CPFD 80/10.54/26
Commissioning date	27/01/2010 for 6 TPH boiler and 25/03/2011 for 8 TPH boiler

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently biomass (rice husk) as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge & handling, electrical systems, equipment safeties & controls.

The CPA operator has utilized biomasses for heat generation i.e. Rice Husk, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the CPA during this monitoring period:**
The project is currently operational as per the monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the project activity like equipment retrofitting, Capacity addition etc.[81]

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections

There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

[81] Boiler was not operational for 10 days out of the 92 days in this monitoring period due to plant shut down

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meters
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data has been transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

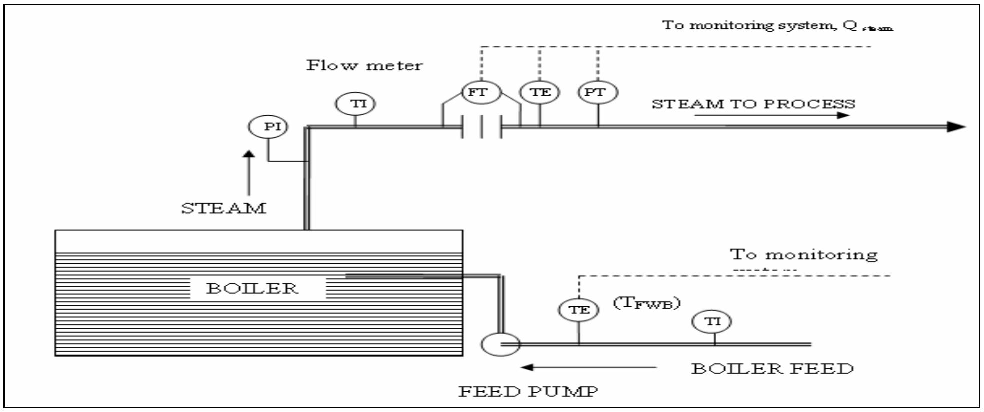


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Duly calibrated weigh Bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,\ k}$/ $Q_{ob,\ i}$
b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$
c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However no fossil fuel was used in this CPA for the monitoring period.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator). This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system. The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually.. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

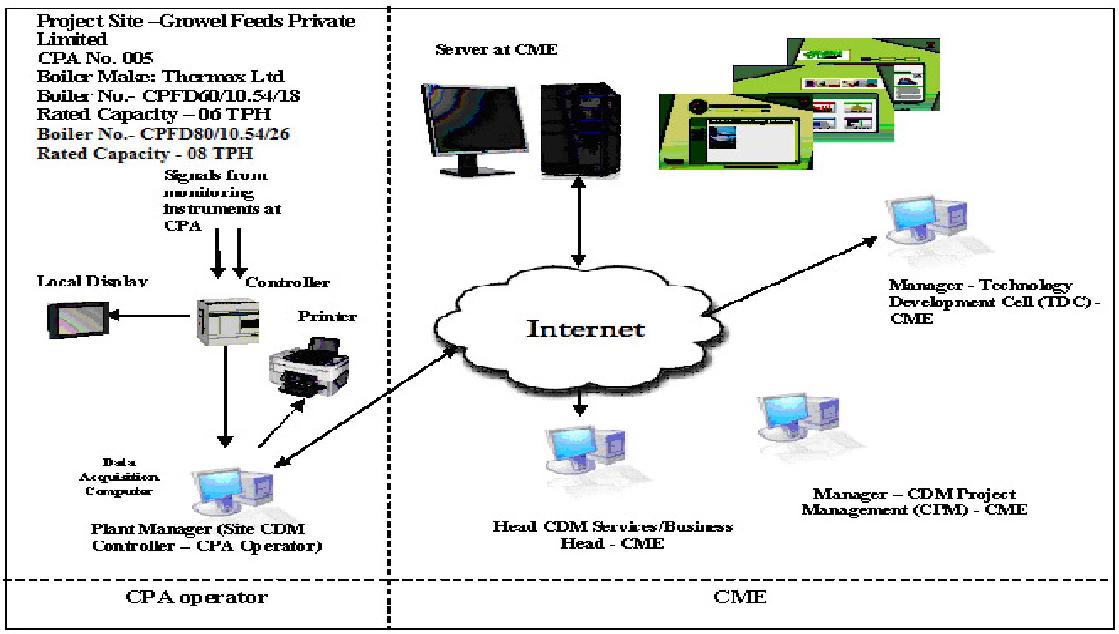


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

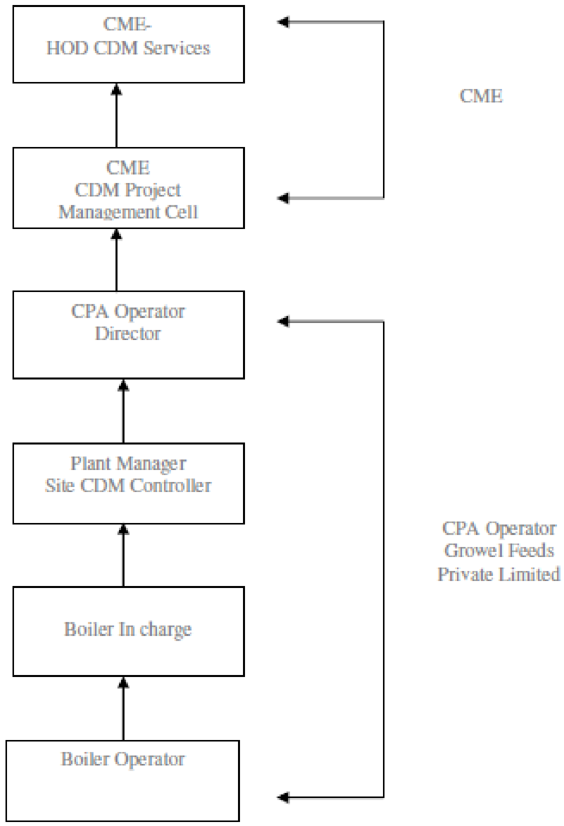


Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator

Key operational roles	• **CPA Management Responsibilities**
Director – CPA operator	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM Services for final reporting into emission reduction sheet. • Quarterly Performance Review
Plant Manager – (Site CDM Controller)	• Performance review -Monthly • Verification / review of data • Internal audits • Review of corrective actions
Boiler In charge	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipment • Implementation of corrective action
Operators - Boiler	• Operation and maintenance of boiler • Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i. e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation**.**

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	6 (value applicable for the Project activity as per CPA 005)

Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$CAP_{boiler, old}$
Unit	Tonnes/hr
Description	Rated capacity (output) of the existing renewable fuel fired boiler
Source of data	Manufacturer's specification/ Plant data
Value(s) applied	6 (value applicable for the Project activity as per CPA 005)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$CAP_{boiler, add}$
Unit	Tonnes/hr
Description	Rated capacity (output) of the Boiler added to the existing renewable facility
Source of data	Manufacturer's specification
Value(s) applied	8 (value applicable for the Project activity as per CPA 005)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per para 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 005)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant

Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4) The lower values has been chosen in conservative manner (Sourced from included CPA-DD)
Value(s) applied	89.5 (value applicable for the Project activity as per CPA 005)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass
Source of data	Third Party Survey report
Value(s) applied	28.39 (value applicable for the Project activity as per CPA 005)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	0.86 – Southern Grid (value applicable for the Project activity as per CPA 005)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per " Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 005)
Purpose of data	Project Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 005)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	0.004186 for Indian Coal (in case of Indian coal is used)0.004260 for biomass residues (rice husk) (value applicable for the Project activity as per CPA 005)
Purpose of data	Not used for emission reduction calculation
Additional comment	Data type: Calculated as per para 34 equation 14 of AMS I.C ver. 16. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Monitoring parameters for 6 TPH Boiler:

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied

Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	3,515.12[82]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	171.81[83]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	Kg/cm^2g

[82] For the data and calculations, kindly refer Emission reduction spread sheet
[83] For the data and calculations, kindly refer Emission reduction spread sheet

Description	Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	8.06[84]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{FWB}
Unit	^{o}C
Description	Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	67.99[85]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

[84] For the data and calculations, kindly refer Emission reduction spread sheet
[85] For the data and calculations, kindly refer Emission reduction spread sheet

Monitoring parameters for 8 TPH Boiler:

Data/Parameter	$Q_{steam, old, y}$
Unit	Tonnes
Description	Quantity of steam produced by an existing renewable energy unit
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	3,515.12[86]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	$Q_{steam,old,y} = Q_{steam}$
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{steam, add, y}$
Unit	Tonnes
Description	Quantity of steam generated by additional renewable energy unit at an existing renewable energy production facility
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	5412.05[87]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0009 for Instrument Details*.
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation

[86] For the data and calculations, kindly refer Emission reduction spread sheet
[87] For the data and calculations, kindly refer Emission reduction spread sheet

Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$T_{steam, old,y}$
Unit	°C
Description	Steam Temperature at MSSV (Main steam stop valve) outlet of an existing renewable energy production facility
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	171.81[88]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0009 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	$T_{steam,old,y} = T_{steam}$
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$T_{steam, add, y}$
Unit	°C
Description	Steam Temperature at MSSV (Main steam stop valve) outlet of additional renewable energy unit (Boiler) at an existing renewable energy production facility
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	172.57[89]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0009 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	NA

[88] For the data and calculations, kindly refer Emission reduction spread sheet
[89] For the data and calculations, kindly refer Emission reduction spread sheet

QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$P_{steam, old,y}$
Unit	Kg/cm^2g
Description	Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet of an existing renewable energy production facility
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	8.06[90]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0009 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	$P_{steam,old,y} = P_{steam}$
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$P_{steam, add,y}$
Unit	Kg/cm^2g
Description	Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet of additional renewable energy unit (boiler) at an existing renewable energy production facility
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	8.30[91]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0009 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode

[90] For the data and calculations, kindly refer Emission reduction spread sheet
[91] For the data and calculations, kindly refer Emission reduction spread sheet

Calculation method (if applicable)	$P_{steam,old,y} = P_{steam}$
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$T_{FWB,old,y}$
Unit	^oC
Description	Average Feed Water Temperature at inlet an existing renewable energy production facility (boiler)
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	67.99[92]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0009 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and paper mode
Calculation method (if applicable)	$T_{FWB,old,y} = T_{FWB}$
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	$T_{FWB,add,y}$
Unit	^oC
Description	Feed Water Temperature at inlet of additional renewable energy unit (boiler) at an existing renewable energy production facility
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	70.52[93]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0009 for Instrument Details.*

[92] For the data and calculations, kindly refer Emission reduction spread sheet
[93] For the data and calculations, kindly refer Emission reduction spread sheet

Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	$T_{FWB,old,y} = T_{FWB}$
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	$h_{,y} = h_{,old,y}$
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	1192
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$h_{add,y}$
Unit	hr or hours
Description	Boiler operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement

Value(s) of monitored parameter	1422
Monitoring equipment	Built in timer in monitoring system On-site measurement
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data has been archived by Electronic and Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to Monitoring system for measurement of run hours.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Monitoring parameters for 6 TPH and 8 TPH Boiler:

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	145.44
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0009 for Instrument Details.*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and paper mode. Monitoring: Biomass stored has been recorded on the first day of monitoring period and kept as opening balance in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,k}$
Unit	Tonnes

Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge slip, Log book and Plant record.
Value(s) of monitored parameter	1955
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0009 for Instrument Details*.
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and paper mode. Monitoring: Biomass (rice husk) has been measured on the weigh bridge inside the plant premise at each delivery. The weigh bridge slip with delivery note/invoices has been obtained from the fuel supplier and has been mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	129.86
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0009 for Instrument Details*.
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and paper mode. Monitoring: has been measured at the end of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k}$
Unit	Tonnes

<table>
<tr><td>Description</td><td>Quantity of biomass fuel type k consumed during the monitoring period</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>Log Book/plant record</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>For 6 TPH Boiler : 778
For 8 TPH Boiler : 1193</td></tr>
<tr><td>Monitoring equipment</td><td>--</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data Archiving: Data has been archived by paper mode.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>It is calculated by the formula for biomass fuel type
$Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
$Q_{c,k} = FC_{biomass,k,y} = Q_{c,k,add} = Q_{c,k,A} + Q_{c,k,B}$

The parameter will be derived to proportionate biomass consumption for 6 TPH and 8TPH boiler on % energy supplied basis, as per following method,

<table>
<tr><td>Quantity of energy supplied by the 6 TPH boiler</td><td>$EG_{thermal\ y}$</td><td>Measured</td></tr>
<tr><td>Quantity of energy supplied by the 8 TPH boiler</td><td>$EG_{thermal\ add,y}$</td><td>Measured</td></tr>
<tr><td>Total quantity of energy supplied by both 6 TPH and 8 TPH boiler</td><td>$EG_{thermal,y}$ + $EG_{thermal,add,y}$</td><td>Calculated (Z)</td></tr>
<tr><td colspan="3">% Distribution of energy supplied by each unit</td></tr>
<tr><td>For 6TPH boiler</td><td>$EG_{thermal,y}$ / $(EG_{thermal,y} + EG_{thermal,Add,y})$ * 100</td><td>Calculated (X)</td></tr>
<tr><td>For 8TPH boiler</td><td>$EG_{thermal,,add,y}$ / $(EG_{thermal,y} + EG_{thermal,Add,y})$ * 100</td><td>Calculated (Y)</td></tr>
</table>

Based on the derived values of ‘X’ and ‘Y’, the quantity of biomass consumed will be calculated as;

<table>
<tr><td>Quantity of biomass fuel type k consumed in a process j during the year y</td><td>$Q_{c,k}$</td><td>Calculated (Tonnes)</td></tr>
<tr><td>For 6TPH boiler ($Q_{c,k,A}$)</td><td>$Q_{c,k}$ * X</td><td>Calculated (Tonnes)</td></tr>
<tr><td>For 8TPH boiler ($Q_{c,k,B}$)</td><td>$Q_{c,k}$ * Y</td><td>Calculated (Tonnes)</td></tr>
</table>
</td></tr>
</table>

QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes
Description	Quantity of stored fuel type fossil i on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	$Q_{ob,i} = Q_{ob,i,add}$
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel will be measured inside the plant premises. The weigh bridge slip with delivery note/invoices will be obtained from the fuel supplier.
Calculation method (if applicable)	$Q_{np,i} = Q_{np,i,add}$
QA/QC procedures	NA
Purpose of data	Project Emission Calculation

Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	$Q_{in,i} = Q_{in,i,add}$
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i} = FC_{j,PJ,y} = FC_{i,j,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.

<table>
<tr><td>Calculation method (if applicable)</td><td>It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$
Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
The parameter will be derived to proportionate fossil fuel consumption for 6 TPH and 8TPH boiler on % energy supplied basis, as per following method,
<table>
<tr><td>Quantity of energy supplied by the 6 TPH boiler</td><td>$EG_{thermal\ y}$</td><td>Measured</td></tr>
<tr><td>Quantity of energy supplied by the 8 TPH boiler</td><td>$EG_{thermal\ add,y}$</td><td>Measured</td></tr>
<tr><td>Total quantity of energy supplied by both 6 TPH and 8 TPH boiler</td><td>$EG_{thermal,y}$ + $EG_{thermal,add,y}$</td><td>Calculated (Z)</td></tr>
<tr><td colspan="3">% Distribution of energy supplied by each unit</td></tr>
<tr><td>For 6TPH boiler</td><td>$EG_{thermal,y}$ / ($EG_{thermal,y}$ + $EG_{thermal,Add,y}$) * 100</td><td>Calculated (X)</td></tr>
<tr><td>For 8TPH boiler</td><td>$EG_{thermal,,add,y}$ / ($EG_{thermal,y}$ + $EG_{thermal,Add,y}$) * 100</td><td>Calculated (Y)</td></tr>
</table>
Based on the derived values of ‘X’ and ‘Y’, the quantity of fossil fuel consumed will be calculated as;
<table>
<tr><td>Quantity of Fossil fuel type i consumed in a process j during the yeary</td><td>$Q_{c,i}$</td><td>Calculated (Tonnes)</td></tr>
<tr><td>For 6TPH boiler ($Q_{c,i,A}$)</td><td>$Q_{c,i}$ * X</td><td>Calculated (Tonnes)</td></tr>
<tr><td>For 8TPH boiler ($Q_{c,i,B}$)</td><td>$Q_{c,i}$ * Y</td><td>Calculated (Tonnes)</td></tr>
</table>
</td></tr>
<tr><td>QA/QC procedures</td><td>This can be verified with the help of steam generation and steam to fuel ratio.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity

Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 22/05/2012
Value(s) of monitored parameter	11.50
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by Electronic and paper mode. Monitoring: Analysis from accredited agency according to relevant national standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by Electronic and paper mode.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-

Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by Electronic and paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the TJ/Gg
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	% water
Description	Moisture content of the biomass residues
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by Electronic and paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter shall be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$NCV_{i,y}$
Unit	TJ/Gg or GJ/t
Description	Weighted average net calorific value of the fuel type i in year y
Measured/Calculated /Default	Calculated or Measured

<table>
<tr><td>Source of data</td><td>
<table>
<tr><td>Data source</td><td>Conditions for using the data source</td></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>---</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>NA</td></tr>
<tr><td>QA/QC procedures</td><td>If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted.
$NCV_i = NCV_{j,y}$
i is the fuel type combusted in process j during the year y.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	For 6 TPH : 31.97 For 8 TPH : 59.35
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0009 for Instrument Details*

<table>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording: Monthly
Monitoring frequency : Continuous
Data Archiving: Data has been archived by Electronic and paper mode.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>The parameter will be derive to proportionate electricity consumption for 6 TPH and 8TPH boiler on % energy supplied basis, as per following method,
<table>
<tr><td>Quantity of energy supplied by the 6 TPH boiler</td><td>$EG_{thermal\ y}$</td><td>Measured</td></tr>
<tr><td>Quantity of energy supplied by the 8 TPH boiler</td><td>$EG_{thermal\ add,y}$</td><td>Measured</td></tr>
<tr><td>Total quantity of energy supplied by both 6 TPH and 8 TPH boiler</td><td>$EG_{thermal,y}$ + $EG_{thermal,add,y}$</td><td>Calculated (Z)</td></tr>
<tr><td colspan="3">% Distribution of energy supplied by each unit</td></tr>
<tr><td>For 6TPH boiler</td><td>$EG_{thermal,y\ /}$ ($EG_{thermal,y}$ + $EG_{thermal,Add,y}$) * 100</td><td>Calculated (X)</td></tr>
<tr><td>For 8TPH boiler</td><td>$EG_{thermal,,add,y}$ / ($EG_{thermal,y}$ + $EG_{thermal,Add,y}$) * 100</td><td>Calculated (Y)</td></tr>
</table>
Based on the derived values of ‘X’ and ‘Y’, the parameter (electricity consumption) will be calculated as-
<table>
<tr><td colspan="3">Auxiliary Electricity consumption for Project activity from Grid in year</td></tr>
<tr><td>For 6TPH boiler</td><td>$EC_{PJ,j,y}$</td><td>Monitored</td></tr>
<tr><td>For 8TPH boiler</td><td>$EC_{PJ,j,y}$</td><td>Monitored</td></tr>
<tr><td>Auxiliary electricity consumption of the project from Grid in year y for common auxiliary</td><td>$EC_{PJ,j,common,y}$</td><td>Monitored</td></tr>
<tr><td>For 6TPH boiler</td><td>$EC_{PJ,j,common,y\ *}$ X</td><td>Calculated MWh (A)</td></tr>
<tr><td>For 8TPH boiler</td><td>$EC_{PJ,j,common,y\ *}$ Y</td><td>Calculated MWh (B)</td></tr>
<tr><td colspan="3">Total electricity auxiliary consumption for the each Project activity -</td></tr>
<tr><td>For 6TPH boiler</td><td>$EC_{PJ,j,y}$ + A</td><td>Measured and Calculated MWh</td></tr>
<tr><td>For 8TPH boiler</td><td>$EC_{PJ,j,y}$ + B</td><td>Measured and Calculated MWh</td></tr>
</table></td></tr>
<tr><td>QA/QC procedures</td><td>Measured by calibrated energy meter</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh

Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set or Fossil fuel based power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	For 6 TPH and 8 TPH : 0
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0009 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data will be archived by Electronic/Paper mode

<table>
<tr><td>Calculation method (if applicable)</td><td>The parameter will be derived to proportionate electricity consumption for 6 TPH and 8TPH boiler on % energy supplied basis, as per following method,

<table>
<tr><td>Quantity of energy supplied by the 6 TPH boiler</td><td>$EG_{thermal\ y}$</td><td>Measured</td></tr>
<tr><td>Quantity of energy supplied by the 8 TPH boiler</td><td>$EG_{thermal\ add,y}$</td><td>Measured</td></tr>
<tr><td>Total quantity of energy supplied by both 6 TPH and 8 TPH boiler</td><td>$EG_{thermal,y} + EG_{thermal,add,y}$</td><td>Calculated (Z)</td></tr>
<tr><td colspan="3">% Distribution of energy supplied by each unit</td></tr>
<tr><td>For 6TPH boiler</td><td>$EG_{thermal,y} / (EG_{thermal,y} + EG_{thermal,Add,y}) * 100$</td><td>Calculated (X)</td></tr>
<tr><td>For 8TPH boiler</td><td>$EG_{thermal,,add,y} / (EG_{thermal,y} + EG_{thermal,Add,y}) * 100$</td><td>Calculated (Y)</td></tr>
</table>

Based on the derived values of ‘X’ and ‘Y’, the parameter (electricity consumption) will be calculated as-
<table>
<tr><td colspan="3">Auxiliary Electricity consumption for Project activity from off-Grid in year</td></tr>
<tr><td>For 6TPH boiler</td><td>$EC_{EL,j,y}$</td><td>Monitored</td></tr>
<tr><td>For 8TPH boiler</td><td>$EC_{EL,j,y}$</td><td>Monitored</td></tr>
<tr><td>Auxiliary electricity consumption of the project from off-Grid in year y for common auxiliary</td><td>$EC_{EL,j,,common,y}$</td><td>Monitored</td></tr>
<tr><td>For 6TPH boiler</td><td>$EC_{EL,j,common,y} * X$</td><td>Calculated MWh (A)</td></tr>
<tr><td>For 8TPH boiler</td><td>$EC_{EL,j,common,y} * Y$</td><td>Calculated MWh (B)</td></tr>
<tr><td colspan="3">Total electricity auxiliary consumption for the each Project activity -</td></tr>
<tr><td>For 6TPH boiler</td><td>$EC_{EL,j,y} + A$</td><td>Measured and Calculated MWh</td></tr>
<tr><td>For 8TPH boiler</td><td>$EC_{EL,j,y} + B$</td><td>Measured and Calculated MWh</td></tr>
</table>
</td></tr>
<tr><td>QA/QC procedures</td><td>NA</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$AVD_{,y}$
Unit	Km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y

Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	13.11
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	For 6 TPH : 105 For 8 TPH : 160
Monitoring equipment	--
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by paper mode.

