"BIOMASS BASED RENEWABLE ENERGY GENERATION AT KARNAL"

Document Prepared By

Enen Green Services Pvt. Ltd

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The purpose of the project activity is to utilize biomass (rice husk) available in the region for steam generation for captive consumption. The project undertaken includes three steam generation boilers of capacity 12 TPH, 12 TPH and 3 TPH respectively, located at Karnal district in the state of Haryana, India.

Pre – Project Scenario
Prior to initiation of the project activity the Project Proponent (PP) was using Pet Coke based boilers of capacity 12 TPH, 12 TPH, 3 TPH and 8 TPH to fulfil its captive steam requirement of around 28 TPH. 8 TPH boiler was being used as standby.
.

Project Scenario
In the project scenario, three pet coke based boilers (12 TPH, 12 TPH and 3 TPH) have been retrofitted in order to fire rice husk as fuel for steam generation. Only the 8 TPH boiler has not been retrofitted and will run on pet coke only. The same shall be used as a standby in case of emergencies at the project site. The captive steam requirement is same in the pre-project and post project scenario.

Biomass Collection, Transportation, Processing and Handling
A survey was conducted at the project activity site and report has been submitted for availability of Biomass (rice husk). It is confirmed that there is adequate availability of rice husk within 100 km radius around the site. The biomass residue, used as fuel for the project activity, is collected from the local dealers and then transported to the project site by trucks and trolleys. The Biomass laden trucks/trolleys are weighed on electronic weigh bridges installed at the entrance of the plant. The biomass is then stored in the open area at the project site. The biomass does not require any processing as it is ready to be fired as received.

This project activity is estimated to bring about an emission reduction of 508,430 tonnes of CO_2e over the chosen crediting period of ten years with an annual average of approximately 50,843 tonnes of CO_2e.

1.2 Sectoral Scope and Project Type

The project activity falls under the sectoral scope 1: Energy industries (renewable / non-renewable) in accordance with the sectoral scopes defined by the VCS.

This is not a grouped project as it does not involve combination of GHG projects or other project categories. It is a single project and there are no other project participants involved.

Furthermore, in accordance with the Clean Development Mechanism, a part of Green House Gas (GHG) program approved by the VCS board, the project is categorised as follows:

Project Type: Type (I); Renewable energy projects
Project category: C; Thermal energy production with or without electricity
Reference: APPENDIX B; Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories

1.3 Project Proponent

The project proponent is responsible for retrofitting, commissioning and subsequent operation and maintenance of the project activity. The project proponent is also responsible for monitoring and maintaining records as required for the project activity. Modern Dairies Limited is the project participant and all the communication with the DOE as well as with the VCS registry would be the entity listed in the table below:

Organization name	Modern Dairies Limited
Contact person	V. K. Nayyar
Title	Mr.
Address	Post Box No. 3, 136 KM, GT Road, Karnal, Haryana
Telephone	+91-9896113733
Email	works@moderndairies.com

1.4 Other Entities Involved in the Project

There is no other entity involved in the project activity.

1.5 Project Start Date

Project start date: 3rd October, 2012; (The earliest commissioning of 12 TPH, 17.5 kg/cm^2 retrofitted boiler i.e. Boiler 1) [1].

The 2nd Boiler i.e. 12 TPH, 17.5 kg/cm^2 retrofitted boiler was commissioned on 3rd January, 2013 and the 3rd Boiler i.e. 3 TPH, 10.5 kg/cm^2 retrofitted boiler was commissioned on 28th May, 2013 [2].

Duration of the Project Activity: A maximum of 25[3] years. It is to be further noted that all the three boilers have started their initial operation at different dates as mentioned below, and accordingly their end of life time date (after 25 years) varies. Project participant will claim the credit till the end of life time (i.e. $\mathbf{Date}_{\mathbf{baseline\ retrofit}}$) only.

Boiler	**Make**	**Original commissioning date**	**End of life time date (Date $_{\text{baseline retrofit}}$)**
12 TPH (Boiler 1)	Thermax	13 March 2007	12 March 2032
12 TPH (Boiler 2)	IBL	29 June 1999	28 June 2024
3 TPH (Boiler 3)	Thermax	06 March 2003	05 March 2028

[1] Commissioning Certificate
[2] Commissioning Certificates
[3] This is based on the remaining life time of boiler which is determined on the basis of "Tool to determine the remaining lifetime of equipment" version 01, Annex 15, EB 50

1.6 Project Crediting Period

Crediting Period Start Date: 3/10/2012[4]
VCS Project Crediting Period: Ten years, this may be renewed at most twice.
1st Crediting Period: 03/10/2012 – 02/10/2022 (However Project participant will claim the credit till the end of life time (i.e. $\text{Date}_{\text{baseline retrofit}}$) only. Please refer section 1.5 for $\text{Date}_{\text{baseline retrofit}}$)

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	**x**
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
2012-2013	50,843
2013-2014	50,843
2014-2015	50,843
2015-2016	50,843
2016-2017	50,843
2017-2018	50,843
2018-2019	50,843
2019-2020	50,843
2020-2021	50,843
2021-2022	50,843
Total estimated ERs	**508,430**
Total number of crediting years	10
Average annual ERs	50,843

Since the emission reductions from the project activity are below 300,000 tCO_2e per year, it falls under the category of "Project".

1.8 Description of the Project Activity

The purpose of the project activity is to utilize rice husk available in the region for steam generation for captive consumption. The project undertaken includes three Steam generation boilers of capacity 12 TPH, 12 TPH and 3 TPH located at post box No. 3, 136 KM, GT road,

[4] Commissioning Certificate

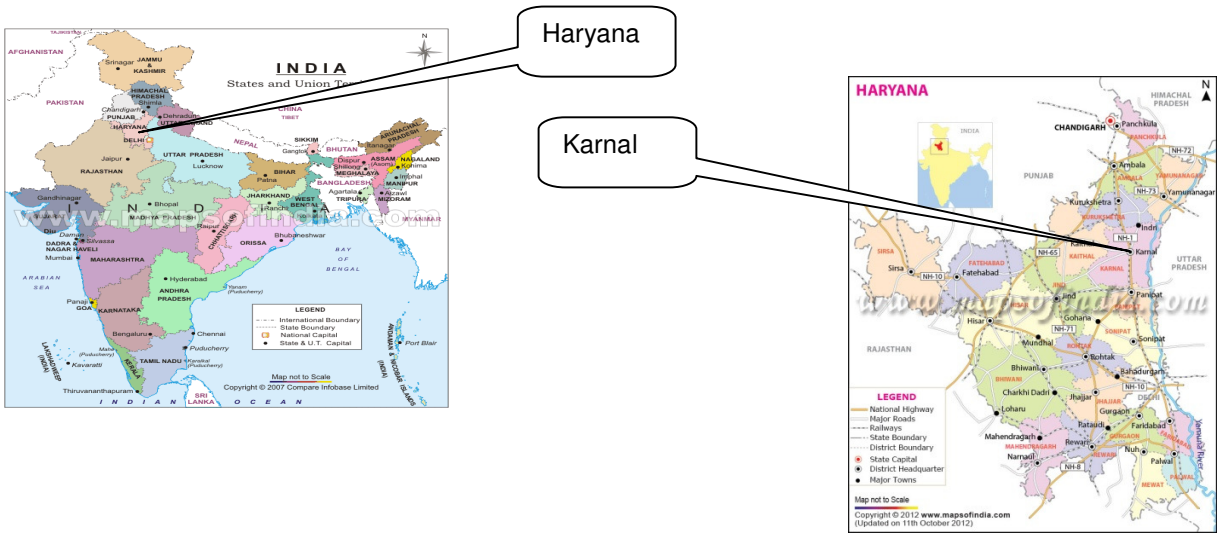
Karnal district of Haryana, India respectively. The detail description of technology used is presented in section 1.1 above.

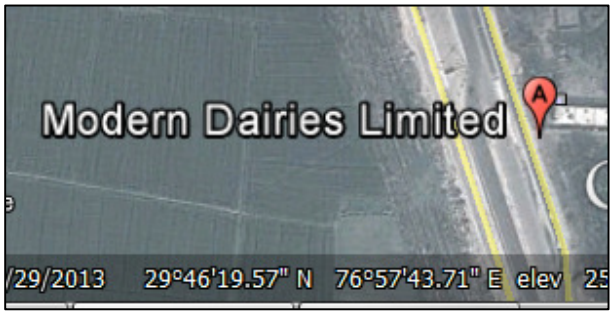
This whole process will support climate change mitigation as it would lead to an emission reduction of 508,430 tonnes of CO_2e over the chosen crediting period of ten years.

Lifetime of the project activity is expected to be 25 years[5].

1.9 Project Location

The project activity is located at Post Box No. 3, 136 KM, GT Road, Karnal district, in the state of Haryana, India. The map illustrating the location of the project plant is depicted below:





The Geographical co-ordinates of the project activity are:

Latitude	:	29°46'19.57" N
Longitude	:	76°57'43.71" E

[5] This is based on the remaining life time of boiler which is determined on the basis of "Tool to determine the remaining lifetime of equipment" version 01, Annex 15, EB 50

1.10 Conditions Prior to Project Initiation

The proposed project activity is a steam generation plant with retrofitted boilers so as to fire biomass (rice husk). Prior to initiation of the project activity the PP was using pet coke as the fuel, to fulfil its captive steam requirement. The original commissioning dates of all the three boilers are mentioned in below table:

Boiler	Make	Original commissioning date	End of life time date (Date $_{baseline\ retrofit}$)
12 TPH (Boiler 1)	Thermax	13 March 2007	12 March 2032
12 TPH (Boiler 2)	IBL	29 June 1999	28 June 2024
3 TPH (Boiler 3)	Thermax	06 March 2003	05 March 2028

The purpose of this project activity is to utilize carbon neutral fuel i.e. rice husk (biomass) for the generation of steam. The project activity avoids anthropogenic greenhouse gas emissions into the atmosphere, estimated to be approximately 50,843 tonnes of CO_2e per annum by retrofitting the boilers installed on site to utilize rice husk instead of pet coke.