<table>
<tr><td>Calculation method (if applicable)</td><td>
The parameter will be derive to proportionate number of truck trips for biomass fuel for 6 TPH and 8TPH boiler for Project activity on % energy supplied basis, as per following method,
<table>
<tr><td>Quantity of energy supplied by the 6 TPH boiler</td><td>$EG_{thermal\ y}$</td><td>Measured</td></tr>
<tr><td>Quantity of energy supplied by the 8 TPH boiler</td><td>$EG_{thermal\ add,y}$</td><td>Measured</td></tr>
<tr><td>Total quantity of energy supplied by both 6 TPH and 8 TPH boiler</td><td>$EG_{thermal,y} + EG_{thermal,add,y}$</td><td>Calculated (Z)</td></tr>
<tr><td colspan="3">% Distribution of energy supplied by each unit</td></tr>
<tr><td>For 6TPH boiler</td><td>$EG_{thermal,y}$ / $(EG_{thermal,y} + EG_{thermal,Add,y})$ * 100</td><td>Calculated (X)</td></tr>
<tr><td>For 8TPH boiler</td><td>$EG_{thermal,,add,y}$ / $(EG_{thermal,y} + EG_{thermal,Add,y})$ * 100</td><td>Calculated (Y)</td></tr>
</table>
Based on the derived values of ‘X’ and ‘Y’, the parameter (Number of truck trips for biomass fuel) will be calculated as-
<table>
<tr><td>Number of truck trips during the year y</td><td>$N_{,y}$</td><td>Number</td></tr>
<tr><td>For 6TPH boiler</td><td>$N_{,y}$ * X</td><td>Number</td></tr>
<tr><td>For 8TPH boiler</td><td>$N_{,y}$* Y</td><td>Number</td></tr>
</table>
</td></tr>
<tr><td>QA/QC procedures</td><td>The data is checked for consistency by comparing the invoice / delivery note</td></tr>
<tr><td>Purpose of data</td><td>Leakage Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Measured/Calculated /Default	Calculated

<table>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable).</td></tr>
<tr><td>Monitoring equipment</td><td>---</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data Archiving: Data will be archived by Paper mode.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>For a) and b): Measurements should be undertaken in line with national or international fuel standards
For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For c): Review appropriateness of the values annually
For d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures</td><td>Applicable where Option B is used.
For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

D.3. Implementation of sampling plan
No sampling plan needed over the monitoring period since 100% data are monitored and reported.

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 Emission calculation for 6 TPH Boiler capacity:

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

Q_{steam}	:	3,515.12 Tonnes
H_s	:	662.07 kCal/Kg
H_w	:	67.99 kCal/Kg
$\eta_{BL,Thermal}$	:	100%
$EF_{FF,CO2}$	:	89.5tCO_2/TJ

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

$EG_{thermal}$ = 3515.12 * (662.07- 67.99) *4.186 X 10^{-6}
= 8.741 TJ/yr

Hence;
$BE_{thermal,CO_2,y}$ = (8.741 /100 %) * 89.5
= 782.36 tCO_2

Baseline Emission calculation for 8 TPH Boiler capacity:

In this case of Project activity involves the addition of renewable energy unit at an existing renewable energy production facility, where the existing and new unit share the use of common and limited renewable resources (e.g., biomass residues), the potential for the Project activity to reduce the amount of renewable resource available to, and thus thermal energy production by, existing units must be considered in the determination of baseline emissions, Project emissions, and/or leakage, as relevant.

For Project activities that involve the addition of new energy production units (e.g., turbines) at an existing facility, net increase in thermal energy generation should be calculated as follows:

$EG_{thermal,add,y} = EG_{thermal,pj,y} - EG_{thermal,old,y}$

$EG_{thermal,add,y}$ = Net increase in thermal energy generation at existing plant in year y that should be considered as energy baseline (EGBL) (TJ)
$EG_{thermal,pj,y}$ = Total actual thermal energy produced in year y by all units, existing and new Project units (TJ)
$EG_{thermal,old,y}$= Estimated thermal energy that would have been produced by existing units (installed before the Project activity) in year y in the absence of the Project activity; TJ

The value $EG_{thermal\ old\ y}$ is given by

$EG_{thermal,old,y} = MAX(EG_{thermal,actual,y,}\ EG_{thermal,estimated,y})$

$EG_{thermal,actual,y,}$ = The actual, measured thermal energy production of the existing units in year y (TJ)
$EG_{thermal,estimated,y}$ = The estimated thermal energy that would have been produced by the existing units under
the observed availability of the renewable resource for year y (TJ)

$EG_{thermal,actual,y,}$ = 8.741 TJ/yr

$EG_{thermal,estimated,y}$ = 16.15TJ/yr
$EG_{thermal,estimated,y}$ is calculated based on the rated capacity of the existing boiler, its operational hours in this monitoring period and specific enthalpy of evaporation at atmospheric pressure.
Thus,
$EG_{thermal,old,y} = MAX(EG_{thermal,actual,y,}\ EG_{thermal,estimated,y})$
= 16.15TJ/yr.

$EG_{thermal,PJ,y} = Q_{steam,\ add} * (H_s - H_w) * 4.186 \times 10^{-6} + EG_{thermal,old,y}$

$EG_{thermal,PJ,y}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)
$EG_{thermal,actual,y}$ is determined from Plant record
$_{thermal,estimated,y}$ is determined from the rated capacity (output) and the operating parameter of the existing Boiler

$Q_{Steam,add,y}$	:	5,412.05 Tonnes
$H_{s,add,y}$	:	6,62.31 kCal/Kg

$H_{w,add,y}$: 70.52 kCal/Kg
$\eta_{BL,Thermal}$: 100%
$EF_{FF,CO2}$: 89.5tCO_2/TJ

$EG_{thermal,PJ,y}$ = (5,412.05 * (662.31- 70.52) *4.186 X 10^{-6}) + (3515.12 * (662.07- 67.99) *4.186 X 10^{-6})
= 13.41 + 8.741
= 22.15 TJ/yr.

Therefore,
$EG_{thermal,add,y}$ = EG $_{thermal,PJ,y}$ - EG $_{thermal,old,y}$
= 22.15 – 16.15
= 6.00 TJ/yr

The Baseline is calculated as per the paragraph 15 of the methodology $EG_{thermal,y} = EG_{thermal,add,y}$

Hence;
$BE_{thermal,CO_2,y}$ = (6.00 /100 %) * 89.5
= 536.96 tCO_2 e

Thus total $BE_{thermal,CO2,y}$ = (782.36+536.96)
= 1,319.33 tCO_2 e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.86 tCO_2/MWh (for southern regional grid)

<u>Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):</u>

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,

$$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where;

For 6 TPH Boiler :

$EC_{PJ,j,y}$ = 40.33 MWh
$EF_{grid,CM,y}$ = 0.86 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 0.0 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 40.33* 0.86* (1+20/100) + 0.0*1.3* (1+20%)
= 41.62 tCO_2e

For 8 TPH Boiler :

$EC_{PJ,j,y}$ = 72.17 MWh
$EF_{grid,CM,y}$ = 0.86 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 0.0 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 72.17* 0.86* (1+20/100) + 0.0*1.3* (1+20%)
= 74.48 tCO_2e

$PE_{EC,y}$ = (41.62+74.48)
= 116.10 tCO_2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 116.10 + 0$
$= 116.10\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

As per the clarification given in the foot note for paragraph 29 of methodology, 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.

The energy generating equipment currently being utilised is not transferred from outside the boundary of the Project activity. Biomass (Rice Husk) consumed in the project activity is not transported to the Project site over a distance of more than 200 km. Hence leakage is considered to be zero

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$\mathbf{ER_y = BE_y - PE_y - LE_y}$

Where,

ER_y = Emission reduction in year y (tCO_2e).
LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year y (tCO_2e).

Therefore; $ER_y = BE_y - PE_y - LE_y$
$= 1,319.33 - 116.10 - 0$
= **1,202 tCO_2e** (rounded down value)

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)
Total	1,319.33	116. 10	0	1,202

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

Item	Values estimated in ex-ante calculation of registered CPA-DD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	3,200*	1,202

* As per the included CPA-DD, the estimated emission reductions are 12,696 tCO_2e/year. Since the monitoring period is from 01/06/2012 to 31/08/2012 i.e. 92 days (both days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (12,696/365*92 = 3,200).

E.6. Remarks on difference from estimated value in registered CPA-DD

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0009: Instrument Details

For 6 TPH

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy /Class	Calibration Date	Calibration Frequency	Calibration Validity
Quantity of steam supplied in year y , (Q_{steam})	Steam Flow Meter	Endress + Hauser	EC03DD20000	±2.3%	25/01/2012	Once in 3 year*	24/01/2015
Average Steam Temperature at MSSV (Main steam stop valve) outlet during year,(T_{steam})	RTD	Endress + Hauser	EC03DD20000	Class A	25/01/2012	Once in 3 year*	24/01/2015
Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year (P_{steam})	Pressure Transmitter	Endress + Hauser	E8004221129	±0.15%	30/08/2011	Once in 3 year*	29/08/2014
Average Feed Water Temperature at inlet of boiler (T_{FWB})	RTD	Endress + Hauser	E80080142EA	Class A	30/09/2011	Once in 3 year*	29/09/2014
Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	(Dual Source) Energy Meter	HPL Socomec	1L262663	Class 1.0	30/04/2012	Yearly**	29/04/2013
Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k,}$)	Weigh Bridge	EDPL	950094510	Class III	03/03/2012	Yearly***	02/03/2013
Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

For 8 TPH:

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy / Class	Calibration Date	Calibration Frequency	Calibration Validity
Quantity of steam supplied in year y , (Q_{steam})	Steam Flow Meter	Endress + Hauser	E8010120000	±2.3%	23/09/2011	Once in 3 year*	22/09/2014
Average Steam Temperature at MSSV (Main steam stop valve) outlet during year,(T_{steam})	RTD	Endress + Hauser	E8010120000	Class A	23/09/2011	Once in 3 year*	22/09/2014
Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year (P_{steam})	Pressure Transmitter	Endress+ Hauser	F1000E21129	±0.15%	17/01/2012	Once in 3 year*	16/01/2015
Average Feed Water Temperature at inlet of boiler (T_{FWB})	RTD	Endress + Hauser	E8007C142EA	Class A	22/09/2011	Once in 3 year*	21/09/2014
Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter	HPL SOCOMEC	1L262653	Class 1.0	30/04/2012	Yearly**	29/04/2013

For Softener:

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy /Class	Calibration Date	Calibration Frequency	Calibration Validity
Auxiliary Electricity Consumption of the Project activity from the Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter	HPL SOCOMEC	1L264834	Class 1.0	30/04/2012	Yearly**	29/04/2013

*Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy

Appendix-8

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 0010)
Reference number of the project activity	CPA 4041-0011[94]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	31/05/2012 (Inclusion Date of CPA in Registered PoA No.4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2012 to 31/08/2012 (first and last days included) Start date of emission reduction in this monitoring period: 01/06/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. Shree GRG Oil Mill
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	3,258 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	1,969 tCO_2e

94 http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=DKWA3ERVNJ2S71089QG65IHP4OLMTX

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of biomass fired boiler having rated steam generation capacity of 8 tonnes per hour (TPH) and heater having 0.4 million kCal/hour rated capacity at Shree GRG Oil Mill for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of two equipments as follows:
1) **Boiler**: 8 TPH, Combipac boiler, manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 17.5 kg/cm^2 and has refractory lined furnace with water wall. Steam is applied for cooking of seeds, distillation and solvent recovery process.

2) **Heater:** 0.4 million kCal/hour rated capacity, thermopac heater manufactured by Thermax Limited and has a refractory lined furnace. Heat produced from heater is utilizing for deodorization for oil refining.

(c) Relevant dates for the project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
CPA-4041 0011	Shree GRG Oil Mill	Boiler – 8 TPH (from and at 100^{0}C)	08/08/2009	31/05/2012	01/06/2012
		Heater- 0.4 million kCal/hr	23/09/2009	31/05/2012	01/06/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/06/2012 to 31/08/2012 (first and last days included) is 1,969 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
CPA-4041 0011	Shree GRG Oil Mill	C-371-74, Agro Food Park, RIICO, Sri Ganganagar, Rajasthan – 335 002, India	29^0 52’ 00.50’’ N, 73^0 55’ 26.17’’ E	India

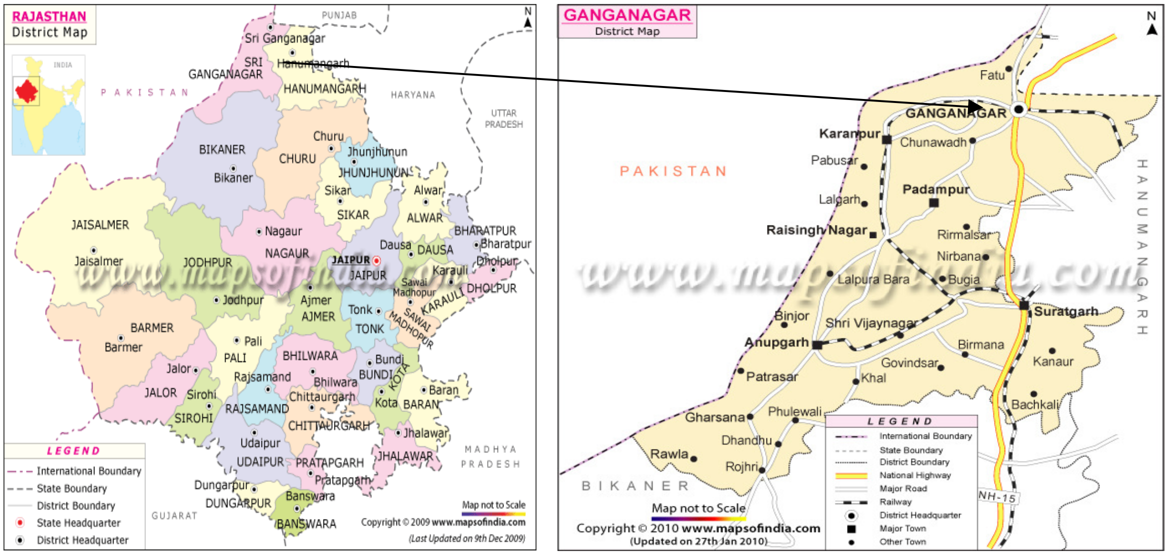


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler and heater) displacing fossil fuel has been addressed as CPA and the Equipment (boiler and heater) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [95]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[96]

Relevance Tools:

[95] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[96] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf

1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01), EB 39 Annex 7)[97]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[98]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[99]
4. "Tool to calculate Project or leakage CO^2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[100]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/06/2012

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.
The biomass fired heaters consist of thermic fluid / thermal oil heaters, pressurized and non pressurized hot water generators, which work on closed loop pipe line system, for transferring the thermal energy indirectly, to the process through the heat transfer medium like thermic fluids / thermal oil or pressurized / non pressurized water. The biomass fired heaters are similar to the boilers, as both pick up the heat from the biomass fuel combustion & transfer it to the process/heat utilities. The heaters transfer the thermal energy in the form of heat to the user which could be a process or heat utilities in a closed loop piping system.

[97] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[98] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[99] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[100] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Technical Specification of installed equipments:

Parameter	**Description**
CPA Number	010
CPA Operator	Shree GRG Oil Mill
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler and Heater
Equipment capacity	Installation of biomass fired boiler having rated steam generation capacity of 8 tonnes per hour (TPH) and heater having 0.4 million kCal/hour rated capacity
Boiler and Heater Make	Thermax Limited
Boiler and Heater Model	Boiler : Combipac, Heater : Thermopac
Maximum working pressure for Boiler and Maximum working Temperature for Thermopac	Boiler : 17.5 kg/cm^2 Heater : 280 ^{0}C
Rated steam and heat generation Capacities for Boiler and Heater	Boiler : 8 TPH From & At 100^{0}C Heater :0.4 million kCal/hour
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Boiler : Rice husk and Mustard Husk Heater : Rice Husk
Type of fuel firing	Screw feeder
Furnace type	Boiler : Refractory lined furnace with water wall Heater : Refractory lined
Boiler & Heater Number	Boiler : CP 80/17.5/02 Heater: VTB -04/69
Commissioning date	Boiler : 08/08/2009 Heater : 23/09/2009

Basic technology of Biomass fuel fired Boiler:

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently rice husk and mustard husk fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge & handling, electrical systems, equipment safeties & controls.

Basic technology of Biomass fuel fired Heater:

The heater consists of mainly the following parts:

1. Heat Exchangers – form the heat transfer surface of the heater,
2. Furnace fuel combustor – designed to burn efficiently a particular type of biomass fuel

3. Accessories - for various systems like fuel storage, fuel handling & feeding, heat transfer fluid/water pipe lines, fans & draught system, flue gas discharge, ash discharge & handling, electrical system, equipment safety & controls, de-aerator & expansion Tank, heat transfer fluid/treated water system and storage.

The CPA operator has utilized biomasses for heat generation i.e. Rice Husk and Mustard Husk which is in compliance with definition of renewable biomass as per “Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the CPA during this monitoring period:**

The project is currently operational as per the monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the project activity like equipment retrofitting, Capacity addition etc.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections

There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity

There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period

There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

The biomass based Steam & Heat generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

1) Boiler Monitoring Parameters

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by separate temperature measuring instrument and field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument or field instrument integral to steam flow meter.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meter
6	Fuel Weighing	Weighing machine (mass meter)

2) Heater Monitoring Parameters

Sr. no.	Monitoring Parameters	Measuring instruments
1	Fluid Flow	Flow meter
2	Heat Transfer Fluid/heating medium –inlet & outlet temperature sensors	Directly measured by field instruments integral to the flow meter.
3	Electrical Energy Consumption	Energy meters
4	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data gets transferred to CME server through internet connectivity.

The following parameters are monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

a) For Boiler:
The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

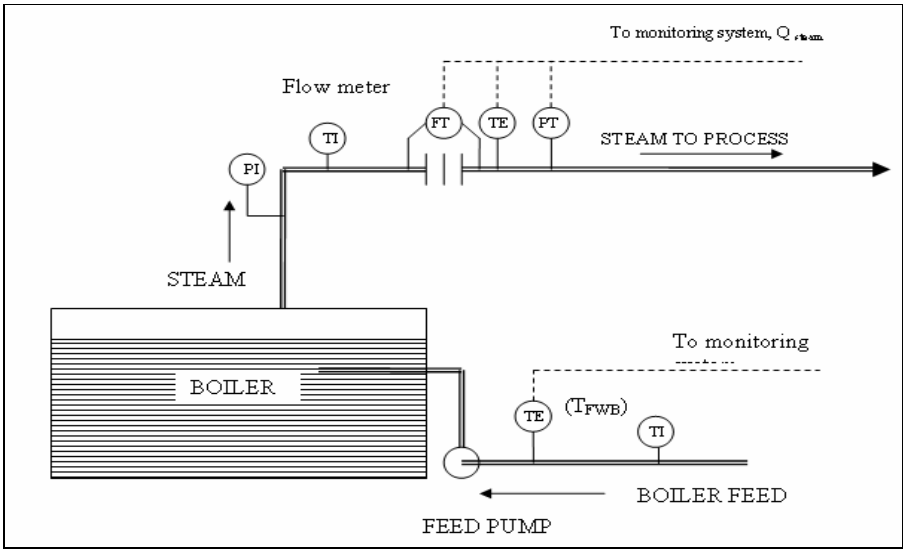


Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

b) For Heater:

The net quantity of heat supplied from a heater is calculated by the product of mass flow of the heat transfer fluid, the specific heat of the fluid at the measuring point and the temperature differential (or rise) across the heater.

Volumetric flow (Q_{flow}) is measured in m^3 with the help of a flow meter installed at the outlet line of the heater, the flow obtained is then converted to mass flow by multiplying with density (δ) which is computed in the monitoring system which is determined based on data provided by manufacturer at corresponding operating temperature (T_{out}) recorded at the heater outlet. No other monitoring parameter is considered to determine this parameter.

Similarly the Cp, specific heat, of the heat transfer fluid is also computed in the monitoring system based on the manufacturer's data corresponding to the operating temperature (T_{out}) recorded near the flow measuring point at the heater outlet.

As delta T i.e. ($T_{out} - T_{in}$) is a direct function to account for the heat generated, temperature sensors are installed at the inlet and outlet line (Two each- one working & one stand by) of the heater to measure the rise in temperature of the heat transfer fluid entering the heater and leaving the heater, respectively.

Using the above values the net quantity of heat supplied from the heater is calculated every fifteen minutes with the below mentioned thermodynamic equation & will be totalized for the hour and recorded as hourly heat generation in the daily log book:

$$EG_{thermal} = Q_{flow} * Cp_{out} * \delta_{out} * (T_{out} - T_{in}) * 4.186 \text{ X } 10^{-6}$$

Q_{flow} Flow of heat transfer fluid at the heater outlet (m^3).
Cp_{out} The specific heat of heat transfer fluid at Tout temperature (kCal/kg. ^{O}C).
δ_{out} Density of heat transfer fluid at Tout temperature of the heater (kg/m^3).at the outlet of the heater (kg/m^3).
T_{out} Temperature of the heat transfer fluid at the outlet of the heater (^{O}C).
T_{in} Temperature of the heat transfer fluid at the inlet of the heater (^{O}C).

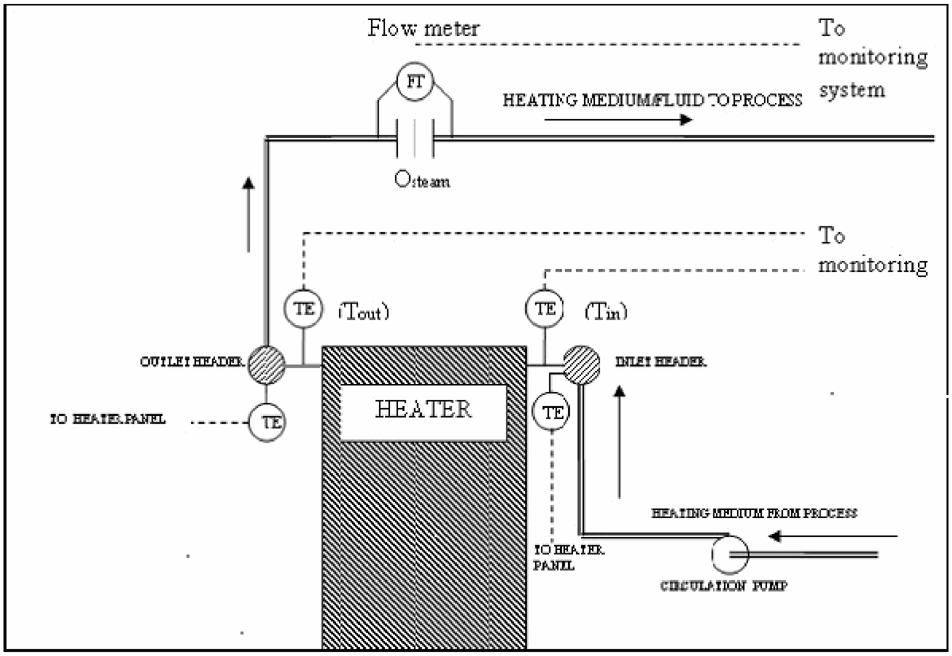


Figure C.1.2 Schematic Representation of monitoring plan for a heater

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Duly calibrated weigh bridge has been used to weigh the biomass consumed in this CPA.

Monitoring fuel Input in the Boiler & Heater:

The following approach has been taken to measure each type of biomass input to the boiler and heater & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,\,k}$/ $Q_{ob,\,i}$

b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$

c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However there was no fossil fuel consumed during the monitoring period for this CPA.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler & heater parameters have been manually recorded as indicated above by the boiler & heater operational staff at site (CPA operator).This manual record of boiler and heater log book has been maintained at site by CPA operator.

2) **Automated boiler and heater performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 for boiler and 1,2 for heater as per table above in Section D) required for monitoring the boiler and heater of this CPA were installed on the heat generating system. The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

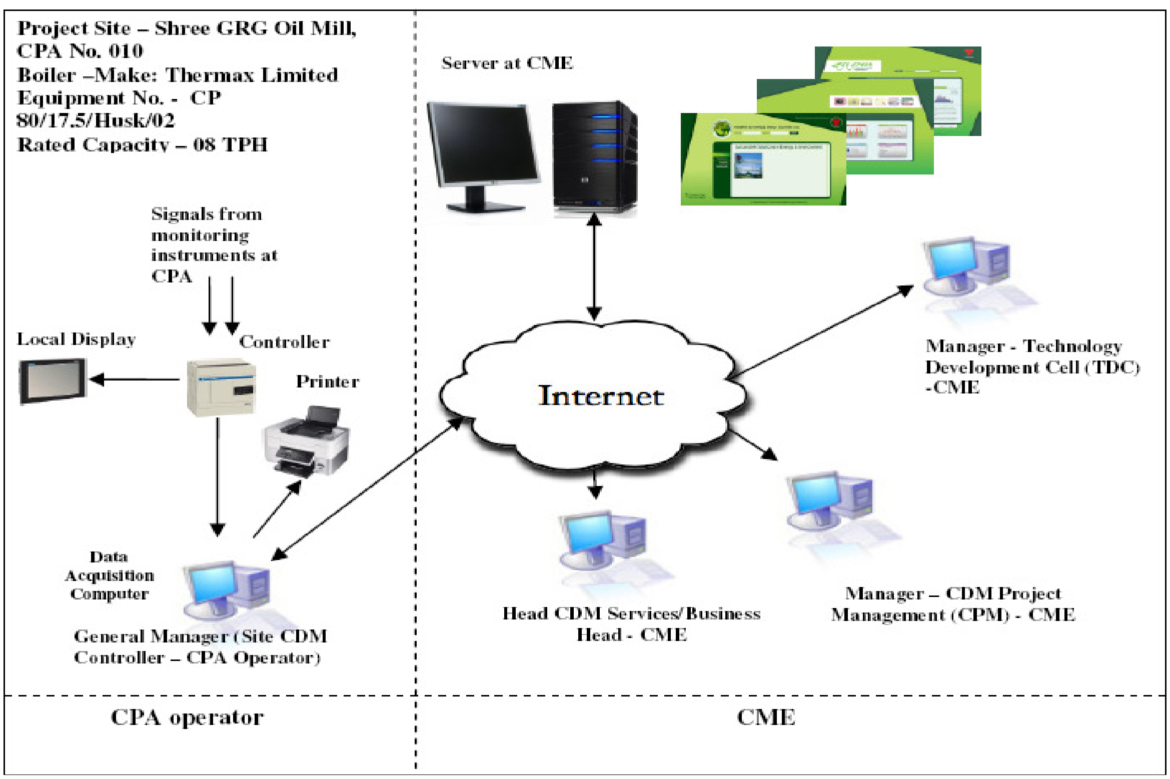


Figure C.1.1 Schematic Representation of Monitoring Plan for CPA under PoA

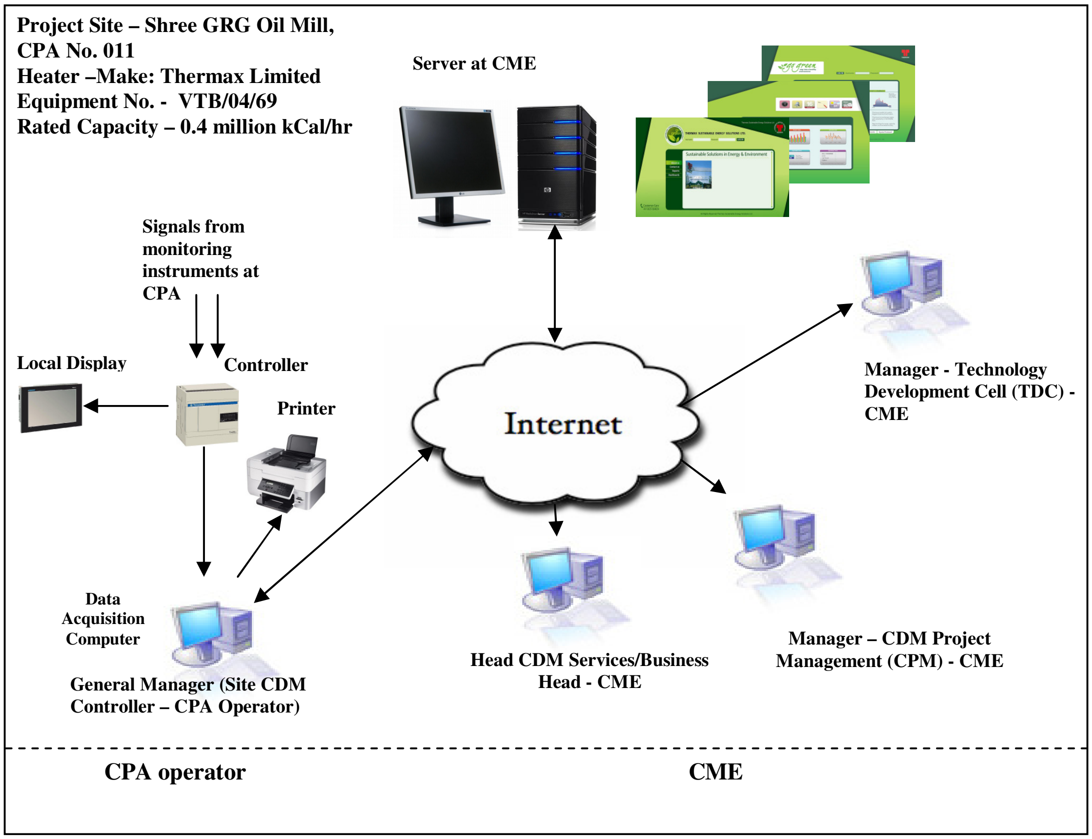


Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

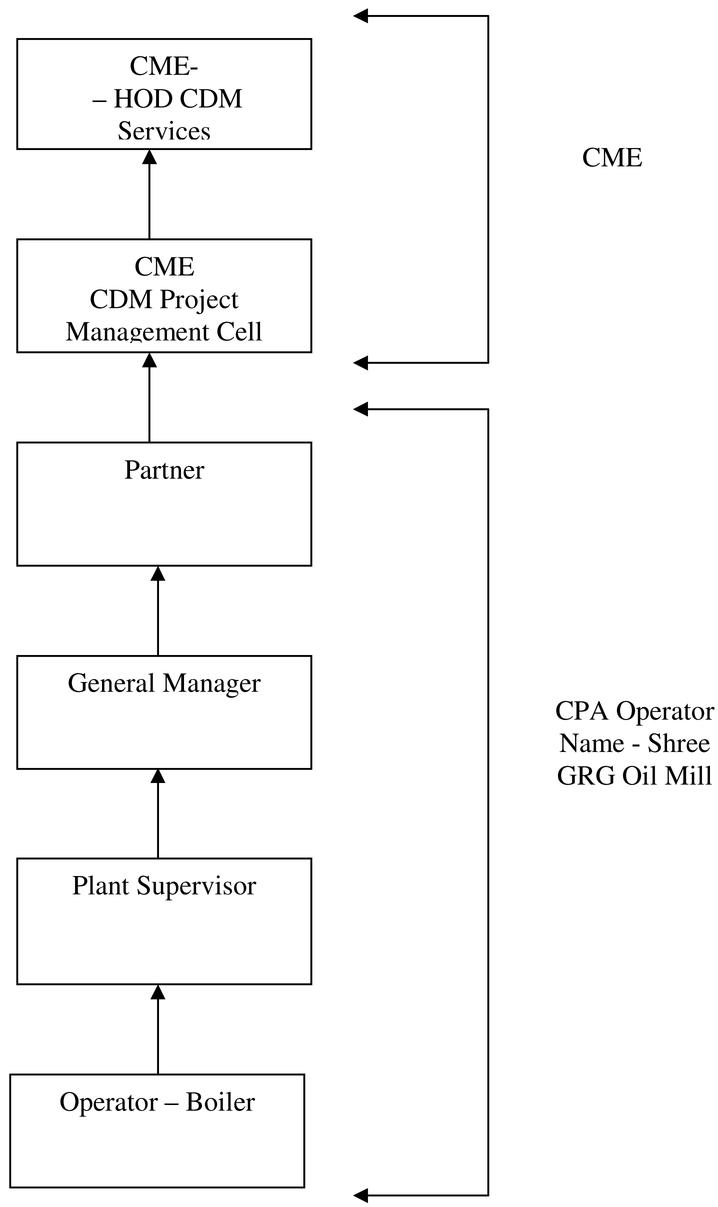


Fig.C.1.3.1 Monitoring Plan for CPA Implementation by CPA Operator for Boiler

Key operational roles	**CPA Management Responsibilities**
Partner – CPA Operator	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM Services for final reporting into emission reduction sheet. • Quarterly Performance Review
General Manager (site CDM Controller)	• Performance review –Monthly • Verification / review of data

	• Internal audits • Review of corrective actions
Plant Supervisor	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipment • Maintenance of key monitoring equipment • Implementation of corrective action
Operator – Boiler	• Operation and maintenance of boiler • Recording/Collection of Data • Daily Logbook data maintenance

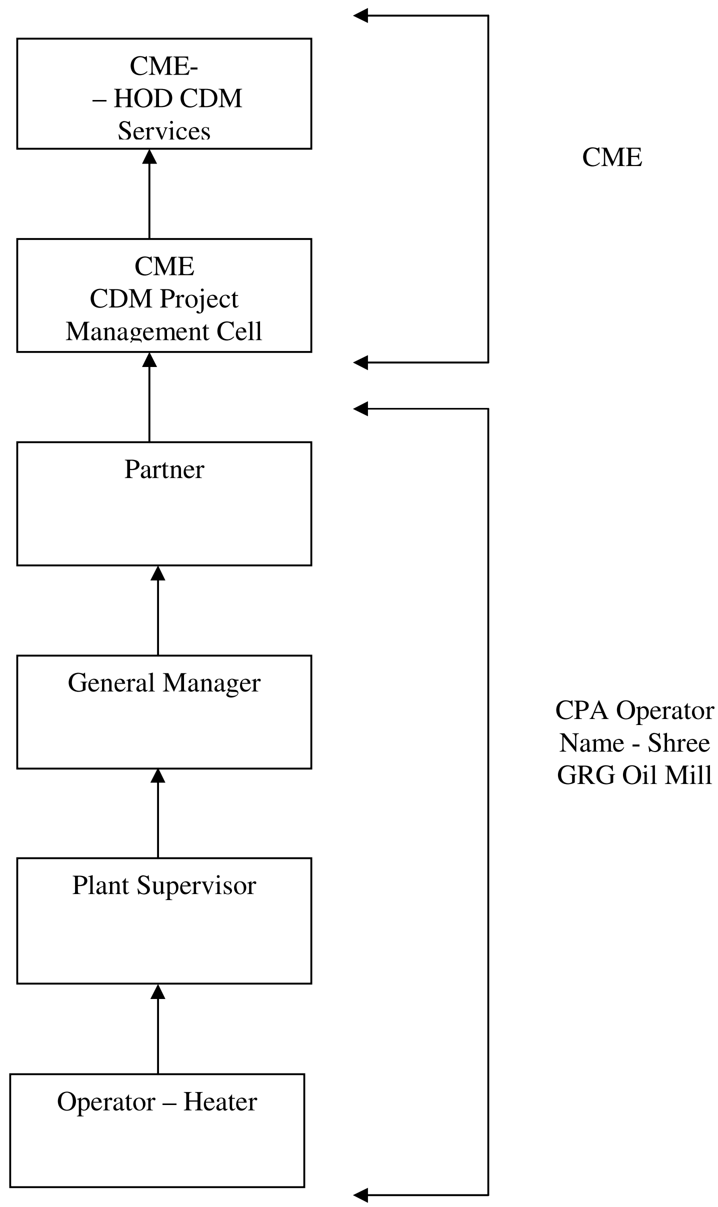


Fig.C.1.3.2 Monitoring Plan for CPA Implementation by CPA Operator for Heater

Key operational roles	**CPA Management Responsibilities**
Partner – CPA Operator	• Overall Responsibilities of Operation & Management of Project • Submission of Documents/Data to CME – Head CDM Services for final reporting into emission reduction sheet. • Quarterly Performance Review
General Manager (site CDM Controller)	• Performance review -Monthly • Verification / review of data

	• Internal audits • Review of corrective actions
Plant Supervisor	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipment • Maintenance of key monitoring equipment • Implementation of corrective action
Operator – Heater	• Operation and maintenance of heater • Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler & Heater Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

a) Emergency Preparedness Plan for Boiler:
i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i.e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation.

b) Emergency Preparedness Plan for Heater:

i) Heat flow measurement system failure:

In case of heat flow measurement system failure, the heat will be estimated based on the most conservative approach theoretically possible.

ii) Failure of Temperature sensors:

In case of failure of the RTD/ Temp Transmitter, the heater operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on inlet and outlet line of the heater. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years.
Calibration will be carried out by independent accredited third party entity

iii) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter.
The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the heater i. e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor.
The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation.

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	8 (value applicable for the Project activity as per CPA 010)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	CAP_{heater}
Unit	kCal/hr
Description	Rated capacity (thermal output) of the heater of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	0.4 million (value applicable for the Project activity as per CPA 010)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per paragraph 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	For boiler - 100 (value applicable for the Project activity as per CPA 010) For heater – 100 (value applicable for the Project activity as per CPA 010)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_2e/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower values has been chosen in conservative manner (Sourced from included CPA-DD)
Value(s) applied	89.5 (value applicable for the Project activity as per CPA 008)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass within 50 km radial distance
Source of data	Published literature/official reports/Third Party Survey report/ public domain document at the beginning of crediting period
Value(s) applied	Rice husk - 46.17 % Mustard husk – 38.45% (values applicable for the Project activity as per CPA 010)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	0.80 -NEWNE Grid (value applicable for the Project activity as per CPA 010)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 010)
Purpose of data	Project Emission calculation
Additional comment	The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all project electricity consumption sources at the site of the captive power plant(s). However, Project activity is Greenfield project hence there is no Captive Power Plant (CPP) present at the site. Hence default value at the time of PoA validation i.e. 1.3 tCO_2/MWh is considered for the calculation of project emissions in conservative manner as the auxiliary load of baseline plant activity is less than the auxiliary load of Project activity. Electricity consumption from the CPP (Diesel Generator set) is the project emission and not the leakage electricity consumption source. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 008)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TDL_{l,y} = TDL_{j,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Cp_{i,out}$
Unit	kCal/kg °C
Description	Specific heat of heat transfer fluid at heater outlet.
Source of data	As mentioned in included CPA-DD
Value(s) applied	- (value applicable for the Project activity as per CPA 010)
Purpose of data	Baseline Emission calculation
Additional comment	Determined based on outlet of heat transfer fluid. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\delta_{i,out}$
Unit	kg /m^3
Description	Density of heat transfer fluid at Tout temperature of the heater (kg/m^3)
Source of data	Manufacturer's specification
Value(s) applied	- (value applicable for the Project activity as per CPA 010)
Purpose of data	Baseline Emission calculation
Additional comment	Value will be derived from Manufacturer's standard based on outlet temperature. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	Rice husk - 0.004444 for boiler Mustard husk -0.004736 for boiler Indian coal – 0.004186 for boiler Indian coal – 0.004615 (in case Indian coal is used in heater) Rice husk - 0.004645 for heater (value applicable for the Project activity as per CPA 010)
Purpose of data	Not used for emission reduction calculation
Additional comment	Data type: Calculated as per para 34 equation 14 of AMS I.C ver. 16. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	8354.35[101]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0011 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[101] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	191.24[102]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^2g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	12.45[103]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[102] For the data and calculations, kindly refer Emission reduction spread sheet
[103] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{FWB}
Unit	^oC
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	70.62[104]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