In the absence of the proposed project activity the steam would have been supplied to the process by the pet coke based boilers.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

India is a Non-annex 1 country and hence there is no compliance with an emission trading program or any binding limits on GHG emissions for the project activity. The project is a voluntary initiative by M/s. Modern Dairies Limited and has not been implemented to meet any local / national laws or regulatory compliances.

Furthermore, all applicable laws and regulations of the host country (India) have been complied with. The required certification is obtained from the Deputy Director of Boilers under Indian Boiler act. The No Objection Certificate as well as the Consent to Operate has been obtained from the state Pollution Control Board under Air Act and Water Act.

Details of the approvals obtained have been provided below:

“Consent to Establish (NOC for expansion)” obtained from HPCB under the provision of Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Pollution) Act, 1974 dated 13-03-2006

“Consent to Operate” obtained from HPCB under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 and its subsequent amendments dated 02-07-2010

1.12 Ownership and Other Programs

1.12.1 Right of Use

Owner of the project activity is M/s Modern Dairies Limited (MDL) and documents showing proof of title and ownership of the emission reductions are as follows:

- Certificate of Incorporation

- Purchase order of Boilers
- Commissioning Certificate of the Retrofitted boilers
- Purchase orders of biomass (rice husk)

1.12.2 Emissions Trading Programs and Other Binding Limits

The net GHG emission reductions generated by the project activity will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions.

1.12.3 Other Forms of Environmental Credit

The project proponent hereby corroborates that the project activity has not created or sought or received any other form of environmental credit.[6]

1.12.4 Participation under Other GHG Programs

The project activity by MDL has not been registered and is not seeking registration under any other GHG emission program to avail carbon benefits during the crediting period of the project activity.[7]

1.12.5 Projects Rejected by Other GHG Programs

The project proponent hereby corroborates that the project activity has not been rejected by any other GHG program.[8]

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is not a grouped project hence the criteria is not applicable

Leakage Management

This section is not applicable as this is a non - AFOLU project activity.

Commercially Sensitive Information

All relevant information for the purpose of Project description is included in VCS PD. All the information disclosed to the validator has been provided in the public version of the report.

Further Information

Project's contribution to Sustainable Development

The contributions of proposed project activity towards sustainable development are explained with indicators viz. social, economical, environmental, technological well-being, legislative and temporal as follows:

[6] An undertaking by MDL
[7] An undertaking by MDL
[8] An undertaking by MDL

Environmental well-being

The project activity will conserve coal by avoiding the process steam generation from coal fired boiler. It also helps in mitigating the emission of GHG (CO_2) as rice husk is a carbon neutral fuel.

Social well being

The project activity will pave the way for development and increases the social status and living conditions and the prevailing living standard in the vicinity of the project activity and thus results in empowering the nearby. Also it will contribute to a small increase in the local employment by employing skilled and un-skilled personnel for operation and maintenance of the equipment. The Project Activity will result in reduced migration of the local population.

Economic well being

The project has created a business opportunity during construction phase for local stakeholders such as suppliers, contractors etc. contributing to economic well-being aspects. Further, the project also influences creation of employment opportunities for local people, which would enhance their social status. Also, it saves the fossil fuel (coal) and therefore allows it to be diverted to other needy sections of the economy.

Technological well being

The project activity utilizes biomass as fuel to generate steam. The project activity represents the environmentally safe technology for the application.

Legislative:

The Project Proponent has obtained all the relevant approvals required for the establishment and operation of the project activity. All the approvals obtained are mentioned in section 1.11 above.

Temporal:

MDL has not applied for any other kind of renewable or carbon benefit anywhere else for the same.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Title: Thermal energy production with or without electricity
Type: I – Renewable energy project
Category I.C: Thermal Energy production with or without electricity; I.C/Version 19
Sectoral Scope: 01

The reference has been taken from the list of the small-scale CDM project activity categories contained in Appendix B of the simplified M&P for small-scale CDM project activities.

2.2 Applicability of Methodology

The proposed activity is utilization of biomass (rice husk) for steam generation required for various processes at the processing unit. Emission reductions due to the project activity are considered equivalent to the emissions that would have occurred from combustion of fossil fuel in the baseline scenario. Additionally, this is a small-scale project activity as the total annual thermal output is less than 45 $MW_{thermal}$ (please refer worksheet "Input and small scale limit" of emission reduction calculation excel sheet for details). Hence, it qualifies for the category C.

The proposed VCS project activity falls under the Type I and Category C, thus, the position of the VCS project activity vis-à-vis applicability conditions in the AMS-I.C version 19 have been described in the following table. This methodology comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuels under the following conditions:

Sr .No.	**Applicability condition**	**Justification for project activity**
1	This methodology comprises renewable energy technologies that supply users[9] with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.	The proposed project activity at MDL is rice husk (biomass) based thermal energy generation (producing steam) that displaces fossil fuel use. The rice husk being used in the project activity is a waste generated from the rice crop, hence qualifies as renewable biomass residues as per EB 23, Annex-18. This type of project activities is included in the methodology and therefore the proposed project fulfills this requirement.
2	Biomass-based cogeneration systems are included in this category. For the purpose of this methodology "cogeneration" shall mean the simultaneous generation of thermal energy and electrical energy in one process. [10] Project activities that produce heat and power in separate element processes (for example heat from a boiler and electricity from a biogas engine) do not fit under the definition of cogeneration project.	The proposed project activity is generation of steam by using biomass and it is not a biomass based co-generation project. Hence this applicability criterion is not applicable to the project activity.
3	Emission reductions from a biomass cogeneration system can accrue from one of the following activities: a. Electricity supply to a grid; b. Electricity and/or thermal energy (steam or heat)	The proposed project activity is not a biomass based cogeneration project. Hence the given applicability criterion is not relevant to the project activity.

[9] That is residential, industrial or commercial facilities.
[10] This methodology however does not preclude production of heat and power from the same heat generating equipment, for example a portion of steam produced in a boiler is used for process heat and another portion of steam from the same boiler is used for electricity production.

Sr .No.	**Applicability condition**	**Justification for project activity**
	production for on-site consumption or for consumption by other facilities; c. Combination of (a) and (b).	
4	The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal[11] (see paragraph 6 for the applicable limits for cogeneration project activities).	The total installed thermal energy generation capacity of the proposed project activity is only 18.29 MW_{th} thermal energy Thermal energy output capacity for the boiler is not available in the manufacturer's specification in terms of $MW_{thermal}$. Therefore, the capacity is determined by taking the difference between enthalpy of total output leaving the project equipment and enthalpy of input feed water (feed water at 85ºC taking into account the condensate return from boiler).The pre-heater also forms the part of boiler assembly and therefore, the temperature is raised to 85°C (please refer Input and small scale limit spreadsheet for calculation details). Thus, the total rated/ installed thermal energy generation capacity of project equipments is 18.29 MW_{th} which is less than 45 MW_{th}. Hence, the applicability criterion is satisfied by the project activity.
5	For co-fired[12] systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal (see paragraph 6 for the applicable limits for cogeneration project activities).	Not applicable, as Co-firing (biomass along with Fossil Fuel) is not utilized in the project.
6	The following capacity limits apply for biomass cogeneration units: (a) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation	Not applicable, as cogeneration technology is not utilized in the project.

[11]Thermal energy generation capacity shall be manufacturer's rated thermal energy output, or if that rating is not available the capacity shall be determined by taking the difference between enthalpy of total output (for example steam or hot air in kcal/kg or kcal/m^3) leaving the project equipment and the total enthalpy of input (for example feed water or air in kcal/kg or kcal/m^3) entering the project equipment. For boilers, condensate return (if any) must be incorporated into enthalpy of the feed.

[12]A co-fired system uses both fossil and renewable fuels, for example the simultaneous combustion of both biomass residues and fossil fuels in a single boiler. Fossil fuel may be used during a period of time when the biomass is not available and due justifications are provided.

Sr .No.	**Applicability condition**	**Justification for project activity**
	capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.	
7	The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6, and should be physically distinct[13] from the existing units.	The proposed project activity doesn't involve the addition of renewable energy units at the existing renewable facility. The proposed activity involves retrofitting of old boilers (12 TPH, 12 TPH and 3 TPH) for fuel change from Pet coke to rice husk. The rated thermal energy capacity of this project activity is 18.29 $MW_{thermal}$ which is less than 45 $MW_{thermal}$. Hence, the project activity satisfies the applicability criterion.
8	Project activities that seek to retrofit or modify an existing facility for renewable	Proposed project is a retrofit in the existing facility. The proposed activity

[13]Physically distinct units are those that are capable of producing thermal/electrical energy without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

Sr .No.	**Applicability condition**	**Justification for project activity**
	energy generation are included in this category.	involves retrofitting of old boilers (12 TPH, 12 TPH and 3 TPH) for fuel change from Pet coke to rice husk. Thus, the project activity satisfies this applicability criterion.
9	New Facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM methodologies".	Not applicable as the project activity is a retrofit in the existing facility.
10	If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in the emissions reduction calculation.	The project activity is generation of steam by using rice husk in boiler which is a renewable biomass. It does not involve the use of any solid biomass fuel. Hence, this applicability criterion is not applicable to the project activity.
11	Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	As discussed in Para 10 above, the project activity doesn't involve processed solid biomass fuel. Hence the project does not require any manufacturing of solid biomass fuel (briquette). Therefore, this criterion is not applicable to the project activity.
12	If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	Not applicable, as the thermal energy generated by the project activity will be utilized for captive consumption at the MDL facility and will not be delivered to any third party.
13	If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a standalone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into	The project activity doesn't involve utilization of biogas for heat/power production. Hence this criterion is not applicable to the project activity.