[104] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	Q_{flow}
Unit	m^3/hr
Description	Flow of heat transfer fluid at the heater outlet
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	- (Not applicable as $EG_{thermal}$ is calculated for every 15 minutes as mentioned in the CPA DD)
Monitoring equipment	Heat Flow Meter *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	T_{in}
Unit	^oC
Description	Average Inlet Temperature of the heat transfer fluid at the inlet of the heater
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	- (Not applicable as $EG_{thermal}$ is calculated for every 15 minutes as mentioned in the CPA DD)
Monitoring equipment	RTD *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	T_{out}
Unit	^oC
Description	Average Temperature of the heat transfer fluid at the outlet of the heater
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	-(Not applicable as $EG_{thermal}$ is calculated for every 15 minutes as mentioned in the CPA DD)
Monitoring equipment	RTD *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	$H_{,y}$
Unit	hr or hours
Description	Boiler/heater operating hours of the Project activity in year y
Measured/Calculated /Default	Measured
Source of data	On-site measurement
Value(s) of monitored parameter	For boiler – 2,016 For heater – 459
Monitoring equipment	Built in timer in monitoring system
Measuring/Reading/ Recording frequency	Recording Frequency: Monitored daily, reported monthly and consolidated annually. Data Archiving: Data will be archived by Electronic/Paper mode The basis for measurement of operating hours is the Induced Draft Fan for balanced draft systems / Forced Draft Fan for forced draft systems operating hours. The Auxiliary contact of I.D/F.D fan switch gear is connected to monitoring system for measurement of run hours. For each equipment, working hours on different fuels will be monitored.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	-
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,rice\ husk}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k (Rice Husk) on the starting date of this monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	274.89
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic/Paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in log book
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,mustard\ husk}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k (Mustard Husk) on the starting date of this monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Plant record.
Value(s) of monitored parameter	1202.59
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in log book
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,\ rice\ husk}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k (Rice Husk) biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge slip and Plant record.
Value(s) of monitored parameter	0
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass delivery note obtained from the fuel supplier.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	CPA operator has not procured the rice husk during this monitoring period hence value has mentioned not applicable. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,\ mustard\ husk}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k (Mustard Husk) biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge slip / Plant record.
Value(s) of monitored parameter	1447.73
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details.*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass delivery note obtained from the fuel supplier.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,\ rice\ husk}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k (Rice Husk) available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Plant record.
Value(s) of monitored parameter	78.89
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details*.
Measuring/Reading/ Recording frequency	Data Archiving: Data has been be archived by Electronic and Paper mode. Monitoring: Rice Husk has been measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,\ mustard\ husk}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k (Mustard Husk) available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Plant record.
Value(s) of monitored parameter	1200.10
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Mustard Husk has been measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c, \text{rice husk}} = FC_{\text{biomass, rice husk,y}}$
Unit	Tonnes
Description	Quantity of biomass fuel type k (Rice Husk) consumed during this monitoring period
Measured/Calculated /Default	Calculated
Source of data	Plant record.
Value(s) of monitored parameter	196
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{\text{ob,rice husk}} + \Sigma(Q_{\text{np,rice husk}}) - Q_{\text{in,rice husk}}$
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c, \text{rice husk,B}} = FC_{\text{biomass, rice husk,B,y}}$
Unit	Tonnes
Description	Quantity of biomass fuel type k (Rice Husk) consumed during the monitoring period for boiler
Measured/Calculated /Default	Calculated
Source of data	Plant record.
Value(s) of monitored parameter	0 (CPA operator has not fired rice husk in the boiler during this monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	The parameter will be derived based on a. Total rice husk consumption
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,\ rice\ husk,H} = FC_{biomass,\ rice\ husk,H,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k (Rice Husk) consumed during the monitoring period for heater
Measured/Calculated /Default	Calculated
Source of data	Plant record.
Value(s) of monitored parameter	196
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,\ mustard\ husk} = FC_{biomass,\ mustard\ husk,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k (Mustard Husk) consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Plant record.
Value(s) of monitored parameter	1450.22
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,mustard\ husk} + \Sigma\ (Q_{np,mustard\ husk}) - Q_{in,mustard\ husk}$
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes
Description	Quantity of stored fuel type fossil i on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel will be measured on Weighbridge outside the plant premise. The weighbridge slip with delivery note/invoice will be obtained from the fuel supplier and will be mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0011 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i} = FC_{j,PJ,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$ Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	The quantity of fossil fuel consumed will be cross checked with payment receipt /invoice obtained from the fuel supplier
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,I,\ B} = FC_{j,PJ,B}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period for boiler
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	This parameter is basically introduced in conjunction with parameter $Q_{c,i,H}$ to cross verify the fossil fuel (Indian coal) consumption in boiler and heater. It is not utilized directly for emission reduction calculations. Data Archiving: Data will be archived by Paper mode Monitoring: It is calculated based on energy generation and fossil fuel consumed.
QA/QC procedures	Coal consumption for Project activity can be verified with the help of steam generation and steam to fuel (Indian coal) ratio for boiler plus heat generation and heat to fuel (Indian coal) ratio for heater. As a plausible measure, the CPA operator will measure total quantity of energy generation from boiler and heater corresponding to fossil fuel consumed.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,I,\ H} = FC_{j,PJ,H}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period for Heater
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	This parameter is basically introduced in conjunction with parameter $Q_{c,i,B}$ to cross verify the fossil fuel (Indian coal) consumption in boiler and heater. It is not utilized directly for emission reduction calculations. Data Archiving: Data will be archived by Paper mode Monitoring: It is calculated based on energy generation and fossil fuel consumed.
QA/QC procedures	Coal consumption for Project activity can be verified with the help of steam generation and steam to fuel (Indian coal) ratio for boiler plus heat generation and heat to fuel (Indian coal) ratio for heater. As a plausible measure, the CPA operator will measure total quantity of energy generation from boiler and heater corresponding to fossil fuel consumed.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$NCV_{rice\ husk}$
Unit	GJ/tonnes
Description	Net calorific value of biomass fuel k (rice husk) used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 25/05/2012
Value(s) of monitored parameter	13.40
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by Paper mode. Monitoring: Analysis from accredited independent agency according to relevant national standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the GJ/tonnes
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$NCV_{mustard\ husk}$
Unit	GJ/tonnes
Description	Net calorific value of biomass fuel k (mustard husk) used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 25/05/2012
Value(s) of monitored parameter	14.09
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by Paper mode. Monitoring: Analysis from accredited independent agency according to relevant national standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to the GJ/tonnes
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Hydrogen_{rice\ husk}$
Unit	%
Description	Percentage of hydrogen in biomass fuel (rice husk)
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by Paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen $_{\text{mustard husk}}$
Unit	%
Description	Percentage of hydrogen in biomass fuel (mustard husk)
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by Paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen $_{\text{rice husk}}$
Unit	%
Description	Percentage of Oxygen in biomass fuel (rice husk)
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by Paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen $_{mustard\ husk}$
Unit	%
Description	Percentage of Oxygen in biomass fuel (mustard husk)
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by Paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture $_{rice\ husk}$
Unit	% water
Description	Moisture content of the biomass residues (rice husk)
Measured/Calculated /Default	-
Source of data	Not applicable as laboratory analysis report provides NCV directly
Value(s) of monitored parameter	-
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by Paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture $_{\text{mustard husk}}$
Unit	% water
Description	Moisture content of the biomass residues (mustard husk)
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Unit</td><td>GJ/t</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of the fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated or Measured</td></tr>
<tr><td>Source of data</td><td>
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>---</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>---</td></tr>
<tr><td>QA/QC procedures</td><td>If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted.
$NCV_i = NCV_{j,y}$
i is the fuel type combusted in process j during the year y.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$FC_{i,j,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed in a process j during the year y
Measured/Calculated /Default	Measured
Source of data	Plant record
Value(s) of monitored parameter	0 (No fossil fuel type i consumed in a process j during monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book
Value(s) of monitored parameter	2.27
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0011 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set or Fossil fuel based power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	0.22
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0011 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording : Monthly Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y\ rice\ husk}$
Unit	Km
Description	Average return trip distance (from and to) between the source of the biomass (rice husk) and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	80
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated aagainst the number of truck trips. Calculated based on the distance kilometres provided by trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	No rice husk was procured during the monitoring period

Data/Parameter	$AVD_{,y\ mustard\ husk}$
Unit	Km
Description	Average return trip distance (from and to) between the source of the biomass (mustard husk) and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	63.18
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y\ rice\ husk}$
Unit	--
Description	Number of truck trips during the year y for rice husk
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	200
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data has been checked for consistency by comparing the invoice / delivery note
Purpose of data	Leakage Emission Calculation
Additional comment	No rice husk was procured during the monitoring period

Data/Parameter	$N_{,y\ mustard\ husk}$
Unit	--
Description	Number of truck trips during the year y for Mustard Husk
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	207
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data has been checked for consistency by comparing invoice / delivery note
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$EF_{CO2,i,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/GJ</td></tr>
<tr><td>Description</td><td>Weighted average CO_2 emission factor of fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)</td></tr>
<tr><td>Monitoring equipment</td><td>NA</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data Archiving: Data will be archived by Paper mode.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>For a) and b): Measurements should be undertaken in line with national or international fuel standards
For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For c): Review appropriateness of the values annually
For d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures</td><td>Applicable where Option B is used.
For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

D.3. Implementation of sampling plan

No sampling plan needed over the monitoring period since 100% data are monitored and reported

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam/heat produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

a) For Boiler:

$EG_{thermal,boiler} = Q_{steam} * (H_s - H_w) * 4.186 \text{ X } 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

Q_{steam} : 8354.35 Tonnes
H_s : 665.68 kCal/Kg
H_w : 70.62 kCal/Kg
$\eta_{BL,Thermal}$: 100 %
$EF_{FF,CO2}$: 89.5 tCO_2/TJ

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

$EG_{thermal}$ = 8354.35 * (665.68- 70.62) *4.186 X 10^{-6}
= 20.81 TJ

Hence;

$BE_{thermal,CO_2,y}$ = (20.81 /100 %) * 89.5
= 1,862.48 tCO_2e

b) For Heater:

$EG_{thermal} = Q_{flow} * Cp_{out} * \delta_{out} * (T_{out} - T_{in}) * 4.186 \text{ X } 10^{-6}$

Q_{flow}	Flow of heat transfer fluid at the heater outlet (m^3).
Cp_{out}	The specific heat of heat transfer fluid at Tout temperature (kCal/kg. ^{O}C).
δ_{out}	Density of heat transfer fluid at Tout temperature of the heater (kg/m^3).at the outlet of the heater (kg/m^3).
T_{out}	Temperature of the heat transfer fluid at the outlet of the heater (°C).
T_{in}	Temperature of the heat transfer fluid at the inlet of the heater (°C).

$EG_{thermal} = 1.22$ TJ

$BE_{thermal,CO2,y} = 1.22 *89.5*100\%$

$BE_{thermal,CO2,y} = 109.05$

Thus total $BE_{thermal,CO2,y}$ for the project activity = 1,862.48 + 109.05 = 1,971.53 tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO_2/MWh for NEWNE grid

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y}*EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y}*EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$ = 2.27 MWh
$EF_{grid,CM,y}$ = 0.80 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 0.22 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 2.27* 0.80* (1+20/100) + 0.22*1.3* (1+20%)

$= 2.52\ tCO_2e$

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$

$= 2.52 + 0$

$= 2.52\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

The energy generating equipment currently being utilised is not transferred from outside the boundary of the Project activity. Biomass (Rice Husk and mustard husk) consumed in the project activity is not transported to the project site over a distance of more than 200 km. Hence leakage is not considered.

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$ER_y = BE_y – PE_y – LE_y$

Where,

ER_y = Emission reduction in year y (tCO_2e).

LE_y = Leakage in year y (tCO_2e).

PE_y = Project emissions in year *y* (tCO_2e).

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)
Total	1,971.53	2.52	0	1,969

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

Item	Values estimated in ex-ante calculation of registered CPA-DD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	3,258*	1,969

*As per the included CPA-DD, the estimated emission reductions are 12,928 tCO_2e/year. Since the monitoring period is from 01/06/2012 to 31/08/2012 i.e. 92 days (first and last days included), ex-ante emissions have been calculated on a pro-rata basis for this monitoring period considering 365 days of operation each for boiler & heater in a year (12,928/365*92 = 3,258).

E.6. Remarks on difference from estimated value in registered CPA-DD

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0011: Instrument Details

<u>For Boiler</u>

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy / Class	Calibration Date	Calibration Frequency	Calibration Validity
Quantity of steam supplied in year y , (Q_{steam})	Steam Flow Meter	Endress + Hauser	E8010420000	±2.3%	23/09/2011	Once in 3 year*	22/09/2014
Average Steam Temperature at MSSV (Main steam stop valve) outlet during year, (T_{steam})	RTD	Endress + Hauser	E8010420000	Class A	23/09/2011	Once in 3 year*	22/09/2014
Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year (P_{steam})	Pressure Transmitter	Endress + Hauser	E8002B21129	±0.15%	22/08/2011	Once in 3 year*	21/08/2014
Average Feed Water Temperature at inlet of boiler (T_{FWB})	RTD	Endress + Hauser	E8007D142EA	Class A	23/02/2012	Once in 3 year*	22/02/2015
Auxiliary Electricity Consumption of the Project activity from the from Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter	Larsen & Toubro	10895723	Class 1.0	14/02/2012	Yearly**	13/02/2013
Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k}$,)	Weigh Bridge No.1 & No.2	Avery India Limited	EBO5S121	Class- III	20/12/2011	Yearly***	19/12/2012
Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)		TEF Systems	B110325	Class- III	20/12/2011	Yearly***	19/12/2012
Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

For Heater

Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy /Class	Calibration Date	Calibration Frequency	Calibration Validity
Flow of heat transfer fluid at the heater outlet	Differential Pressure transmitter	Rosemount (EMERSON Process Management)	08146022	0.075%	22/11/2011	16 months****	21/05/2013
Average Inlet Temperature of the heat transfer fluid at the inlet of the heater	RTD	WAREE	RTD-PT-100-3210/ RTD-100068	Class II	10/04/2012	Yearly*****	9/04/2013
Average Temperature of the heat transfer fluid at the outlet of the heater	RTD	WAREE	RTD-PT 100 No.3210/ RTD 100066	Class II	10/04/2012	Yearly*****	9/04/2013
Auxiliary Electricity Consumption of the Project activity from the from Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter (Heater)	Larsen & Toubro	10895170	Class 1.0	23/02/2012	Yearly**	22/02/2013

* Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy.

**** Calibration frequency has been fixed according to the manufacturer's specification

***** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

Appendix-9

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 012)
Reference number of the project activity	CPA 4041-0012[105]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	29/06/2012 (Inclusion Date of CPA in Registered PoA 4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (both days included) Start date of emission reduction in this monitoring period: 01/07/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. KOPRAN LIMITED
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	893 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	491 tCO_2e

[105] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=0ZOF2EL3H6WCNAT5BVYSXD4KI9P7UG

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 4 TPH biomass residues (Biomass Briquette) fired boiler at KOPRAN LIMITED as a replacement of existing 3 TPH furnace oil fired equipment for meeting their in house thermal energy requirement. The existing 3TPH, furnace oil based boiler has been scrapped and is cut into pieces as per the requirement of the Directorate of Steam boilers, Government of Maharashtra. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 4 TPH, Multipac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 10.54 kg/cm^2 and has a horizontal fixed grate furnace. The steam generated from the boiler is utilized in solvent recovery plant for distillation purpose, sanitization plant, purification plant and in other heating processes.

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
CPA-4041 0012	KOPRAN LIMITED	Boiler – 4 TPH (From and At 100^0C)	09/12/2010	29/06/2012	01/07/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/07/2012 to 31/08/2012 (both days included) is 491 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
CPA-4041 0012	KOPRAN LIMITED	Plot No. K4/4, Additional MIDC Industrial Area, Village - Birwadi, Taluka - Mahad, District - Raigad 402302, Maharashtra	18.1081^0 North, 73.5189^0 East	India

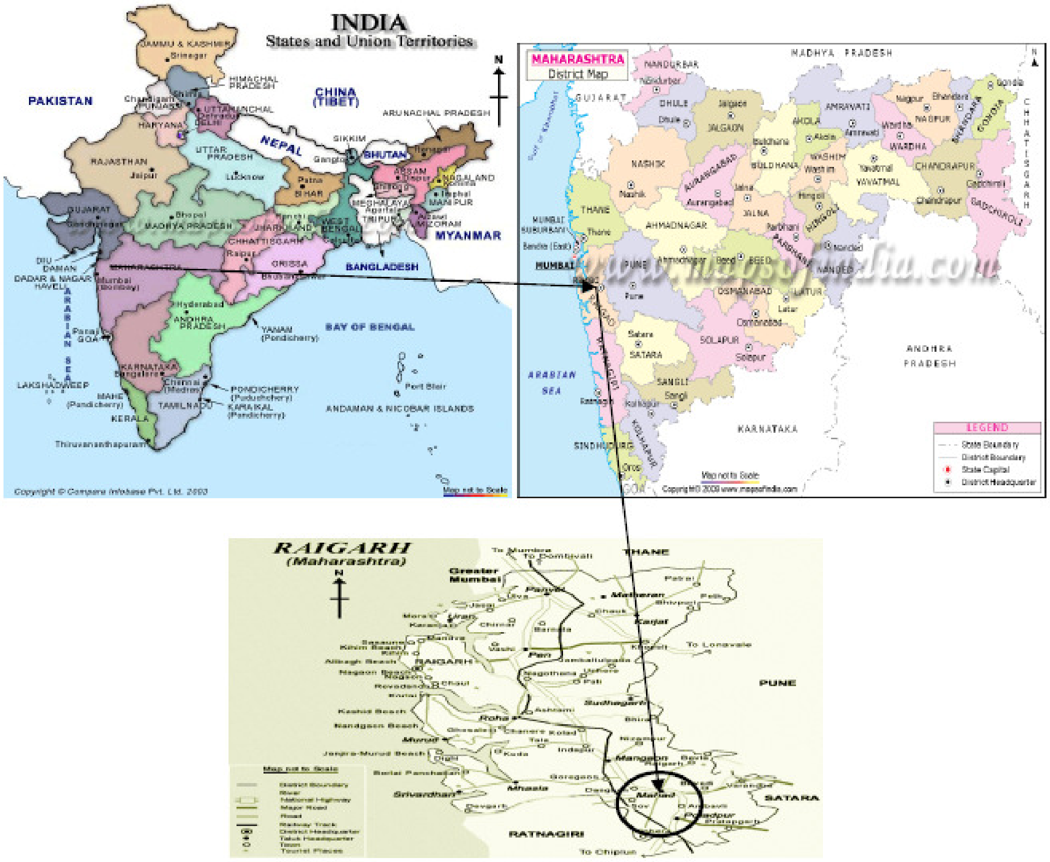


Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [106]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[107]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[108]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[109]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[110]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[111]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/07/2012

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

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106 http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
107 cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
108 http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
109 http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
110 http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
111 http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	Description
CPA Number	012
CPA Operator	KOPRAN LIMITED
Project Scenario	Biomass fired thermal energy generation as a replacement of existing fossil fuel fired equipment.
Type of equipment	Boiler
Equipment capacity	Installation of 4 Tonnes Per Hour (TPH) biomass briquettes fired boiler
Boiler Make	Thermax Limited
Boiler Model	Multipac
Maximum working pressure	10.54 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	4 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Biomass Briquettes)
Type of fuel firing	Manual
Furnace type	Horizontal fixed grate
Boiler Number	IFB40D/10.54/57
Commissioning date	09/12/2010

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently Biomass briquettes as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge, electrical systems, equipment safeties & controls

The CPA operator has utilized biomass for heat generation i.e. Biomass Briquettes, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms" – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the CPA during this monitoring period:**

The project is currently operational as per the monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the CPA like equipment retrofitting, Capacity addition etc. The project boiler was operational throughout the monitoring period.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections

There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology
There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meter
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments (sr. no. 1 to 4) are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data gets transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

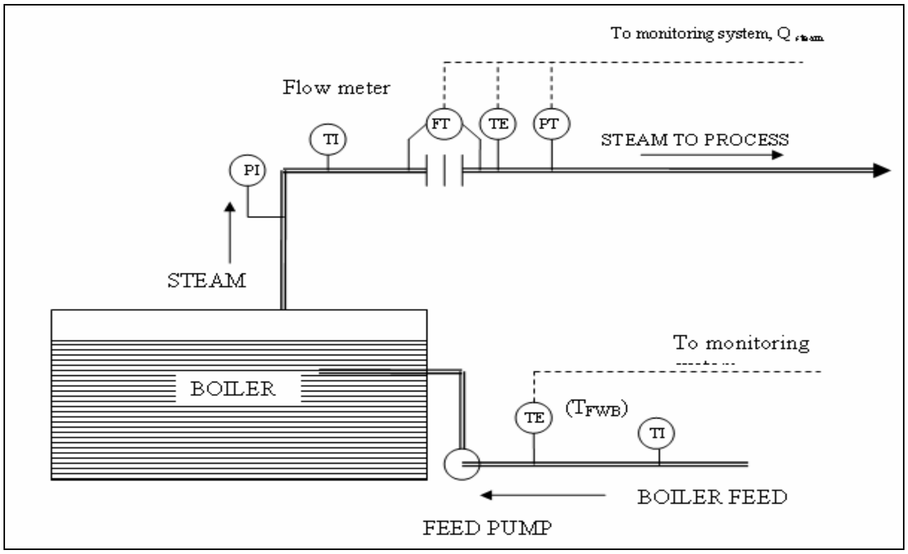

Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid Power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available outside the Project boundary. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Duly calibrated weigh bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,\,k}$/ $Q_{ob,\,i}$
b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$
c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However there was no fossil fuel used during this monitoring period for this CPA.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator). This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system. The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

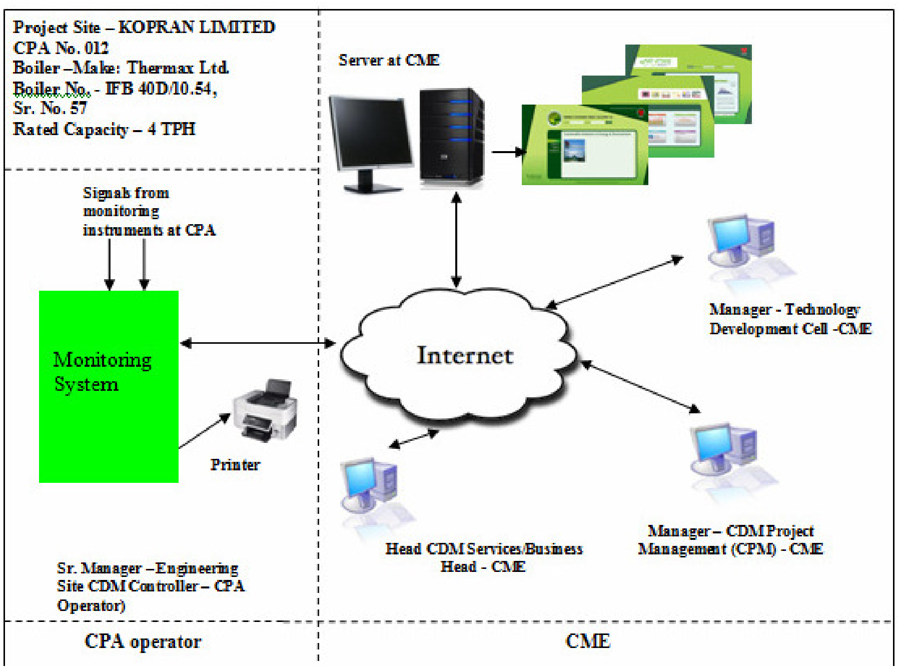

Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

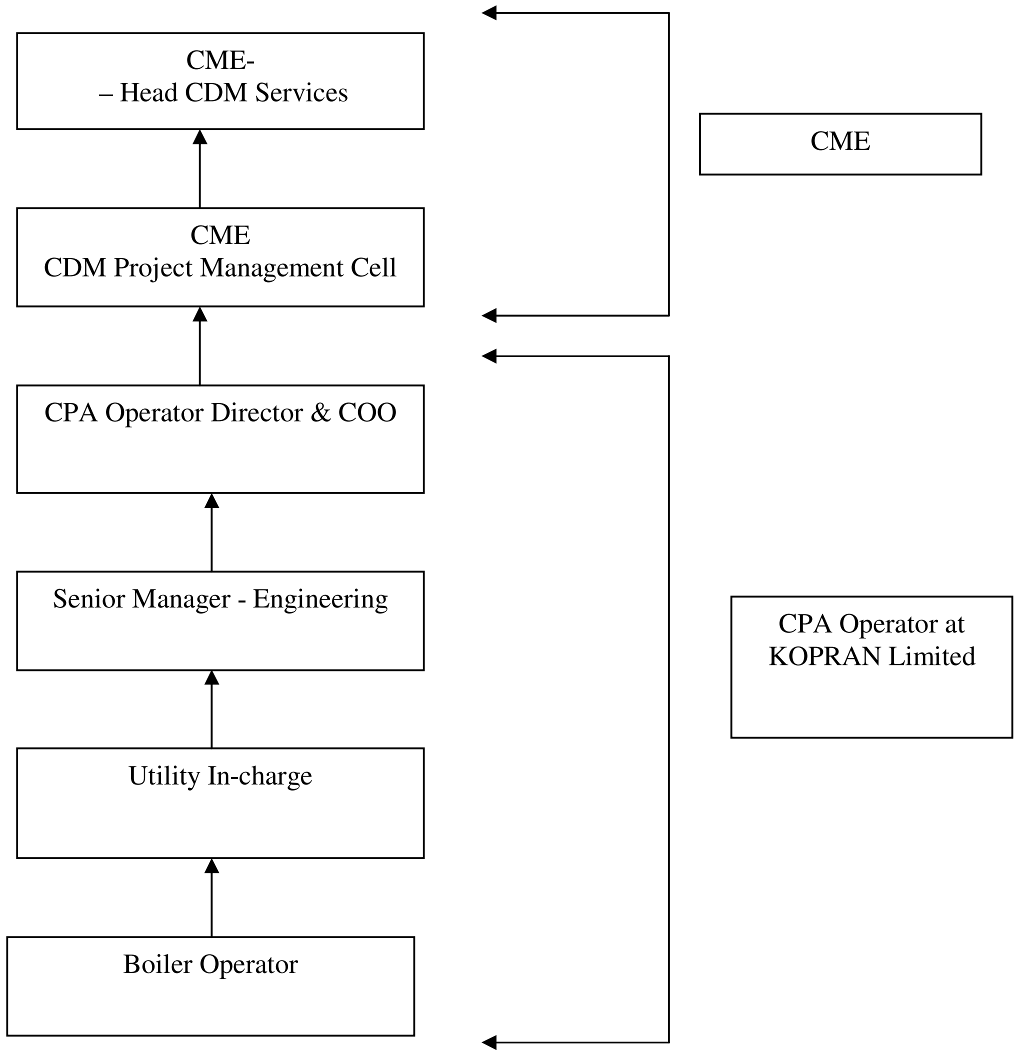

Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator

Key operational roles	**CPA Management Responsibilities**
Director & COO- CPA operator	• Overall Responsibilities of Operation & Management of Project
V. P. Operation	• Quarterly Performance Review • Submission of Documents/Data to CME
Sr. Manager- Engineering (site CDM Controller)	• Performance review –Monthly • Verification / review of data • Internal audits • Review of corrective actions
Utility- In charge	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments

	• Maintenance of key monitoring equipments • Implementation of corrective action
Boiler Operator	• Operation and Maintenance of boiler • Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i.e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation**.**

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	4 (value applicable for the Project activity as per CPA 012)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per para 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 012)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower value has been chosen in conservative manner (Sourced from included CPA-DD)
Value(s) applied	75.5 (value applicable for the Project activity as per CPA 012)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass within identified region
Source of data	Independent Survey report
Value(s) applied	82.97 (value applicable for the Project activity as per CPA 012)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	0.80 - NEWNE Grid (value applicable for the Project activity as per CPA 012)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption". (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 012)
Purpose of data	Project Emission calculation
Additional comment	For this project activity, the electricity consumption source is a Project or leakage electricity consumption source as per the above mentioned Tool, This is inline with the registered PoA-DD, Hence this value is used for the calculating the off-grid (DG) emissions. Presently, available off-grid (DG) is not used for the project activity, hence emissions attributable to the Project activity has been neglected. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{LE,l,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption for biomass processing, outside Project boundary.
Source of data	Third party report based on the field measurement on various equipments for biomass briquettes for electricity consumption for biomass processing.
Value(s) applied	44.24
Purpose of data	Project Emission calculation
Additional comment	Calculated on pro-rata basis for 1290 hrs of operational hours in this monitoring period and the ex-ante value fixed for 8400 hrs in a year as mentioned in the included CPA-DD. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 012)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MW
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	Biomass briquettes - 0.004417 Coal - 0.004390 (value applicable for the Project activity as per CPA 012)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	3164.78[112]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[112] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	171.15[113]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0012 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^2g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	7.41[114]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[113] For the data and calculations, kindly refer Emission reduction spread sheet
[114] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{FWB}
Unit	^{o}C
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	71.81[115]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data will be archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

[115] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/plant record
Value(s) of monitored parameter	108.33
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge slip, Log Book/Plant record.
Value(s) of monitored parameter	756.84
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass briquettes have been measured on Weighbridge outside the plant premise at each delivery. The weighbridge slip with delivery note/invoice has been obtained from the fuel supplier and has been mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log book/plant record
Value(s) of monitored parameter	118.56
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: has been measured on the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/plant record
Value(s) of monitored parameter	746.61
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	The quantity of biomass briquettes consumed can be cross checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes
Description	Quantity of stored fuel type fossil i on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel will be measured on Weighbridge outside the plant premise. The weighbridge slip with delivery note/invoice will be obtained from the fuel supplier and will be mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i}$
Unit	Tonnes
Description	Quantity of fossil fuel type i (Coal) consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$. Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	The quantity of coal consumed will be cross checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 25/05/2012
Value(s) of monitored parameter	15.99
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by paper mode. Monitoring: Analysis from accredited agency according to relevant national standards.
Calculation method (if applicable)	NCV report specifies in kCal/kg and accordingly the same is converted to TJ/Gg
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and will be applied only when the laboratory analysis mentions GCV in their analysis report. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	% water
Description	Moisture content of the biomass residues
Measured/Calculated /Default	-
Source of data	-
Value(s) of monitored parameter	Not applicable as laboratory analysis report provides NCV directly
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and will be applied if the laboratory analysis mentions GCV in their analysis report. The weighted average should be calculated for each monitoring period and used in the calculations. Since the report gives the NCV, this value is not applied.
QA/QC procedures	-
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Unit</td><td>TJ/Gg or GJ/t</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of the fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated or Measured</td></tr>
<tr><td>Source of data</td><td>
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>-</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>-</td></tr>
<tr><td>QA/QC procedures</td><td>If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted.
$NCV_i = NCV_{j,y}$
i is the fuel type combusted in process j during the year y.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	32.05
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	0
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0012 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data will be archived by Electronic/Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	Km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	517.69
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	65
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,c, y}$
Unit	Km
Description	Average round trip distance (from and to) between the biomass fuel supply sites and the site of biomass processing in year y
Measured/Calculated /Default	Calculated
Source of data	Data / declaration from supplier
Value(s) of monitored parameter	76.23
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	-
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,c,y}$
Unit	--
Description	Number of truck trips during the transportation of biomass to the biomass processing site in year y
Measured/Calculated /Default	Measured
Source of data	Data / declaration from supplier
Value(s) of monitored parameter	199
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	The CPA operator shall ensure provision of this parameter from the biomass supplier in the form of declaration. Monitoring Frequency: Continuous, at each trip
Calculation method (if applicable)	NA
QA/QC procedures	The data has been checked for consistency of the number of truck trips with quantity of biomass combusted
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$EF_{CO2,i,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/GJ</td></tr>
<tr><td>Description</td><td>Weighted average CO_2 emission factor of fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)</td></tr>
<tr><td>Monitoring equipment</td><td>NA</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data Archiving: Data will be archived by Paper mode.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>For a) and b): Measurements should be undertaken in line with national or international fuel standards
For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For c): Review appropriateness of the values annually
For d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures</td><td>Applicable where Option B is used.
For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

D.3. Implementation of sampling plan

No sampling plan needed over the monitoring period since **100% data are monitored and reported**

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 X 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

Q_{steam} : 3164.78Tonnes
H_s : 661.30 kCal/Kg
H_w : 71.81 kCal/Kg
$\eta_{BL,Thermal}$: 100%
$EF_{FF,CO2}$: 75.5tCO_2/TJ

Thus,
$EG_{thermal}$ = 3164.78 * (661.3- 71.81) *4.186 X 10^{-6}
= 7.81TJ

Hence;
$BE_{thermal,CO_2,y}$ = (7.81/100 %) * 75.5
= 589.61 tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:

Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y}= EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO_2/MWh for NEWNE grid

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$ = 32.05 MWh
$EF_{grid,CM,y}$ = 0.80 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 0 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 32.05* 0.80* (1+20/100) + 0*1.3* (1+20/100)
= 30.77 tCO_2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
I	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 30.77 + 0$
$= \mathbf{30.77\ tCO_2e}$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity

This part of leakage is not considered as the energy generating equipment currently being utilized is not transferred from outside the boundary of the Project activity

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

This project involves biomass briquettes. Hence leakage due to biomass processing is considered. As the average distance of biomass collection and transportation is more than 200 km, the resulting leakage is also considered. Thus leakage emission is calculated as follows:

Leakage Emissions due to processing of biomass for utilizing electricity:
Leakage Emissions due to processing of biomass for utilizing electricity is calculated using "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption"

$LE_{EC,y} = EC_{LE,l,y} * EF_{EL,l,y} * (1+TDL_{,l,y})$

Where,

$LE_{EC,l,y}$ Leakage emissions from electricity consumption in year *y* (tCO2/yr)
$EC_{ELl,y}$ Net increase in electricity consumption of source *l* in year *y* as a result of leakage (MWh/yr)
$EF_{EL,l,y}$ Emission factor for electricity generation for source *l* in year *y* (tCO2/MWh)
$TDL_{,l,y}$ Average technical transmission and distribution losses for providing electricity to source *l* in year *y*

$EC_{ELl,y}$ has been calculated on pro-rata basis for 1290 hrs of operational hours in this monitoring period and the ex-ante value fixed for 8400 hrs in a year as mentioned in the included CPA-DD.

Hence.
$LE_{EC,y}$ = 44.24*0.80*(1+20%)
= 42.47 tCO_2e

Leakage Emissions due to Transportation of collection of biomass to biomass processing site
Leakage Emissions due to transportation of collection of biomass to biomass processing site is calculated as below
$LE_{collection,y} = N_{c,y}*AVD_{c,y}*EF_{km,CO2}$
Where,

$LE_{collection,y}$	Leakage Emissions due to transportation of collection of biomass to biomass processing site
$N_{c,y}$	Number of truck trips for collecting loose biomass during the year y
$AVD_{c,y}$	Average round trip distance between the biomass fuel supply sites and biomass collection site during the year y
$EF_{km,CO2}$	Average CO_2 emission factor for the trucks measured during year y

Thus,
$LE_{collection,y}$ =199*76.23*0.0005152
= 7.82 tCO_2e

Leakage Emissions due to biomass Transportation of processed biomass to Project site
Leakage Emissions due to transportation of processed biomass to Project site is calculated as below-
$LE_{transportation,y} = N_{,y} * AVD_{,y} * EF_{km, CO2}$
Where:

$LE_{transportation}$	Leakage Emissions due to transportation of processed biomass to Project site
$N_{,y}$	Number of truck trips during the year y
$AVD_{,y}$	Average round trip distance (from and to) between the biomass fuel supply sites and the site of the Project plant during year y (km)
$EF_{km,CO2}$	Average CO_2 emission factor for the trucks measured during the year *y* (tCO_2/km)

Thus,
$LE_{transportation,y}$ = 65*517.69*0.0005152
= 17.34 tCO_2e

So the leakage emission is,
$LE_y = LE_{EC,y} + LE_{collection,y} + LE_{transportation, y}$
=42.47+7.82+17.34
=67.62 tCO_2e

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

The emission reductions have been calculated as per paragraph 30 of the methodology.
$\mathbf{ER_y = BE_y – PE_y – LE_y}$

Where,
ER_y = Emission reduction in year y (tCO_2e).
LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year *y* (tCO_2e).

Therefore; $ER_y = BE_y - PE_y - LE_y$
$= 589.61 - 30.77 - 67.62$
$=$ **491 tCO_2e** (rounded down value)

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)
Total	589.61	30.77	67.62	491

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)	893*	491

*As per the included CPA-DD, the estimated emission reductions are 5,260 tCO_2e/year. Since the monitoring period is from 01/07/2012 to 31/08/2012 i.e. 62 days (both days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (5,260/365*62 = 893).

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

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0012: Instrument Details

Sr. No.	Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Accuracy / Class	Calibration Date	Calibration frequency	Calibration Validity
1	Quantity of steam supplied (Q_{steam})	Steam Flow Meter	Endress + Hauser	E8010220000	±2.3%	23/09/2011	Once in 3 years*	22/09/2014
2	Average Steam Temperature (T_{steam})	RTD	Endress + Hauser	E8010220000	Class A	23/09/2011	Once in 3 years*	22/09/2014
3	Average Steam Pressure (P_{steam})	Pressure Transmitter	Endress + Hauser	E8004121129	± 2 %	15/05/2012	Yearly**	14/05/2013
4	Average Feed Water Temperature (T_{FWB})	RTD	Endress + Hauser	E8007D142EA	Class B	15/05/2012	Yearly**	14/05/2013
5	Auxiliary Electricity Consumption from Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$)	Energy Meter	Schneider Electric	203352/18509-2610	Class 1.0	22/02/2012	Yearly***	21/02/2013
6	$Q_{ob,k}$ (Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site) $Q_{np,k}$ (Quantity of subsequent delivery of fuel type k biomass at the Project site) $Q_{in,k}$ (Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site)	Weigh Bridge	Deligant	SB9831	Class III	05/01/2012	Yearly****	04/01/2013

* Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

**** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy.

Appendix-10

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 013)
Reference number of the project activity	CPA 4041-0013[116]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	29/06/2012 (Inclusion Date of CPA in Registered PoA No.4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (both days included) Start date of emission reduction in this monitoring period: 01/07/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. SHREE SITA EDIBLES PRIVATE LIMITED
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	2,797 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	77 tCO_2e

[116] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=LSPUMIGECTXQ0N8F3JH9V7RO652AWB

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 12 TPH biomass residues (Rice Husk) fired boiler at SHREE SITA EDIBLES PRIVATE LIMITED for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 12 TPH, Combipac boiler manufactured by Thermax Limited. It is designed to work at a maximum pressure of 17.5 kg/cm^2 and has in bed tubes with refractory furnace. The steam generated from the boiler is utilised Thermal Processing of various seeds like soyabean, groundnut, cotton seed, linseed, castor seed etc. for the production of oil and De Oiled Cake (DOC).

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
CPA-4041 0013	SHREE SITA EDIBLES PRIVATE LIMITED	Boiler - 12 TPH (from and At 100^{0}C)	19/03/2012	29/06/2012	01/07/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/07/2012 to 31/08/2012 (both days included) is 77 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
CPA-4041 0013	SHREE SITA EDIBLES PRIVATE LIMITED	Village-Arasnara, Dhamdha road, District-Durg 491001, Chhattisgarh, India	21.3016 ^{0} North, 81.3305 ^{0} East	India

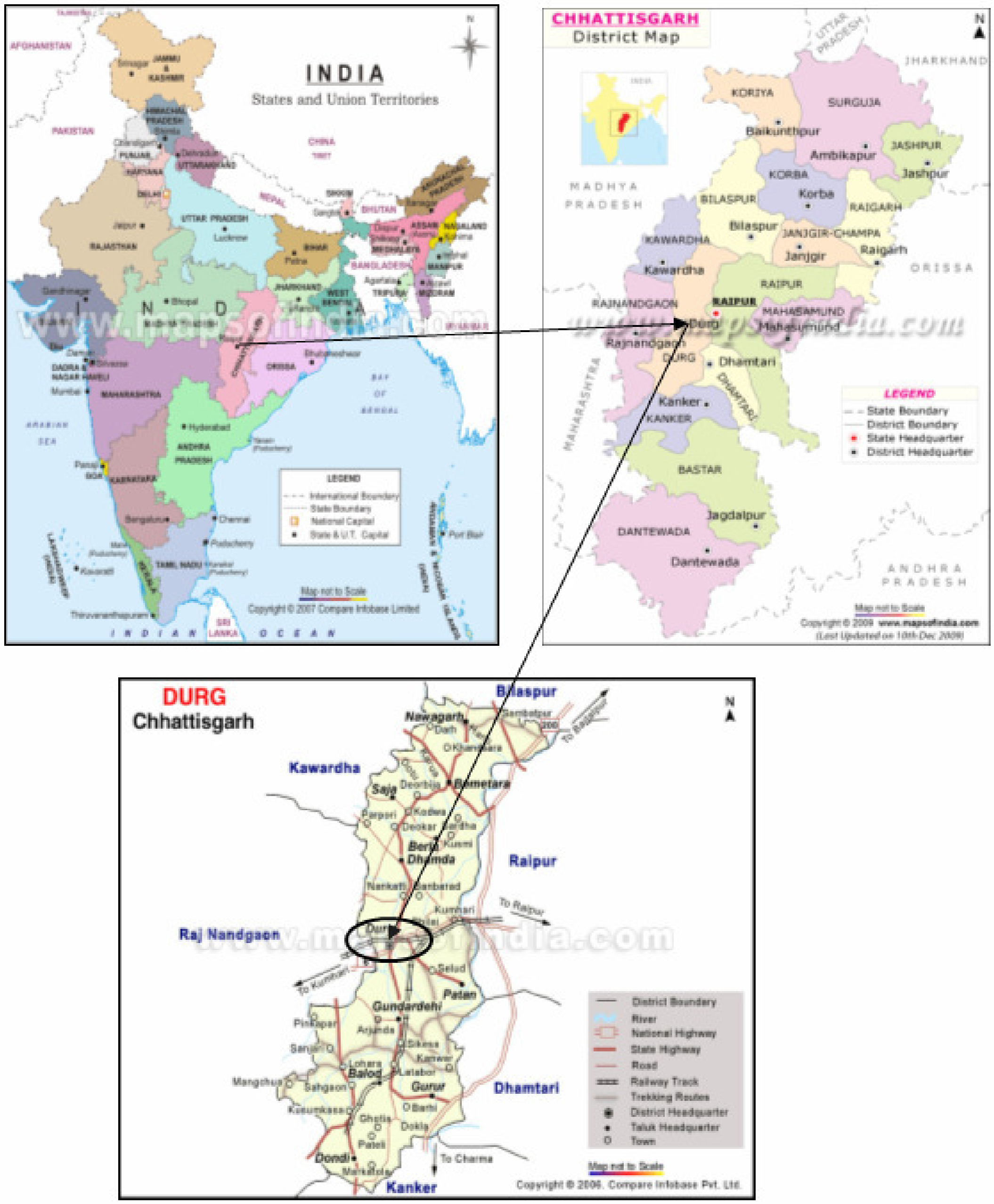

Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51[117]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[118]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[119]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[120]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[121]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[122]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/07/2012

Length of the crediting period: 10 Years

117 http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
118 cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
119 http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
120 http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
121 http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
122 http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	**Description**
CPA Number	013
CPA Operator	SHREE SITA EDIBLES PRIVATE LIMITED
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler
Equipment capacity	Installation of biomass fired boiler having rated steam generation capacity of 12 tonnes per hour (TPH)
Boiler Make	Thermax Limited
Boiler Model	Combipac
Maximum working pressure	17.5 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	12 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as Rice husk)
Type of fuel firing	Automatic firing
Furnace type	In bed tubes with refractory
Boiler Number	CPFD-120/17.5/5
Commissioning date	19/03/2012

The boiler consists of mainly the following parts:

1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently a particular type of biomass fuel
3. Accessories- for various systems like water treatment, storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, flue gas discharge, ash discharge & handling, electrical systems, equipment safety & controls.