Sr .No.	**Applicability condition**	**Justification for project activity**
	account either as project or leakage emissions.	
14	Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources[14] provided: (a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or (b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. These emissions shall be calculated as per the procedures defined in the approved methodology AMS-III.K. [15] Alternatively, conservative emission factor values from peer reviewed literature or from a registered CDM project activity can be used, provided that it can be demonstrated that the parameters from these are comparable e.g. source of biomass, characteristics of biomass such as moisture, carbon content, type of kiln, operating conditions such as ambient temperature.	The project activity involves generation of steam using biomass (rice husk) in the boilers. It is not a charcoal based energy generation project. Hence this applicability criterion is not applicable to the project activity.

As stated above, the proposed VCS project activity meets the applicability criteria mentioned in the applied approved methodology, AMS-I.C., version 19.

The combined thermal energy production for proposed project activity is 18.29 MWth, which is less than the limit of 45MWth; therefore establishing that the proposed project activity is a small scale project activity.

As demonstrated above, the project activity satisfies the qualifying criteria of Type I: Renewable Energy Projects and Category IC: "Thermal energy production with or without electricity". Hence the choice of project Type and category is justified.

2.3 Project Boundary

[14]Refer EB 23, Annex 18 for the definition of renewable biomass.
[15]AMS-III.K "Avoidance of methane release from charcoal production by shifting from traditional open-ended methods to mechanized charcoaling process"

In accordance with § 15 of applied approved methodology AM- I. C., Version 19, the spatial extent of the project boundary encompasses biomass based boilers generating thermal energy (saturated steam) for its application in the processing units of MDL. Thus, project boundary includes biomass storage, biomass fired boilers, steam generation and auxiliary electricity consumption.

The project boundary is illustrated in the diagram below:

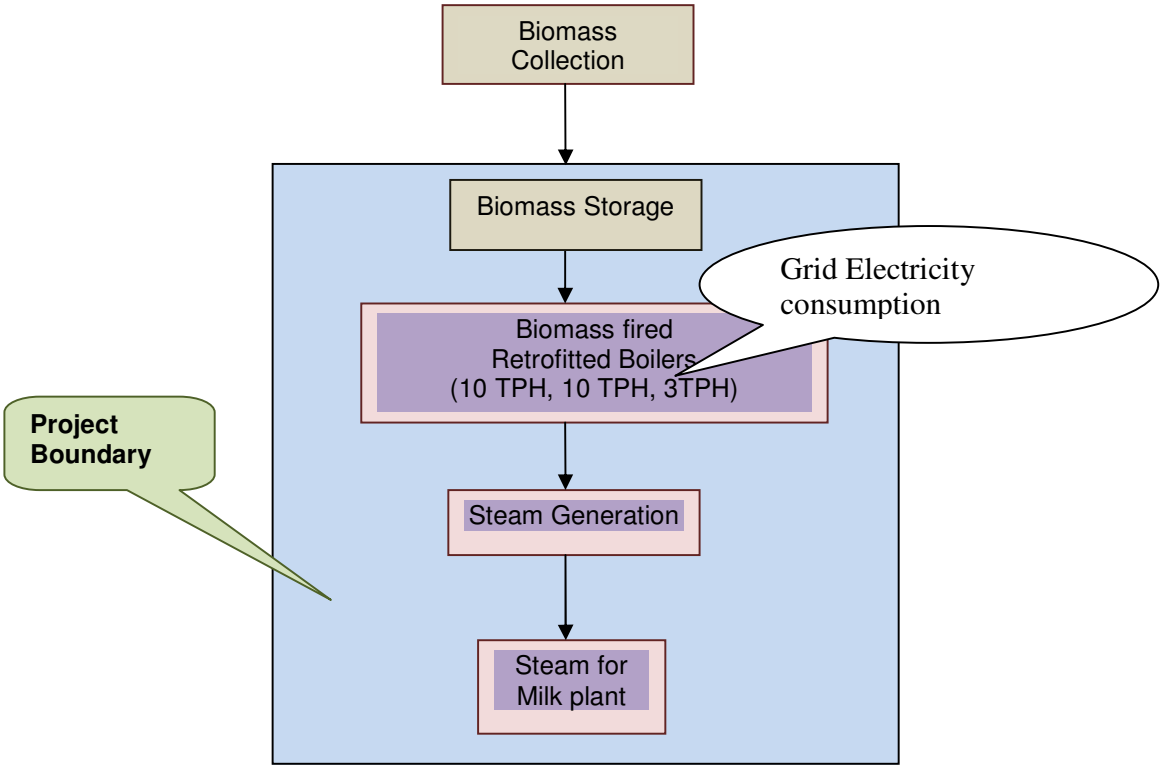


Figure B.3.1: Project boundary

The sources and gases included in the project boundary are enlisted below:

Source		Gas	Included?	Justification/Explanation
Baseline	Steam Generation	CO_2	Included	Main Emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
		Other	Excluded	Excluded for simplification. This is conservative
	Uncontrolled Burning or decay of surplus	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools

Source		Gas	Included?	Justification/Explanation
	Biomass residues.			in the LULUCF sector
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
		Other	Excluded	Excluded for simplification. This is conservative
Project	On site fossil fuel and Electricity consumption due to the project activity	CO_2	Included	CO_2 emissions due to the import of electricity by the project activity will be taken into account. Only possibility of fossil fuel consumption is in the 8 TPH boiler which is not retrofitted and will be kept as stand by boiler. However since it was same in pre-project and project scenario, emissions generated from 8 TPH boiler are not accounted in project emissions.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
		Other	Excluded	Excluded for simplification. This is conservative
	Off site Transportation of biomass residues	CO_2	Excluded	Explained in section 4.1
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
		Other	Excluded	Excluded for simplification. This is conservative
	Combustion of biomass residues for electricity and/or heat generation	CO_2	Excluded	Does not apply to the project activity as there is no uncontrolled burning or decay of biomass residues that would lead to GHG emissions
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	Storage of biomass residues	CO_2	Excluded	Does not apply to the project activity as the biomass residues storage period is less than one year.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	

2.4 Baseline Scenario

Approved methodology AMS-I.C., version 19 has been applied to the project activity as it meets applicability criteria outlined in the methodology. In accordance with §16 of AMS.I.C Version 19, for renewable energy technologies that displace technologies using fossil fuels, the simplified

baseline is "the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced". IPCC default values shall be used only when country or project specific data are not available or demonstrate difficulty to be obtained.

Since total steam generating capacity of the three retrofitted biomass fired boilers is of comparable capacity as in the baseline scenario boilers, in absence of the project activity the existing boilers would been continued in operation and thus become the baseline for the project activity, which fulfills the stipulation made under § 16 of AMS I.C, version 19 which defines the baseline as the technologies that would have been used in the absence of the project activity as described above.

From a legal and regulatory point of view as well as from an economic viewpoint there are no requirements/incentives for MDL to apply any changes to their current practice for thermal energy generation. Therefore the most plausible baseline scenario is continuation of the current practice (business as usual) and faces no barriers, hence, the same has been chosen as the baseline scenario.

2.5 Additionality

The additionality of the project activity is explained on the basis of barrier analysis mentioned in "Guidelines on the Demonstration of Additionality of Small Scale Project activities" version 09, EB 68, Annex 27[16]. The Guidelines on the Demonstration of Additionality of Small Scale Project activities mentions various barriers and requires explanation to show that the project activity would not have occurred due to at least one barrier and that the VCS revenue would significantly act as an impetus for the project to survive.

1. Investment barrier
2. Technological barrier
3. Barrier due to prevailing practice
4. Other barriers

Investment Barrier:

Justification for the applied investment analysis approach:

The guidance provided by CDM EB in its 35th Meeting (Annex 34 - Non-binding best practice examples to demonstrate additionality for SSC project activities), states that, "*Best practice examples include but are not limited to, the application of investment comparison analysis using a relevant financial indicator, application of a benchmark analysis or a simple cost analysis (where CDM is the only revenue stream such as end-use energy efficiency)*". Accordingly, investment comparison analysis using unit cost of generation (INR/MJ) as the financial indicator has been selected and an analysis of the same for feasible alternatives has been carried out. It is clearly demonstrated that a pet coke based thermal energy generation system is the most favorable scenario and according to "Guidelines on the Demonstration of Additionality of Small Scale Project activities." version 09, EB 68, Annex 27 for small scale CDM project activities, the project activity is additional.

In accordance with § 19 of the "Guidance on the Assessment of Investment Analysis", Version 05 which states that "*If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used*", an analysis

[16] https://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

has been carried out to compare the Unit cost in the various credible baseline scenario alternatives for the project activity:

- Fossil fuel i.e. pet coke based thermal energy generation (continued use of the fossil fuel (pet coke)) that was used prior to the implementation of the project activity.
- Biomass (Rice husk) based thermal energy generation to meet the steam requirement of the facility (project activity without VCS).

The assumptions that are common to all scenarios in this unit cost analysis have been listed below. In accordance with § 6 of the "Guidance on the Assessment of Investment Analysis" Version 05, all input values used in the unit cost analysis were applicable at the time of investment decision taken by the project proponent on 30th June 2012[17].

Assumptions considered for the investment comparison are tabulated below:

Parameter	Value	Unit	Source
Steam Quantity Boiler 1 Boiler 2 Boiler 3	 12 12 3	TPH	Technical specification of boiler
Steam Pressure Boiler 1 Boiler 2 Boiler 3	 17.5 17.5 10.5	kg/cm^2	Technical specification of boiler
Steam Enthalpy Boiler 1 Boiler 2 Boiler 3	 2,796.20 2,796.20 2,781.19	kJ/kg	Estimated based on saturated steam pressure; (ChemicaLogic Steam Tab Companion; Steam table)
Feed water Enthalpy Boiler 1 Boiler 2 Boiler 3	 355.94 355.94 355.94	kJ/kg	Estimated based on feed water temperature (85℃); Liquid property (ChemicaLogic Steam Tab Companion)
Operating hours	7,920	hr/annum	As per information from M/s Modern Dairies Limited and plant operating hours as per industrial practices
Pet coke calorific value	7,770	kcal/kg	Lab test report
Biomass calorific value	2,800	kcal/kg	Lab test report
Pet coke Price	7,400	INR/Tonne	As per supplier's invoices
Biomass Price	3,200	INR/Tonne	As per supplier's quotations

Unit cost comparison analysis[18]:

Boiler 1:

[17] Board resolution dated 30 June 2012.
[18] For further supporting sources, please refer to annex 1.