The CPA operator has utilized biomasses for heat generation i.e. Rice Husk, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the CPA during this monitoring period:**
The project is currently operational as per the registered monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events

occurred during the monitoring period, which affects the monitoring plan of the project activity like equipment retrofitting, Capacity addition etc.[123]

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections

There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity

There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period

There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	**Monitoring Parameters**	**Measuring instruments**
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument or field instrument integral to steam flow meter.
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meter
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data has been transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

[123] Boiler was not operational for 51days out of 61 days in this monitoring period due to plant shut down

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

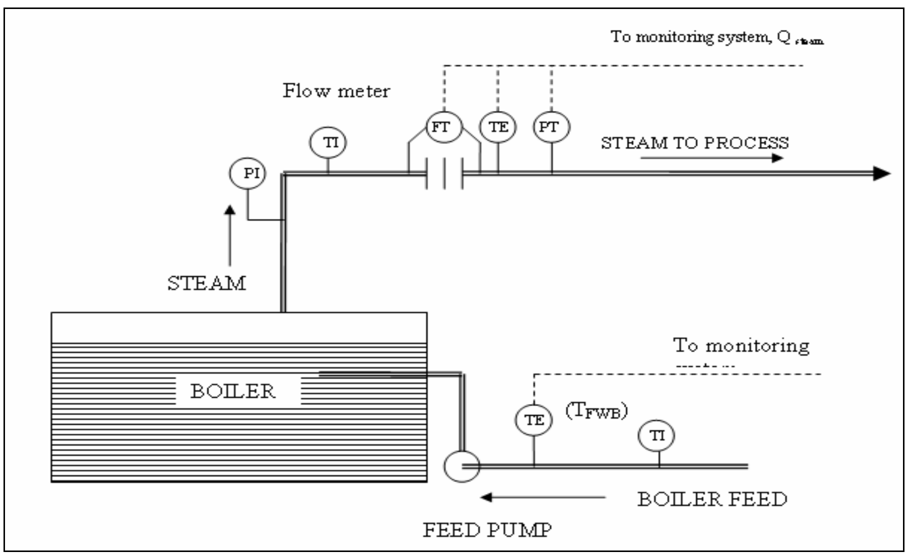

Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) have been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off-grid power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured on the weigh bridge and the same is recorded in the logbook.
Duly calibrated weigh bridge has been used to weigh the biomass consumed in the CPA

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob, k}$/ $Q_{ob, i}$

b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$

c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However there was no fossil fuel used during this monitoring period for this CPA.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator). This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

All the necessary instruments required for monitoring the boiler of this CPA was installed on the heat generating system. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

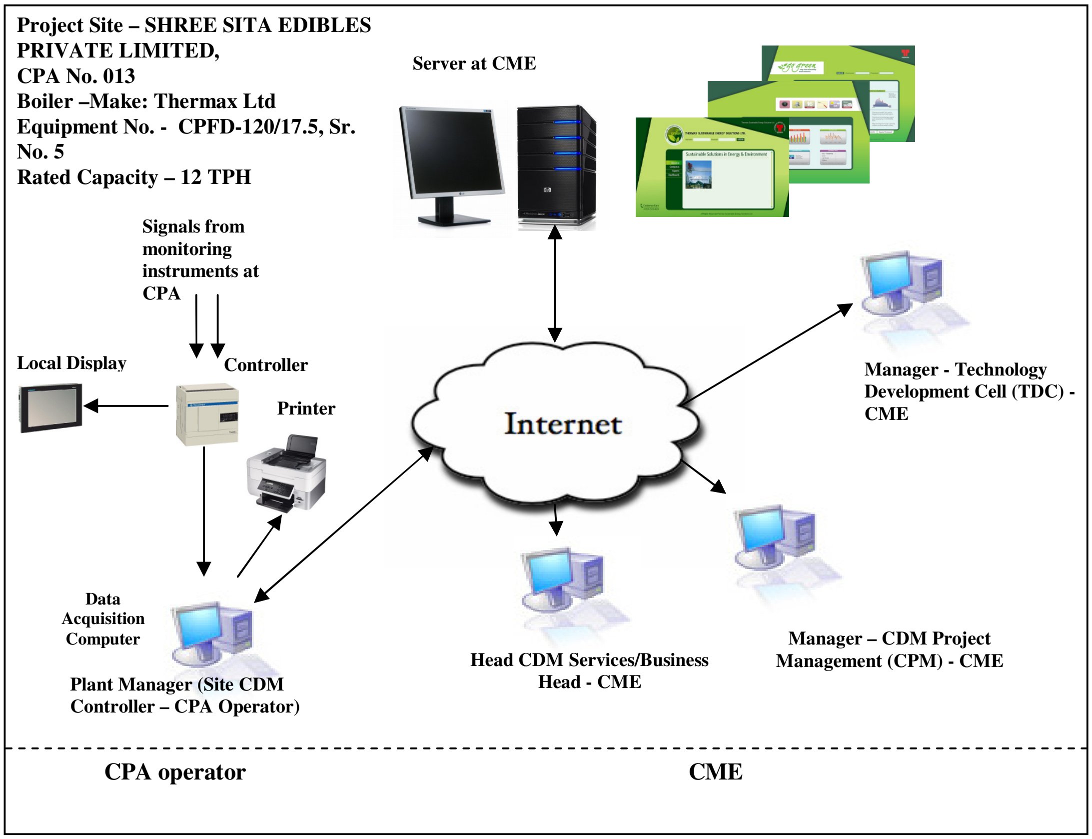

Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

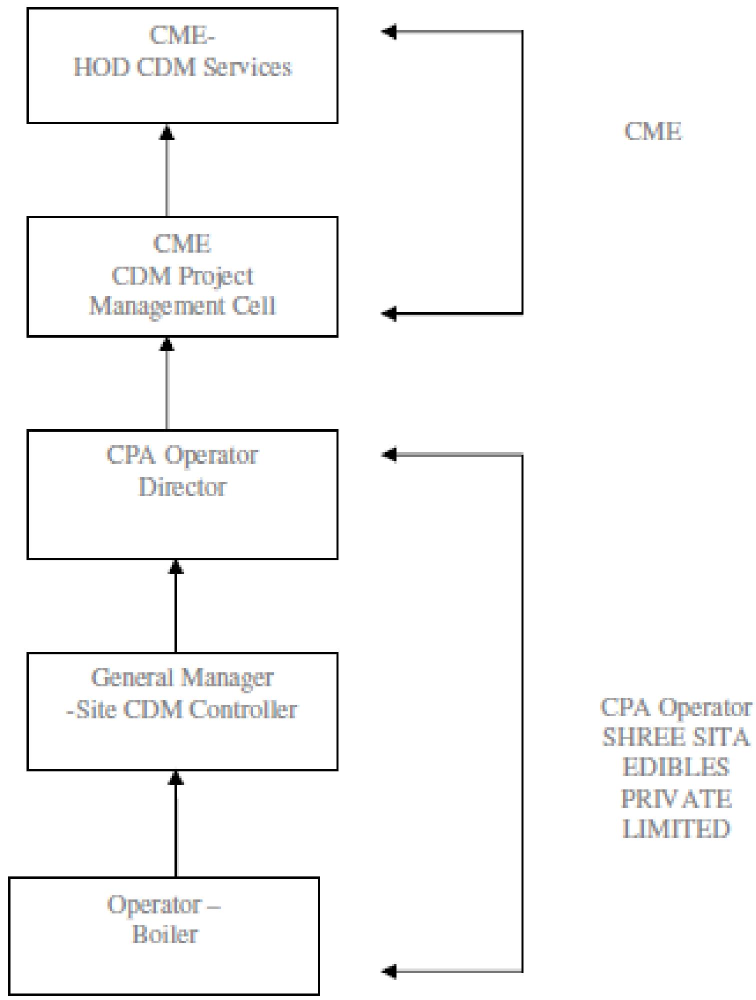

Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator

Key operational roles	**CPA Management Responsibilities**
Director- CPA Operator	• Overall Responsibilities of Operation & Management of Project • Quarterly Performance Review • Submission of Documents/Data to CME
General Manager (Site CDM Controller)	• Performance review –Monthly • Verification / review of data • Internal audits • Review of corrective actions • Verifying & Archiving the data • Verifying & Archiving the data • Checking of monitored data

	• Calibration of key monitoring equipments • Maintenance of key monitoring equipments • Implementation of corrective action
Operator – Boiler	• Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation**.**

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

SECTION D. Data and Parameters

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	12 (value applicable for the Project activity as per CPA 013)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per para 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 013)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower value has been chosen in conservative manner (Sourced from included CPA-DD)
Value(s) applied	89.5 (value applicable for the Project activity as per CPA 013)
Purpose of data	Baseline Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass within 75 km radial distance
Source of data	Third Party Survey report
Value(s) applied	55.06 (value applicable for the Project activity as per CPA 013)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	0.80 -NEWNE Grid (value applicable for the Project activity as per CPA 013)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y} = EF_{EL,l,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j and/or l in year y
Source of data	The value has been considered as per " Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 013)
Purpose of data	Project Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the registered CPA-DD.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature / National data in conservative manner (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 013)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in registered CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MWh
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	Indian Coal – 0.004211 (in case of Indian Coal is used) Rice husk – 0.004260. (value applicable for the Project activity as per CPA 013)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	425.30[124]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[124] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meter
Source of data	On site measurement
Value(s) of monitored parameter	190.02[125]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0013 for Instrument Details.*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	P_{steam}
Unit	kg/cm^2g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	12.89[126]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[125] For the data and calculations, kindly refer Emission reduction spread sheet
[126] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	T_{FWB}
Unit	^{o}C
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	34.21[127]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	65.00
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic/Paper mode. Monitoring: Biomass stored has been recorded on the first day of start of monitoring period and kept as an opening balance in log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[127] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	84.19
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass has been measured on Weighbridge in the plant premise at each delivery and has been mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	18.91
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: measured at the end date of monitoring period and recorded in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	130.28
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	This can be verified with the help of steam generation and steam to fuel ratio
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes
Description	Quantity of stored fuel type fossil i (coal) on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book / Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel will be measured on Weighbridge in the plant premise and will be mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i} = FC_{j,PJ,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$ Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	The quantity of fossil fuel consumed will be cross checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Measured
Source of data	Analysis report of the biomass by external agency dated 20/08/2012
Value(s) of monitored parameter	13.30
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by paper mode. Monitoring: Analysis from accredited according to relevant national/international standards.
Calculation method (if applicable)	Analysis report provides GCV and not NCV. Hence NCV is calculated from GCV. NCV = GCV -0.212H-0.0245M-0.008Y (in GJ/t) Source- http://www.worldcoal.org/pages/content/index.asp?PageID=190 Where H = % Hydrogen in fuel, M= % moisture in fuel, Y = % Oxygen in fuel.
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel by external agency dated 20/08/2012
Measured/Calculated /Default	Measured
Source of data	Laboratory analysis report
Value(s) of monitored parameter	4.03
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and is applied since the laboratory analysis mentions GCV in their analysis report.
QA/QC procedures	Laboratory analysis as per national or international standards
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	Measured
Source of data	Laboratory analysis report by external agency dated 20/08/2012
Value(s) of monitored parameter	31.49
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and is applied since the laboratory analysis mentions GCV in their analysis report.
QA/QC procedures	Laboratory analysis as per national or international standards
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	%
Description	Moisture content of the biomass residues
Measured/Calculated /Default	On-site measurement
Source of data	Laboratory analysis report by external agency dated 20/08/2012
Value(s) of monitored parameter	9.90
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and is applied since the laboratory analysis mentions GCV in their analysis report.
QA/QC procedures	Laboratory analysis as per national standards
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Unit</td><td>TJ/Gg or GJ/t</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of the fuel type i in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated or Measured</td></tr>
<tr><td>Source of data</td><td>
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>
</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>---</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>---</td></tr>
<tr><td>QA/QC procedures</td><td>If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted.
$NCV_i = NCV_{j,y}$
i is the fuel type combusted in process j during the year y.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$FC_{i,j,y}$
Unit	Tonnes
Description	Quantity of fossil fuel type i consumed in a process j during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record
Value(s) of monitored parameter	0 (No fossil fuel type i consumed in a process j during monitoring period)
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	--
QA/QC procedures	--
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	24.13
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	0
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0013 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data will be archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	Km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	14
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	17
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data has been archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year y
Measured/Calculated /Default	Calculated
Source of data	The following data sources may be used if the relevant conditions apply: **Data source** — **Conditions for using the data source** a) Values provided by the fuel supplier in invoices — This is the preferred source b) Measurements by the Project participants — If a) is not available c) Regional or national default values — If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances). d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories — If a) is not available
Value(s) of monitored parameter	NA (No fossil fuel type has been consumed during this monitoring period. Hence not applicable)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	For a) and b): Measurements should be undertaken in line with national or international fuel standards For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures	Applicable where Option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.3. Implementation of sampling plan

No sampling plan needed over the monitoring period since 100% data are monitored and reported

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (kCal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

Q_{steam} : 425.30 Tonnes
H_s : 665.94 kCal/kg
H_w : 34.21 kCal/kg
$\eta_{BL,Thermal}$: 100%
$EF_{FF,CO2}$: 89.5 tCO_2/TJ

Thus,
$EG_{thermal}$ = 425.30 * (665.94- 34.21) *4.186 X 10^{-6}
= 1.125 TJ

Hence;
$BE_{thermal,CO_2,y}$ = (1.125 /100 %) * 89.5
= 100.66 tCO_2e

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

The Project emissions are calculated as per paragraph 26 of the methodology:

Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion";
- CO_2 emissions from electricity consumption by the Project activity using the latest version of "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption";
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)" (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

<u>Scenario A: Electricity consumption from the grid</u>

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y}= EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO_2/MWh for NEWNE grid

<u>Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):</u>

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,J,Y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$ = 24.13 MWh
$EF_{grid,CM,y}$ = 0.80 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 0 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 24.13* 0.80* (1+20/100) + 0*1.3* (1+20%)
= 23.16 tCO_2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 23.16 + 0$
$= 23.16\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity and

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

As per the clarification given in the foot note for paragraph 29 of methodology, 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.

The energy generating equipment currently being utilised is not transferred from outside the boundary of the Project activity. Biomass (Rice Husk) consumed in the project activity is not transported to the Project site over a distance of more than 200 km. Hence leakage is considered to be zero.

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

The emission reductions have been calculated as per paragraph 30 of the methodology.

$\mathbf{ER_y = BE_y - PE_y - LE_y}$

Where,

ER_y = Emission reduction in year y (tCO_2e).
LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year *y* (tCO_2e).

Therefore; $ER_y = BE_y - PE_y - LE_y$
$= 100.66 - 23.16 - 0$

= **77 tCO_2e** (rounded down value)

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)
Total	100.66	23.16	0	77

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

Item	Values estimated in ex-ante calculation of registered CPA-DD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	2,797*	77

*As per the included CPA-DD, the estimated emission reductions are 16,468 tCO_2e/year. Since the monitoring period is from 01/07/2012 to 31/08/2012 i.e. 62days (first and last days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (16,468/365*62 = 2,797).

E.6. Remarks on difference from estimated value in registered CPA-DD

The achieved emission reductions are lower than the ex-ante value of emission reductions in the registered CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0013: Instrument Details

Sr. No.	Description monitoring parameters	Description Of Instrument	Make	Sr. No.	Instrument Accuracy /Class	Calibration Date	Calibration frequency	Calibration Validity
1.	Quantity of steam supplied in year y (Q_{steam})	Steam Flow Meter	Endress + Hauser	ECO29320000	$\pm$2.3%	07/02/2012	Once in 3 years*	06/02/2015
2.	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year,(T_{steam})	RTD	Endress + Hauser	ECO29320000	Class A	07/02/2012	Once in 3 years*	06/02/2015
3.	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year (P_{steam})	Pressure Transmitter	Endress + Hauser	EC172101052	$\pm$ 1.0%	15/06/2012	Yearly**	14/06/2013
4.	Average Feed Water Temperature at inlet of boiler (T_{FWB})	RTD	Bellofram	RTD-01	$\pm$ 1.0%	15/06/2012	Yearly**	14/06/2013
5.	Auxiliary Electricity Consumption of the Project activity from the from Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter	Schneider Electric	203352/18502-2610	Class 1.0	13/06/2012	Yearly***	12/06/2013
6.	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k}$,)	Weigh Bridge	Essae-toraika	950041998	Class-III	24/09/2011	Yearly ****	23/09/2012
	Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

* Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

**** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy

Appendix-11

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

MONITORING REPORT

Title of the project activity	"Promotion of Biomass Based Heat Generation Systems in India" (CPA Number 015)
Reference number of the project activity	CPA 4041-0015[128]
Version number of the monitoring report	4.0
Completion date of the monitoring report	12/12/2012
Registration date of the project activity	29/06/2012 (Inclusion Date of CPA in Registered PoA 4041)
Monitoring period number and duration of this monitoring period	Monitoring period of the PoA : Monitoring Period Number 1 Monitoring Period : 12/01/2011 to 31/08/2012 (both days included) Start date of emission reduction in this monitoring period: 01/08/2012
Project participant(s)	Project Participants: 1. Thermax Sustainable Energy Solutions Ltd. 2. RWE Power Aktiengesellschaft CPA Operator: 1. SKOL BREWERIES LIMITED
Host Party(ies)	India
Sectoral scope(s) and applied methodology(ies)	Sectoral scope: 1 : Energy industries (renewable - / nonrenewable sources) Applied methodology: AMS I.C. "Thermal energy production with or without electricity" (Version 16)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	1,079 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	3 tCO_2e

[128] http://cdm.unfccc.int/ProgrammeOfActivities/gotoCPA?id=S7B6NRHPY5UCTFEWL1MAZIQ28JDGX0

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

(a) Purpose of the component project activity:

The purpose of this small scale Component Project Activity (CPA) is to displace fossil fuel utilization for thermal energy generation by the Promotion of Biomass Based Heat Generation Systems thereby reducing GHG emissions. CPA consists of the installation of 12 TPH biomass residues (biomass briquettes) fired boiler at SKOL BREWERIES LIMITED as a replacement of existing 10 TPH furnace oil fired boiler for meeting their in house thermal energy requirement. Thus the implementation of the CPA results in displacing the thermal energy that would have been generated using fossil fuel based boilers and therefore contributes in GHG emission reduction.

(b) Brief description of the installed technology and equipment:

The CPA consists of installation of 12 TPH, Combipac boiler manufactured by Thermax Limited. It is designed to operate at a maximum pressure of 10.54 kg/cm^2 and has rectangular, refractory lined water cooled furnace. The steam generated from the boiler is utilised in different processes like pasteurization, sterilization, wart boiling and Clean In Place (CIP)

(c) Relevant dates for the component project activity:

UNFCCC ref no.	Name of the CPA operator	Technology details	Date of Commissioning	Date of Inclusion	Start Date of Crediting Period
CPA-4041 0015	SKOL BREWERIES LIMITED	Boiler – 12TPH (At 100^{0}C)	25/07/2012	29/06/2012	01/08/2012

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period i.e. 01/08/2012 to 31/08/2012 (both days included) is 3 tCO_2e

A.2. Location of project activity

UNFCCC ref no.	Name of the CPA operator	Location of CPA	Geographic Coordinate	Host Party (ies)
CPA-4041 0015	SKOL BREWERIES LIMITED	L-5, MIDC Area, Waluj, Aurangabad – 431136, Maharashtra, India.	19.8444^0 North, 75.2000^0 East	India

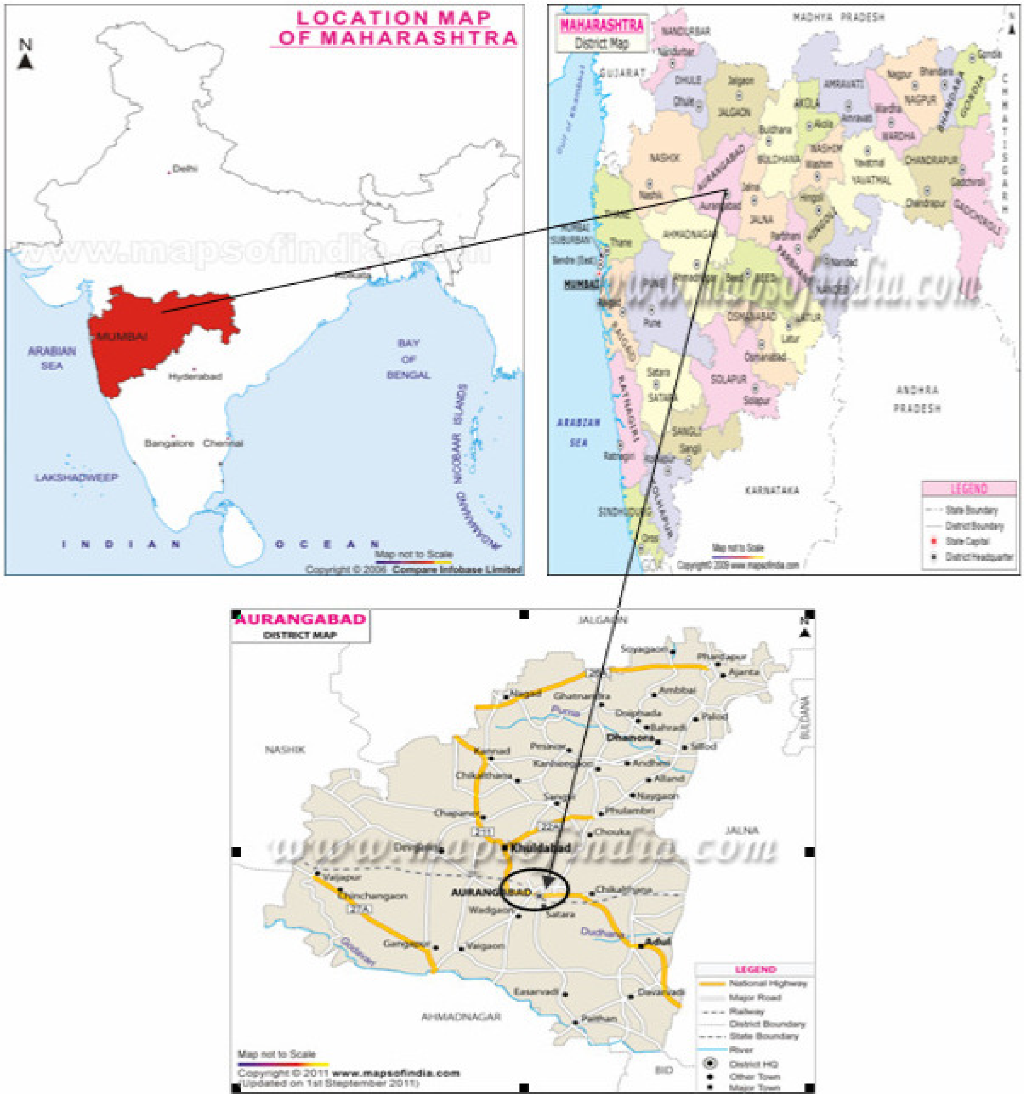

Fig.A.2.1 Physical Location of the CPA

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)
India (host)	Private entity - Thermax Sustainable Energy Solutions Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Private entity- RWE Power Aktiengesellschaft	No
Germany	Private entity- RWE Power Aktiengesellschaft	No

Thermax Sustainable Energy Solutions Ltd. (hereafter referred to as TSESL) India is the Coordinating / Managing Entity (CME) of the PoA. The thermal energy generation from biomass based equipment (boiler) displacing fossil fuel has been addressed as CPA and the Equipment (boiler) Owner has been addressed as 'CPA operator'.