Parameter	Pet coke	Rice husk	Unit
Quantity of steam generated	12	12	TPH
Design efficiency of boiler*	0.80	0.74	%
Conversion factor	4.187	4.187	k/kcal
Fuel calorific value	7,770	2,800	kcal/kg
Running hours	7,920	7,920	Hrs per annum
Enthalpy of steam output	2,796	2,796	kJ/kg
Enthalpy of feed water	356	356	kJ/kg
Boiler output	292,83,120	292,83,120	kJ/hr
Energy input in boiler	366,03,900	395,71,784	kJ/hr
Specific energy consumption	7,28,558	7,87,630	kcal/MT of steam
Fuel consumption rate	94	281	kcal / MT of steam
Annual fuel requirement	8,911	26,734	MT/annum
Price	7,400	3,200	INR./Tonne
Fuel Cost per year	659	856	INR in Lakhs[19] per year
Total steam generated	95,040	95,040	Tonnes/year
Unit cost of energy generation	693	900	INR/ Tonne
Thermal energy per tonne of steam	24,40,260	24,40,260	INR/Tonne
Total Unit cost of energy generation	**0.28**	**0.37**	**INR/MJ**

Boiler 2:

Parameter	Pet coke	Rice husk	Unit
Quantity of steam generated	12	12	TPH
Design efficiency of boiler*	0.80	0.74	%
Conversion factor	4.187	4.187	kJ/kcal
Fuel calorific value	7,770	2,800	kcal/kg
Running hours	7,920	7,920	Hrs per annum
Enthalpy of steam output	2,796	2,796	kJ/kg
Enthalpy of feed water	356	356	kJ/kg
Boiler output	292,83,120	292,83,120	kJ/hr
Energy input in boiler	366,03,900	395,71,784	kJ/hr
Specific energy consumption	7,28,558	7,87,630	kcal/MT of steam
Fuel consumption rate	94	281	kcal / MT of steam
Annual fuel requirement	8,911	26,734	MT/annum
Price	7,400	3,200	INR./Tonne

[19] 1 Lakh is equal to 0.1 Million.

Fuel Cost per year	659	856	INR in Lakhs per year
Total steam generated	95,040	95,040	Tonnes/year
Unit cost of energy generation	693	900	INR/ Tonne
Thermal energy per tonne of steam	24,40,260	24,40,260	kJ/Tonne
Total Unit cost of energy generation	**0.28**	**0.37**	**INR/MJ**

Boiler 3:

Parameter	Pet coke	Rice husk	Unit
Quantity of steam generated	3	3	TPH
Design efficiency of boiler*	0.80	0.74	%
Conversion factor	4.187	4.187	kJ/kcal
Fuel calorific value	7,770	2,800	kcal/kg
Running hours	7,920	7,920	Hrs per annum
Enthalpy of steam output	2,781	2,781	kJ/kg
Enthalpy of feed water	356	356	kJ/kg
Boiler output	72,75,750	72,75,750	kJ /hr
Energy input in boiler	90,94,688	98,32,095	kJ /hr
Specific energy consumption	7,24,076	7,82,785	kcal/MT of steam
Fuel consumption rate	93	280	kcal / MT of steam
Annual fuel requirement	2,214	6,642	MT/annum
Price	7,400	3,200	INR/Tonne
Fuel Cost per year	164	213	INR in Lakhs per year
Total steam generated	23,760	23,760	Tonnes/year
Unit cost of energy generation	690	895	INR/ Tonne
Thermal energy per tonne of steam	24,25,250	24,25,250	kJ/Tonne
Total Unit cost of energy generation	**0.28**	**0.37**	**INR/MJ**

As demonstrated above, the use of pet coke is the most cost effective option. It is evident from the above table that the unit cost of steam generation using biomass (rice husk) is costlier compared to pet coke based steam generation. Hence, the project activity is not a business-as-usual scenario. The above analysis clearly demonstrates that proposed project activity is additional to that would have been implemented in the absence of project.

Sensitivity Analysis

Furthermore a sensitivity analysis is carried project activities to test the robustness of the financial attractiveness of the coal based steam generation as compared to biomass based steam generation. A range of 10% departure from the price of fuels (rice husk and pet coke), their calorific values and efficiency are considered in accordance with §20 of the "Guidance on the Assessment of Investment Analysis", Version 5.