A.4. Reference of applied methodology

Title: AMS- I.C. "Thermal energy production with or without electricity" (Version 16) EB 51 [129]

Reference: The CPA is a small scale PoA Project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM Project activities.[130]

Relevance Tools:
1. "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (version 01 EB 39 Annex 7)[131]
2. "Tool to calculate the emission factor for an electricity system" (Version 02), EB 50 Annex 14[132]
3. "General Guidance on leakage in Biomass Project activities" (Version 03); EB 47; Annex 28[133]
4. "Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion" (version 02) EB 41 Annex 11[134]

A.5. Crediting period of project activity

Type: Fixed Crediting period

Start date of Crediting Period: 01/08/2012

Length of the crediting period: 10 Years

SECTION B. Implementation of project activity
B.1. Description of implemented registered project activity

i. Description of installed technology:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the boiler water, through the heat transfer surfaces of pressure parts, which is converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

[129] http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN
[130] cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[131] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf
[132] http://cdm.unfccc.int/EB/050/eb50_repan14.pdf
[133] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf
[134] http://cdm.unfccc.int/EB/041/eb41_repan11.pdf

Technical Specification of installed equipment (Biomass Fired Boiler):

Parameter	Description
CPA Number	015
CPA Operator	SKOL BREWERIES LIMITED
Project Scenario	Biomass fired thermal energy generation in Greenfield Project
Type of equipment	Boiler
Equipment capacity	Installation of biomass fired boiler having rated steam generation capacity of 12 tonnes per hour (TPH)
Boiler Make	Thermax Limited
Boiler Model	Combipac
Maximum working pressure	10.54 kg/cm^2 (Safety Valve Lift Pressure)
Rated steam generation Capacity	12 TPH From and At 100^{0}C
Saturated OR Superheated steam temperature (applicable for boiler only)	Saturated steam temperature
Type of Biomass Fuel	Biomass residues (hereinafter referred as biomass briquettes)
Type of fuel firing	Automatic firing
Furnace type	Rectangular, refractory lined water cooled
Boiler Number	CPMG120/10.54/5
Commissioning date	25/07/2012

The boiler consists of mainly the following parts:
1. 1. Pressure parts –form heat transfer area, holds steam, water and various mountings.
2. Furnace/ fuel combustor – designed to burn efficiently Biomass briquettes as fuel
3. Accessories- for various systems like water storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, dust collection , water preheating system, flue gas discharge, ash discharge, electrical systems, equipment safeties & controls

The CPA operator has utilized biomass for heat generation i.e. Biomass briquettes, which is in compliance with definition of renewable biomass as per "Glossary of CDM Terms – Version -07.

This CPA involves no technology transfer from Annex 1 country to the host country.

ii. **Actual operation of the CPA during this monitoring period:**
The project is currently operational as per the registered monitoring plan and is implemented in compliance with the included CPA-DD. The project complied with all legal requirements during the current monitoring period. The project performance is normal and there was no any such major events occurred during the monitoring period, which affects the monitoring plan of the CPA like equipment retrofitting, Capacity addition etc.[135]

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations applied for the included monitoring plan during this monitoring period

B.2.2. Corrections

There are no corrections to project information or parameters fixed at validation that have been approved during this monitoring period or submitted with this monitoring report.

[135] The boiler was not operational for 17 days out of 31 days in this monitoring period due to plant shut down

B.2.3. Permanent changes from registered monitoring plan or applied methodology
There are no permanent changes from the included monitoring plan or applied methodology that have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity
There are no changes to the project design of the CPA that have been approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period
There are no changes to the start date of the crediting period that have been approved during this monitoring period or submitted with this monitoring report.

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

SECTION C. Description of monitoring system

The biomass based steam generation system parameters are monitored using Field Instruments, Hardware & Software installed at Project site and Manual data recording in the log book. Measuring instruments used for Monitoring Parameters are listed as follows

Sr. no.	Monitoring Parameters	Measuring instruments
1	Steam Flow	Flow meter
2	Steam Temperature	Directly measured by field instrument integral to steam flow meter.
3	Steam Pressure	Directly measured by separate pressure measuring instrument
4	Feed Water Temperature	Temperature measuring instruments
5	Electrical Energy Consumption	Energy meters
6	Fuel Weighing	Weighing machine (mass meter)

The monitoring parameters from the field instruments (sr. no. 1 to 4) are connected to a monitoring system comprising of computer for local data acquisition &, computation. This data has been transferred to CME server through internet connectivity.

The following parameters has been monitored and recorded during the implementation of project activity.

1) Thermal energy Produced by the System:

The steam flow generated from the biomass boiler has been measured with the help of a steam flow meter. Thus the thermal energy generated from the biomass fired boiler is calculated as the differential value between the thermal energy of the steam at the outlet of the main steam stop valve (MSSV) and the Thermal Energy (Specific enthalpy) of the feed water, measured at the inlet of the boiler at corresponding feed water temperature. The equation is expressed as below:

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$
$EG_{thermal}$ = Net quantity of heat supplied by the Project activity
Q_{steam} = Quantity of steam supplied in Tonnes
H_s = Specific enthalpy of steam at corresponding absolute pressure at the outlet (kCal/kg)
H_w = Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (kCal/kg)

This applies to net quantity of heat supplied calculation for the entire year & the crediting year(s).

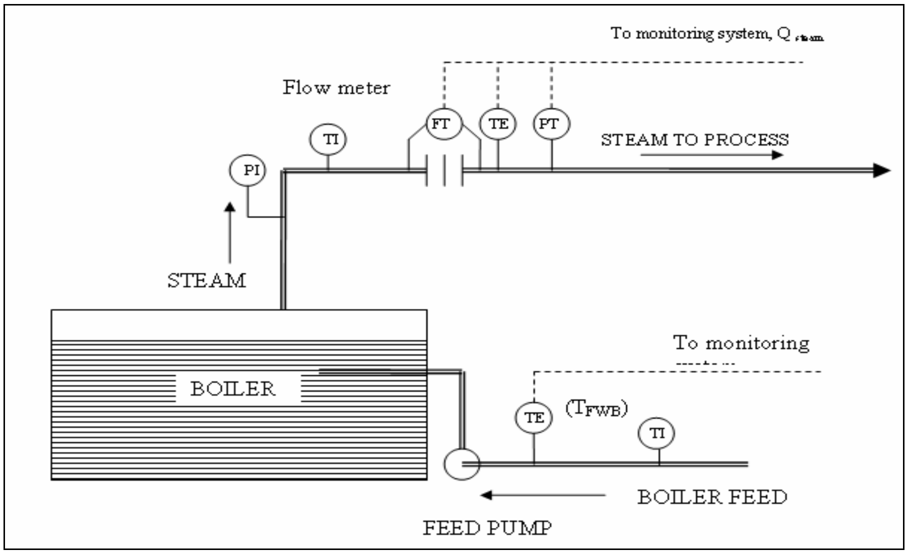

Fig. C.1.1 Schematic Representation of monitoring plan for a boiler

2) Measurement of Electrical Energy Consumption:

Energy meter (dual source type) has been installed for the measurement of electrical energy consumption by the auxiliary equipment of the CPA, supplied by Grid power and off grid power (Diesel Generator power).

3) Measurement of Biomass input for the CPA:

The weigh bridge is available at the Project site. The quantity of biomass coming to the project site is measured in the weigh bridge and the same is recorded in the logbook.

Duly calibrated weigh bridge has been used to weigh the biomass consumed in the CPA.

Monitoring fuel Input in the Boiler:

The following approach has been taken to measure Biomass input to the boiler & also to ensure conservative value applied for Project Emission (PE) / Leakage Emission (LE) calculation:

a. The stored biomass / fossil fuel on the starting date of each monitoring period was measured at the Project site for opening balance as $Q_{ob,\,k}$/ $Q_{ob,\,i}$
b. Each new delivery of biomass/ fossil fuel within the monitoring period have a delivery note that was obtained and recorded from the supplier and a cumulative record of new input biomass / fossil fuel as $Q_{np,k}$ / $Q_{np,,i}$. At the end of each monitoring period, the inventory (remaining quantity of biomass / in storage) is measured as $Q_{in,k}$/ $Q_{in,i}$
c. The consumed biomass / fossil fuel is calculated as $Q_{c,k} = Q_{ob,k} + \Sigma(Q_{np,k}) - Q_{in,k}$, / $Q_{c,k,i} = Q_{ob,i} + \Sigma(Q_{np,i}) - Q_{in,i}$ and has applied for PE / LE calculation

Moisture gain or loss by the biomass is season dependent. Moisture sample is monitored on a monthly basis. The above measurement method ensures the practical method for monitoring biomass / fossil fuel.

4) Measurement of Fossil fuel input for the CPA:

The monitoring of the quantity of fossil fuel input is also based on above method (Sr. no. 3) of measurement. However there was no fossil fuel used during this monitoring period for this CPA.

Description of the Monitoring procedure:

1) **Manual recording:** The boiler parameters have been manually recorded as indicated above by the boiler operational staff at site (CPA operator). This log book have been duly maintained, checked & signed by the operational staff & the site CDM controller (CPA Operator). This manual record of boiler log book has been maintained at site by CPA operator.

2) **Automated boiler performance parameter recording:** The monitoring parameters from the field instruments have been connected to a monitoring system for computation and automatic data acquisition on daily basis. The data archived is transferred to the server of CME periodically (monthly basis) using internet connection. The data has been archived by the CPA Operator and CME.

The Measuring instruments (Sr no 1 to 4 as per table above in Section D) required for monitoring the boiler of this CPA were installed on the heat generating system. The electrical energy consumption is being recorded by the energy meter installed and the readings are being recorded manually on monthly basis. The fuel purchase records are being maintained manually. The source of data collection, frequency of data collection and calibration frequency is as per section D.2 of this document. All field monitoring instruments are connected to a monitoring system for readings display. The reports can be obtained from the monitoring system as and when required.

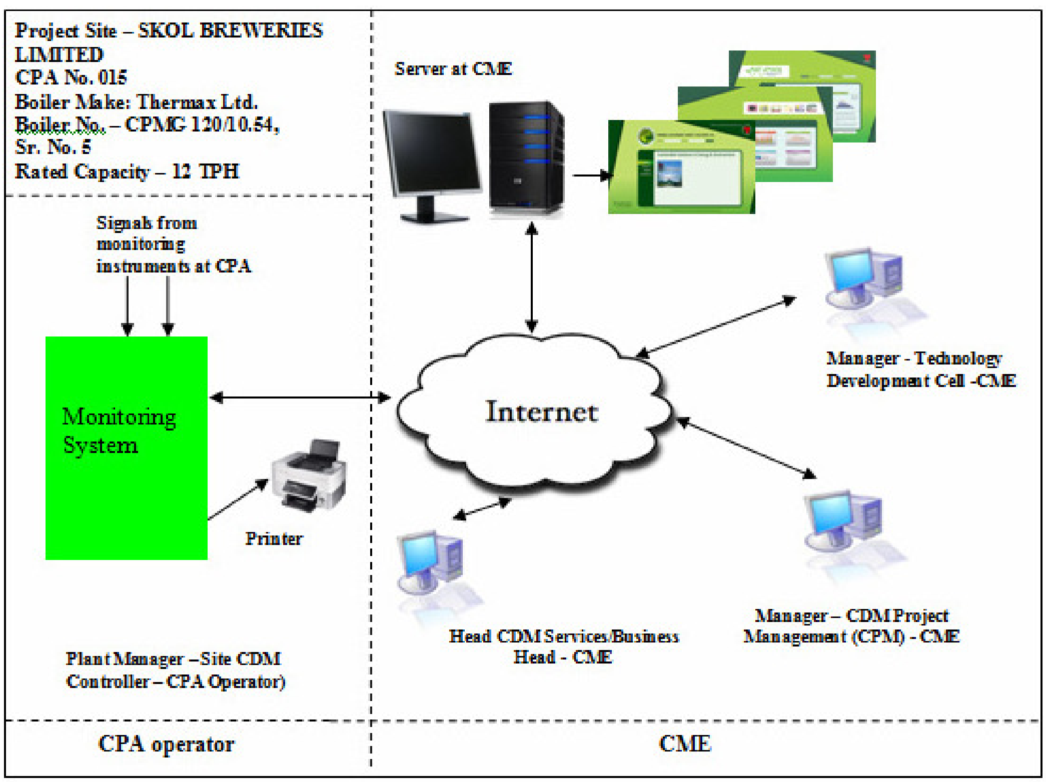

Figure C.1.2 Schematic Representation of Monitoring Plan for CPA under PoA

The project proponent has proposed the following structure for data monitoring, collection, data archiving and calibration of equipments for this CPA. The Monitoring team comprises of the following members.

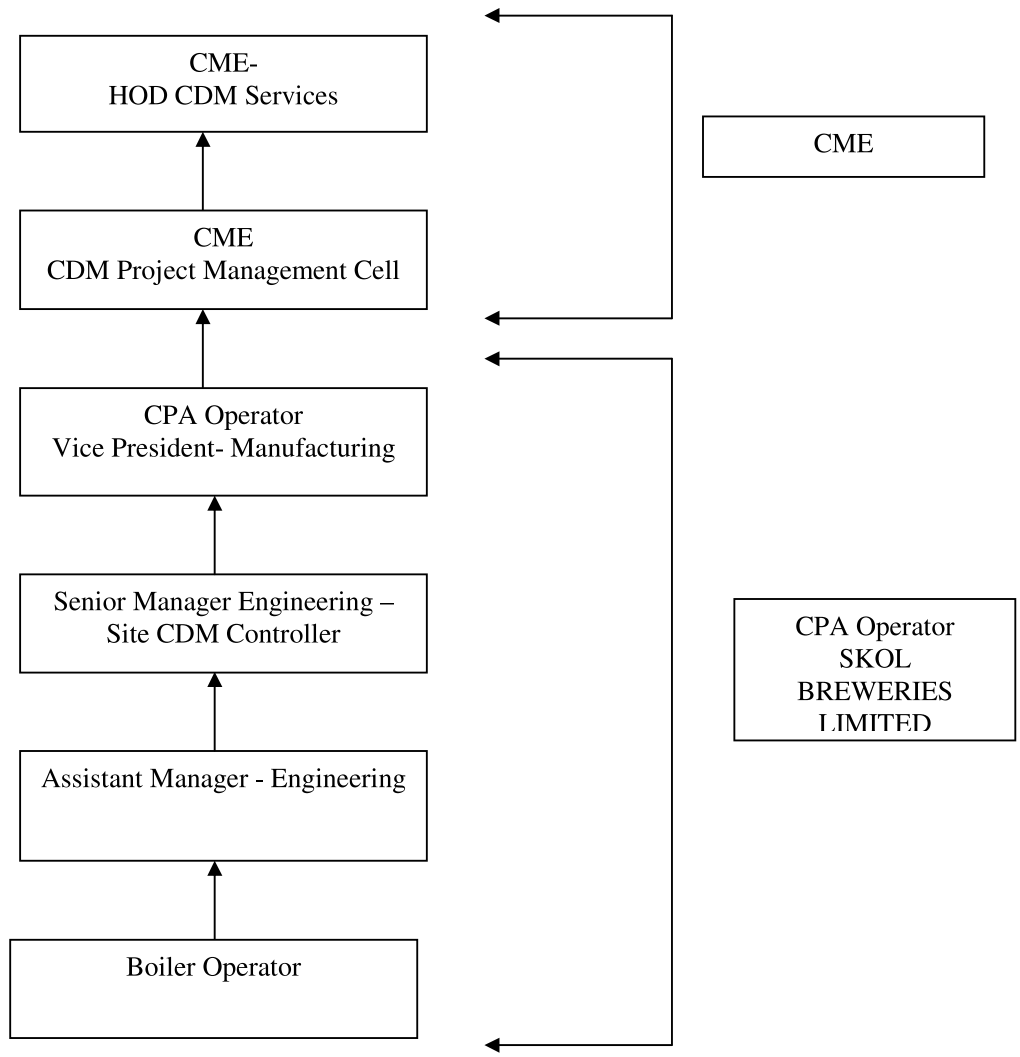

Fig.C.1.3 Monitoring Plan for CPA Implementation by CPA Operator

Key operational roles	**CPA Management Responsibilities**
Vice President- (Manufacturing) CPA Operator	• Overall Responsibilities of Operation & Management of Project. Quarterly Performance Review • Submission of Documents/Data to CME
Senior Manager Engineering – (Site CDM Controller)	• Performance review –Monthly • Verification / review of data • Internal audits • Review of corrective actions
Assistant Manager - Engineering	• Verifying & Archiving the data • Checking of monitored data • Calibration of key monitoring equipments • Maintenance of key monitoring equipments

	• Implementation of corrective action
Operator – Boiler	• Operation and Maintenance of boiler • Recording/Collection of Data • Daily Logbook data maintenance

3) Emergency Preparedness Plan: Boiler Monitoring Data Collection and Archiving:

This plan is prepared in case of partial or total monitoring system failure:

i) Steam flow measurement system failure:

In case of Steam flow measurement system failure, the thermal energy supplied by the CPA will be estimated based on the most conservative approach theoretically possible.

ii) Failure of RTD/ Temperature Transmitter:

In case of failure of the RTD/ Temp Transmitter, the boiler operational staff (CPA operator) will manually record the reading on hourly basis in the log book from the temperature gauge already installed on feed water/steam line of the boiler. The temperature gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration will be carried out by independent accredited third party entity

iii) Failure of Pressure Transmitter:

For pressure transmitter failure, the pressure shall be manually noted from the installed pressure gauges already provided which shall be considered for calculation of emission reduction. The pressure gauge shall be calibrated as per local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. Calibration shall be carried out by independent accredited third party entity

iv) Failure of Energy Meter:

In case of failure of energy meter, the CPA operator will record the failure period of the energy meter. The energy (kWh) consumed in the absence of meter will be calculated considering failure hours and the auxiliary electrical connected load of the boiler i. e. Failure hours*Electrical connected load*Grid/Diesel Generator (DG) emission factor. The time lost in the meter correction / replacement will be recorded in log book and this shall be used for emission reduction calculation.

4) No data transfer to CME's server or Hardware, Software failure at Project Site:

In this case, Project site will continue to record the data automatically. CPA Operator will copy the locally archived data and send it to CME.

During this monitoring period there was no any partial or total monitoring system failure occurred.

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

Data/Parameter	CAP_{boiler}
Unit	Tonnes/hr
Description	Rated capacity (thermal output) of the boiler of the Project activity.
Source of data	Manufacturer's specification
Value(s) applied	12 (value applicable for the Project activity as per CPA 015)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$\eta_{BL,thermal}$
Unit	%
Description	The Efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity
Source of data	Default value of 100% is considered as per paragraph 18 (c) of the applied methodology (as per the included CPA-DD)
Value(s) applied	100 (value applicable for the Project activity as per CPA 015)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{FF,CO2}$
Unit	tCO_{2e}/TJ
Description	CO_2 Emission Factor of the fossil fuel that would have been used in the baseline plant
Source of data	IPCC Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1 (Table 1.4). The lower values has been chosen in conservative manner (Sourced from included CPA-DD)
Value(s) applied	75.5 (value applicable for the Project activity as per CPA 015)
Purpose of data	Baseline Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	SA_k
Unit	%
Description	Surplus availability of Biomass within identified region
Source of data	Independent Survey report
Value(s) applied	87.81 (value applicable for the Project activity as per CPA 015)
Purpose of data	Leakage Emission calculation
Additional comment	This value has been determined ex-ante and valid for the full crediting period as per the included CPA-DD.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Ex-ante Grid Emission Factor in a year y
Source of data	Central Electricity Authority's (CEA's) CO_2 baseline database for the Indian Power sector User Guide (As mentioned in included CPA-DD)
Value(s) applied	0.80 -NEWNEGrid (value applicable for the Project activity as per CPA 015)
Purpose of data	Project Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{EL,j,y}$
Unit	tCO_2/MWh
Description	Emission Factor for fossil fuel based electricity generation for source j in year y
Source of data	The value has been considered as per " Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" (As mentioned in included CPA-DD)
Value(s) applied	1.3 (value applicable for the Project activity as per CPA 015)
Purpose of data	Project Emission calculation
Additional comment	For this project activity, the electricity consumption source is a Project or leakage electricity consumption source as per the above mentioned Tool, This is inline with the registered PoA-DD, Hence this value is used for the calculating the off-grid (DG) emissions. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{LE,l,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption for biomass processing, outside Project boundary
Source of data	Technical specification of electricity consumption for biomass processing.
Value(s) applied	26.99
Purpose of data	Project Emission calculation
Additional comment	Calculated on pro-rata basis for 259 hrs of operational hours in this monitoring period and the ex-ante value fixed for 7200 hrs in a year as mentioned in the included CPA-DD. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EF_{km,CO2}$
Unit	tCO_2/km
Description	Average CO_2 emission factor for the trucks measured during the year y
Source of data	Available literature (Reference: Atmospheric Environment, Volume 43, Issue 34, November 2009, Pages 5510-5517) (As mentioned in included CPA-DD)
Value(s) applied	0.0005152 (value applicable for the Project activity as per CPA 015)
Purpose of data	Leakage Emission calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$TD_{Ll,y} = TD_{Lj,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to source l and/or j in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	20 % (if host country data is not available)
Purpose of data	Project and Leakage Emission calculation
Additional comment	Value is considered as per EB 39 Annex 7, "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption" because, recent, accurate and reliable data within the host country is not available. This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$SEC_{PJ,j,y,measured}$
Unit	TJ/MW
Description	Specific energy consumption of fuel type j of the Project activity in year y
Source of data	As mentioned in included CPA-DD
Value(s) applied	Biomass briquettes - 0.004337 Coal – 0.004311 (value applicable for the Project activity as per CPA 015)
Purpose of data	Not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

D.2. Data and parameters monitored

Data/Parameter	Q_{steam}
Unit	Tonnes
Description	Quantity of steam supplied in year y
Measured/Calculated /Default	Measured
Source of data	On site measurement
Value(s) of monitored parameter	275.48[136]
Monitoring equipment	Steam flow meter *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic/Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{steam}
Unit	°C
Description	Average Steam Temperature at MSSV (Main steam stop valve) outlet
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	162.01[137]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data will be archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

[136] For the data and calculations, kindly refer Emission reduction spread sheet
[137] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	P_{steam}
Unit	kg/cm^{2}g
Description	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	6.79[138]
Monitoring equipment	Pressure transmitter *Kindly refer annex 1_4041-0015 for Measuring Instrument Detail*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	T_{FWB}
Unit	^oC
Description	Average Feed Water Temperature at inlet of boiler
Measured/Calculated /Default	Measured using calibrated meters
Source of data	On site measurement
Value(s) of monitored parameter	84.50[139]
Monitoring equipment	RTD *Kindly refer annex 1_4041-0015 for Measuring Instrument Detail*
Measuring/Reading/ Recording frequency	Recording Frequency: Daily Monitoring Frequency: Continuous Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Calibration certificate has been checked on quarterly basis towards validity of the certificate.
Purpose of data	Baseline Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later

[138] For the data and calculations, kindly refer Emission reduction spread sheet
[139] For the data and calculations, kindly refer Emission reduction spread sheet

Data/Parameter	$Q_{ob,k}$
Unit	Tonnes
Description	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	61.04
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0015 for Measuring Instrument Detail*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Biomass stored has been recorded on the first day of the monitoring period and kept as a opening balance in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,k}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type k biomass at the Project site
Measured/Calculated /Default	Measured
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	401.63
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic/Paper mode. Monitoring: Biomass briquettes have been measured on Weighbridge inside the plant premise at each delivery. The weighbridge slip with delivery note/invoice has been obtained from the fuel supplier and has been mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,k}$
Unit	Tonnes
Description	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	209.17
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic and Paper mode. Monitoring: will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	Quantity of biomass is measured using calibrated weigh bridge to ensure the accuracy of the measurement
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,k} = FC_{biomass,k,y}$
Unit	Tonnes
Description	Quantity of biomass fuel type k consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/plant record
Value(s) of monitored parameter	253.50
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode.
Calculation method (if applicable)	It is calculated by the formula for biomass fuel type $Q_{ob,k}+\Sigma(Q_{np,k})-Q_{in,k}$
QA/QC procedures	The quantity of biomass briquettes consumed can be cross-checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{ob,i}$
Unit	Tonnes
Description	Quantity of stored fuel type fossil i (coal) on the starting date of each monitoring period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: Fossil fuel stored will be measured (by using calibrated Weigh bridge)
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{np,i}$
Unit	Tonnes
Description	Quantity of subsequent delivery of fuel type fossil fuel i (coal)
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode. Monitoring: Fossil fuel will be measured on Weighbridge outside the plant premise. The weighbridge slip with delivery note/invoice will be obtained from the fuel supplier and will be mentioned in the log book.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{in,i}$
Unit	Tonnes
Description	Quantity of remaining fossil fuel type i (coal) available at the end date of each monitored period measured at the Project site
Measured/Calculated /Default	Measured
Source of data	Weigh bridge / Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	Weigh bridge *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Data Archiving: Data has been archived by Electronic and Paper mode. Monitoring: It will be measured by using calibrated weigh bridge.
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$Q_{c,i}$
Unit	Tonnes
Description	Quantity of fossil fuel type i (coal) consumed during the monitoring period
Measured/Calculated /Default	Calculated
Source of data	Log Book/Plant record.
Value(s) of monitored parameter	0 (no fossil fuel was consumed during this monitoring period)
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Data Archiving: Data will be archived by Electronic/Paper mode.
Calculation method (if applicable)	It is calculated by the formula for fossil fuel type $Q_{ob,i}+\Sigma(Q_{np,i})- Q_{in,i}$ Measured Quantity of Fossil fuel type i available at site on the starting date of the monitoring period ($Q_{ob,i}$) in a year y + Quantity of subsequent delivery of Fossil fuel type i at site throughout monitoring period in a year y ($\Sigma(Q_{np,i})$)- Quantity of remaining Fossil fuel type i available at the end date of each monitored period measured at the Project site in a year y ($Q_{in,i}$).
QA/QC procedures	The quantity of coal consumed will be cross-checked with payment receipt /invoice obtained from the fuel supplier.
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	NCV_k
Unit	TJ/Gg
Description	Net calorific value of biomass fuel k used in the Project activity
Measured/Calculated /Default	Calculated
Source of data	Analysis report of the biomass by external agency dated 25/07/2012
Value(s) of monitored parameter	13.58
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Analysis Frequency: Annually. Data Archiving: Data has been archived annually by paper mode. Monitoring: Analysis from accredited agency according to relevant national standards.
Calculation method (if applicable)	Analysis report provides GCV and not NCV. Hence NCV is calculated from GCV. NCV = GCV -0.212H-0.0245M-0.008Y (in GJ/t) Source- http://www.worldcoal.org/pages/content/index.asp?PageID=190 Where H = % Hydrogen in fuel, M= % moisture in fuel, Y = % Oxygen in fuel.
QA/QC procedures	NA
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Hydrogen
Unit	%
Description	Percentage of hydrogen in biomass fuel
Measured/Calculated /Default	Calculated
Source of data	Laboratory analysis report by external agency dated 25/07/2012
Value(s) of monitored parameter	3.70
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived annually by paper mode.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and is applied since the laboratory analysis mentions GCV in their analysis report.
QA/QC procedures	Laboratory analysis as per national or international standards
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Oxygen
Unit	%
Description	Percentage of Oxygen in biomass fuel
Measured/Calculated /Default	Calculated
Source of data	Laboratory analysis report by external agency dated 25/07/2012
Value(s) of monitored parameter	32.59
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Annually Data Archiving: Data has been archived Annually by paper mode. Monitoring: Annual Analysis report.
Calculation method (if applicable)	The purpose of this parameter is to convert the GCV of the fuel to NCV, and is applied since the laboratory analysis mentions GCV in their analysis report.
QA/QC procedures	Laboratory analysis as per national or international standards
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	Moisture
Unit	% water
Description	Moisture content of the biomass residues
Measured/Calculated /Default	On-site measurement
Source of data	Laboratory analysis report by external agency dated 25/07/2012
Value(s) of monitored parameter	7.64
Monitoring equipment	---
Measuring/Reading/ Recording frequency	Recording Frequency: Monthly Data Archiving: Data has been archived by paper mode. Monitoring: Monthly report.
Calculation method (if applicable)	This parameter is a monitored parameter. This parameter shall also be used to convert the GCV of the fuel to NCV, and is applied since the laboratory analysis mentions GCV in their analysis report.
QA/QC procedures	Laboratory analysis as per national or international standards
Purpose of data	This is not used for emission reduction calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Unit</td><td>TJ/Gg or GJ/t</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of the fuel type i (coal) in year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated or Measured</td></tr>
<tr><td>Source of data</td><td><table>
<tr><td>Data source</td><td>Conditions for using the data source</td></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Not applicable as no fossil fuel is consumed in this monitoring period</td></tr>
<tr><td>Monitoring equipment</td><td>NA</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Recording Frequency: Annually
Data Archiving: Data will be archived by Electronic/Paper mode.
Monitoring: Analysis by an independent agency.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>NA</td></tr>
<tr><td>QA/QC procedures</td><td>If the NCV report specifies unit other than TJ/Gg, then it will be appropriately converted.
$NCV_i = NCV_{j,y}$
i is the fuel type combusted in process j during the year y.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

Data/Parameter	$EC_{,PJ,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the Grid in year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	15.63
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0015 for Measuring Instrument Detail*
Measuring/Reading/ Recording frequency	Recording: Monthly Monitoring frequency : Continuous Data Archiving: Data has been archived by Electronic/Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	Measured by calibrated energy meter
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$EC_{EL,j,y}$
Unit	MWh
Description	Auxiliary Electricity Consumption of the Project activity from the off grid Captive Power Plant (Diesel Generator set or Fossil fuel based power source) in a year y
Measured/Calculated /Default	Measured using calibrated meters
Source of data	Log book/Plant record
Value(s) of monitored parameter	0
Monitoring equipment	Electronic Energy Meter *Kindly refer annex 1_4041-0015 for Instrument Details*
Measuring/Reading/ Recording frequency	Monitoring Frequency : Continuous, during power failure Recording: Monthly Data Archiving: Data will be archived by Electronic/Paper mode
Calculation method (if applicable)	NA
QA/QC procedures	NA
Purpose of data	Project Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,y}$
Unit	Km
Description	Average return trip distance (from and to) between the source of the biomass and the site of the Project plant during the year y
Measured/Calculated /Default	Calculated
Source of data	Plant record
Value(s) of monitored parameter	158
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	Biomass is supplied from different sites. Thus this parameter corresponds to the weighted average value of kilometer travelled by trucks that supply the biomass plant calculated against the number of truck trips. Calculated based on the distance kilometres provided buy trucker / supplier
QA/QC procedures	Consistency of distance record provided by trucker / supplier has been checked by comparing recorded distances with other information from other sources (eg. Maps)
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,y}$
Unit	--
Description	Number of truck trips during the year y
Measured/Calculated /Default	Measured
Source of data	Log book/Plant record.
Value(s) of monitored parameter	30
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring Frequency: Continuous, at each trip Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	The data is checked for consistency by comparing the invoice / delivery note
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$AVD_{,c,y}$
Unit	Km
Description	Average round trip distance (from and to) between the biomass fuel supply sites and the site of biomass processing in year y
Measured/Calculated /Default	Calculated
Source of data	Data / declaration from supplier
Value(s) of monitored parameter	70.52
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	Monitoring frequency : Continuous, at each trip Data Archiving: Data will be archived by Paper mode.
Calculation method (if applicable)	NA
QA/QC procedures	-
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

Data/Parameter	$N_{,c,y}$
Unit	--
Description	Number of truck trips during the transportation of biomass to the biomass processing site in year y
Measured/Calculated /Default	Measured
Source of data	Data / declaration from supplier
Value(s) of monitored parameter	97
Monitoring equipment	NA
Measuring/Reading/ Recording frequency	The CPA operator shall ensure provision of this parameter from the biomass supplier in the form of declaration. Monitoring Frequency: Continuous, at each trip
Calculation method (if applicable)	NA
QA/QC procedures	The data has been checked for consistency of the number of truck trips with quantity of biomass combusted
Purpose of data	Leakage Emission Calculation
Additional comment	This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.

<table>
<tr><td>Data/Parameter</td><td>$EF_{CO2,i,y}$</td></tr>
<tr><td>Unit</td><td>tCO_2/GJ</td></tr>
<tr><td>Description</td><td>Weighted average CO_2 emission factor of fuel type i (coal) year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Calculated</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the Project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>NA (No fossil fuel type i (coal) consumed in a process j during monitoring period)</td></tr>
<tr><td>Monitoring equipment</td><td>NA</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data Archiving: Data will be archived by Paper mode.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>For a) and b): Measurements should be undertaken in line with national or international fuel standards
For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For c): Review appropriateness of the values annually
For d): Any future revision of the IPCC Guidelines should be taken into account</td></tr>
<tr><td>QA/QC procedures</td><td>Applicable where Option B is used.
For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.</td></tr>
<tr><td>Purpose of data</td><td>Project Emission Calculation</td></tr>
<tr><td>Additional comment</td><td>This data will be archived up to 2 years after the completion of crediting period or last issuance whichever is later.</td></tr>
</table>

D.3. Implementation of sampling plan
No sampling plan needed over the monitoring period since **100% data are monitored and reported**.

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

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

The baseline emissions are calculated as per paragraph 15 of the methodology:
For steam produced using fossil fuels the baseline emissions are calculated as below:

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

$BE_{thermal,CO_2,y}$	The baseline emissions from steam/heat displaced by the Project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the Project activity during the year y (TJ)
EF_{FF,CO_2}	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the Project activity

$EG_{thermal} = Q_{steam} * (H_s - H_w) * 4.186 \times 10^{-6}$

$EG_{thermal}$	Net quantity of heat supplied by the Project activity (TJ)
Q_{steam}	Quantity of steam supplied in Tonnes
H_s	Specific enthalpy of steam at corresponding absolute pressure and temperature at the outlet (Kcal/kg)
H_w	Specific Enthalpy of feed water at corresponding temperature at the Boiler inlet (Kcal/kg)

Q_{steam} : 275.48 Tonnes
H_s : 660.56 kCal/Kg
H_w : 84.50 kCal/Kg
$\eta_{BL,Thermal}$: 100%
$EF_{FF,CO2}$: 75.5tCO_2/TJ

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

$EG_{thermal}$ = 275.48 * (660.56- 84.50) *4.186 X 10^{-6}
= 0.664 TJ

Hence;
$BE_{thermal,CO_2,y}$ = (0.664 /100 %) * 75.5
= 50.15 tCO_2 e

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

The Project emissions are calculated as per paragraph 26 of the methodology:
Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the Project activity are calculated using the latest version of “Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion”;
- CO_2 emissions from electricity consumption by the Project activity using the latest version of “Tool to calculate baseline, Project and/or leakage emissions from electricity consumption”;
- Any other significant emissions associated with Project activity within the Project boundary;

Project emissions due to electricity consumption

CO_2 emissions from electricity consumption by the Project activity is calculated using the “Tool to calculate baseline, Project and/or leakage emissions from electricity consumption (version 01)” (refer Annex 7, EB 39) as referred in the methodology.

For this CPA the following Scenario applies:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario A: Electricity consumption from the grid

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by grid emission factor ($EF_{grid,CM,y}$).

$$PE_{EC,y} = \sum_{J} EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

Where,

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the Project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

As per the monitoring plan, $EF_{EL,j,y} = EF_{grid,CM,y}$. The combined margin emission factor has been already fixed ex-ante and the value is 0.80 tCO_2/MWh for NEWNE grid.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s):

The Source for off-grid fossil fuel fired captive power plant is Diesel Generator (DG) set (in case of grid failure). The following option has been considered at CPA level, as defined in the tool:

Option B2: Use the following conservative default values:

A value of 1.3 tCO_2/MWh if,

(a) The electricity consumption source is a Project or leakage electricity consumption source; or
(b) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all Project electricity consumption sources at the site of the captive power plant(s).

The emissions for the boiler accessories has been calculated based on electrical energy consumption by accessories measured by energy meter multiplied by off-grid emission factor ($EF_{EL,j,y}$ as per option B2)

Thus,
$PE_{EC,y} = EC_{PJ,j,y} * EF_{grid,CM,y} * (1+TDL_{j,y}) + EC_{EL,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$

Where;

$EC_{PJ,j,y}$ = 15.63 MWh
$EF_{grid,CM,y}$ = 0.80 tCO_2/MWh
$TDL_{j,y}$ = 20 % (Default value)
$EC_{EL,j,y}$ = 0 MWh
$EF_{EL,j,y}$ = 1.3 tCO_2/MWh

$PE_{EC,y}$ = 15.63* 0.80* (1+20/100) + 0*1.3* (1+20%)
= 15.01 tCO_2e

Project emissions from fossil fuel combustion

CO_2 emissions from on-site consumption of fossil fuel by the Project activity is calculated using the latest version of "Tool to calculate Project or leakage CO_2 emissions from fossil fuel combustion"

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	The CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit)
i	Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ is calculated using option B

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$

Where,

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i	Are the fuel types combusted in process j during the year y

As no fossil fuel was used in this monitoring period, project emission from on-site consumption of fossil fuel by the project activity is zero.

$PE_{FC,j,y} = 0$

Thus,

Total Project Emissions $PE_y = PE_{EC,y} + PE_{FC,j,y}$
$= 15.01 + 0$
$= 15.01\ tCO_2e$

E.3. Calculation of leakage

As per para 28 and 29 of the methodology applied, leakage emissions are applicable if:

1. The energy generating equipment currently being utilised is transferred from outside the boundary to the Project activity

This part of leakage is not considered as the energy generating equipment currently being utilized is not transferred from outside the boundary of the Project activity

2. In case collection/processing/transportation of biomass residues is outside the Project boundary, CO_2 emissions from collection/processing/transportation of biomass residues to the Project site.

This project involves biomass briquettes. Hence leakage due to biomass processing is considered. As the average distance of biomass collection and transportation is more than 200 km, the resulting leakage is also considered. Thus leakage emission is calculated as follows:

Leakage Emissions due to processing of biomass for utilizing electricity:
Leakage Emissions due to processing of biomass for utilizing electricity is calculated using "Tool to calculate baseline, Project and/or leakage emissions from electricity consumption"

$LE_{EC,y} = EC_{LE,l,y} * EF_{EL,l,y} * (1+TDL_{,l,y})$

Where,

$LE_{EC,l,y}$ Leakage emissions from electricity consumption in year *y* (tCO2/yr)
$EC_{ELl,y}$ Net increase in electricity consumption of source *l* in year *y* as a result of leakage (MWh/yr)

$EF_{EL,l,y}$ Emission factor for electricity generation for source *l* in year *y* (tCO2/MWh)
$TDL_{,l,y}$ Average technical transmission and distribution losses for providing electricity to source *l* in year *y*

$EC_{ELl,y}$ has been calculated on pro-rata basis for 259 hrs of operational hours in this monitoring period and the ex-ante value fixed for 7200 hrs in a year as mentioned in the included CPA-DD.

Hence.
$LE_{EC,y}$ = 26.99*0.80*(1+20%)
= 25.91 tCO_2e

Leakage Emissions due to Transportation of collection of biomass to biomass processing site
Leakage Emissions due to transportation of collection of biomass to biomass processing site is calculated as below
$LE_{collection,y} = N_{c,y}*AVD_{c,y}*EF_{km,CO2}$
Where,
$LE_{collection,y}$ Leakage Emissions due to transportation of collection of biomass to biomass processing site
$N_{c,y}$ Number of truck trips for collecting loose biomass during the year y
$AVD_{c,y}$ Average round trip distance between the biomass fuel supply sites and biomass collection site during the year y
$EF_{km,CO2}$ Average CO_2 emission factor for the trucks measured during year y

Thus,
$LE_{collection,y}$ =97*70.52*0.0005152
= 3.53 tCO_2e

Leakage Emissions due to biomass Transportation of processed biomass to Project site
Leakage Emissions due to transportation of processed biomass to Project site is calculated as below-
$LE_{transportation,y} = N_{,y} * AVD_{,y} * EF_{km, CO2}$
Where:
$LE_{transportation}$ Leakage Emissions due to transportation of processed biomass to Project site
$N_{,y}$ Number of truck trips during the year y
$AVD_{,y}$ Average round trip distance (from and to) between the biomass fuel supply sites and the site of the Project plant during year y (km)
$EF_{km,CO2}$ Average CO_2 emission factor for the trucks measured during the year *y* (tCO_2/km)
Thus,
$LE_{transportation,y}$ = 30*158*0.0005152
= 2.44 tCO_2e

So the leakage emission is,
$LE_y = LE_{EC,y} + LE_{collection,y} + LE_{transportation,y}$
=25.91+3.53+2.44
=31.87 tCO_2e

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

The emission reductions have been calculated as per paragraph 30 of the methodology.
$\mathbf{ER_y = BE_y - PE_y - LE_y}$

Where,

ER_y = Emission reduction in year y (tCO_2e).
LE_y = Leakage in year y (tCO_2e).
PE_y = Project emissions in year *y* (tCO_2e).

Therefore; ER_y = $BE_y – PE_y –LE_y$
= 50.15 – 15.01 – 31.87
= **3 tCO_2e** (rounded down value)

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)
Total	50.15	15.01	31.87	3

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)	1,079*	3

* As per the included CPA-DD, the estimated emission reductions are 12,706 tCO_2e/year. Since the monitoring period is from 01/08/2012 to 31/08/2012 i.e. 31 days (both days included), ex-ante emissions have been calculated on pro-rata basis for this monitoring period considering 365 days of operation in a year (12,706/365*31 = 1,079).

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

The achieved emission reductions are lower than the ex-ante value of emission reductions in the included CPA-DD. Hence there is no excess of emission reductions.

Annex-1_4041-0015: Instrument Details

Sr. No.	Description monitoring parameters	Description Of Instrument	Make	Sr. No./tag no.	Instrument Accuracy / Class	Calibration Date	Calibration Frequency	Calibration Validity
1	Quantity of steam supplied in year y , (Q_{steam})	Steam Flow Meter	Endress + Hauser	EC002520000	± 2.3%	16/1/2012	Once in 3 year*	15/1/2015
2	Average Steam Temperature at MSSV (Main steam stop valve) outlet during year, (T_{steam})	RTD	Endress + Hauser	EC002520000	Class A	16/1/2012	Once in 3 year*	15/1/2015
3	Average Steam Pressure (gauge) at MSSV (Main steam stop valve) outlet during year, (P_{steam})	Pressure Transmitter	Endress + Hauser	EC004321128	± 2.3%	2/4/2012	Yearly**	1/4/2013
4	Average Feed Water Temperature at inlet of boiler, (T_{FWB})	Temperature transmitter	Endress + Hauser	F201AB14150	Class B	02/03/2012	Yearly**	01/03/2013
5	Auxiliary Electricity Consumption of the Project activity from the from Grid ($EC_{EL,j,y}$) and Off Grid ($EC_{PJ,j,y}$) in year y	Energy Meter	Krykard	80348	Class 1.0	20/04/2012	Yearly***	19/04/2013
6	Quantity of stored fuel type biomass k on the starting date of each monitoring period measured at the Project site ($Q_{ob,k,}$)	Weigh Bridge	Essae Teroka	950052904	Class III	27/04/2012	Yearly****	26/04/2013
	Quantity of subsequent delivery of fuel type k biomass at the Project site($Q_{np,k}$)							
	Quantity of remaining biomass fuel type k available at the end date of each monitored period measured at the Project site ($Q_{in,k}$)							

* Calibration frequency has been chosen once in 3 years as there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification

** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. If local/national standards and manufacturer's specification is not available, it will be as per international standard, but at least once in 3 years. As there is no local/national/international standard that specifies calibration frequency and the calibration frequency is not stated in manufacturer's specification, CPA operator has chosen annual calibration

*** As per the CPA-DD, calibration frequency has to be in line with local/national standard or as per manufacturer's specifications. Eventhough the calibration frequency is not stated in the manufacturing specification and the national standard specifies to calibrate the instrument once in five years, CPA operator has chosen annual calibration

**** As per the CPA-DD, calibration frequency has to be in line with weigh bridge manufacturer's standard / Weight & Measurement department. Calibration of the weigh bridge was done by Weight & Measurement department annualy.

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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