Parameter	Unit Cost of thermal energy generation on coal (INR/MJ)	
	Pet coke	**Biomass**
Base Price	0.28	0.37
10% fall in Biomass Price, other parameter remains constant	0.28	0.33
10% fall in Pet coke Price, other parameter remains constant	0.26	0.37
10% hike in Pet coke Price , other parameter remains constant	0.31	0.37
10% hike in Biomass price other parameter remains constant	0.28	0.34
10% fall in NCV of Biomass, other parameter remains constant	0.28	0.41
10% fall in NCV of Pet coke, other parameter remains constant	0.32	0.37
10% hike in NCV of Pet coke, other parameter remains constant	0.26	0.37
10% hike in NCV of Biomass, other parameter remains constant	0.28	0.34
10% fall in efficiency of Biomass based boiler, other parameter remains constant	0.28	0.41
10% fall in efficiency of Pet coke based boiler, other parameter remains constant	0.32	0.37
10% hike in efficiency of Biomass based boiler, other parameter remains constant	0.28	0.34
10% hike in efficiency of Pet coke based boiler, other parameter remains constant	0.26	0.37

From the sensitivity analysis, it is clear that the unit cost of generation for pet coke based Boiler is still the lowest. Thus, project activity is economically not plausible without VCS registration.

From the summary of results obtained in the unit cost analysis, it is clear that despite the consideration of 10% deviation in favour of rice husk generation system in terms of price and calorific value of rice husk or pet coke, pet coke based thermal energy generation continues to be more economical than a rice husk based thermal energy generation system. Also, it has been observed that the price of biomass increases significantly because of improper collection mechanism, inconsistency in production, lack of a structured and established market etc. The variable moisture content in rice husk also has an adverse affect on the calorific value of rice husk, which directly affects the performance of biomass based thermal generation system and thus, unit cost of energy generation.

Summary:

It can therefore be concluded that the unit cost of steam (thermal) generation is very sensitive to calorific value and cost of rice husk. For all analyzed cases, the unit cost of steam generation is well above the unit cost of steam generation in baseline scenario. Even in the case of a maximum decrease in rice husk price or increase in calorific value of rice husk, the unit cost of steam production in case of project activity is well above the baseline scenario.

As demonstrated above, the use of pet coke is the most cost effective option. It is evident from the above table that the average cost of steam generation using biomass (rice husk) is costlier compared to pet coke based steam generation. Hence the project activity is not a business-as-usual scenario.

Conclusion of the demonstration of additionality

From the explanations given in section 2.5 above, it is evident that the project activity is additional to the baseline scenario as it reduces emissions below baseline level and faces investment barrier which prohibit its implementation and VCS helps the project activity to overcome prohibitive barrier, which would prevent the project from being implemented.

Further, VCU revenues will help alleviate higher unit generation costs and risks associated to technology and fluctuations of biomass prices and NCV in the future.

2.6 Methodology Deviations

No deviations from the applied approved methodology have been taken for the project activity.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions (BEy):

According to the methodology § 16 (AMS-I.C., version 19), the baseline is the fuel consumption of the technologies that would have been used in the absence of the project activities times an emission factor for the fossil fuel consumed. Thus,

In accordance with § 22 of the AMS-I.C. version 19For steam/ heat produced using fossil fuels the baseline emissions are calculated as follows:

The baseline emissions are calculated as follows:

$$BE_{thermal,\,CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal})*EF_{FF,CO2}$$

Where:

$BE_{thermal, CO2,y}$	The baseline emission from steam/heat displaced by the steam activity during the year y in tCO_2e.
$EG_{thermal,y}$	The net quantity of heat supplied by the project activity during the year y TJ.
$EF_{FF,CO2}$	The CO_2 emission factor per unit of the energy of the fuel that would had been used in the base line plant in (tCO_2/ TJ), obtained from reliable local or national data if available, otherwise, IPCC Default emission factor should be used.
$\eta_{BL, thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity (The value of this parameter is as per para 30 (c) of applied methodology. This is the most conservative value for the efficiency. Option (c) is chosen because supportive for using option (a) and (b)) were not available)

3.2 Project Emissions

Project emissions (PEy):

In accordance with § 45 of the AMS-I.C., version 19 Project Emissions include:

1. CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of .Tool to calculate project or leakage CO2 emissions from fossil fuel combustion.;

The project activity is a rice husk based steam generation. Only possibility of fossil fuel consumption is in the 8 TPH boiler which is not retrofitted and will be kept as stand by boiler. However since it was same in pre-project and project scenario, emissions generated from 8 TPH boiler are not accounted in project emissions.

2. 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."

Electricity is imported by the project activity from the grid for auxiliary purposes. Energy meters are installed to measure the electricity consumption by the project activity.

CO_2 emissions from electricity consumption shall be calculated using the latest version of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption."

Project Emissions on account of Import of electricity

$$PE_{EC,\,y} = \Sigma EC_{PJ,i,y} \times FE_{EL,j,y} \times (1+TDL_{j,y})^{20}$$

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 from plant log book data (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

[20] Equation 1, Tool to calculate baseline, project and/or leakage emissions from electricity consumption http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf

3. Any other significant emissions associated with project activity within the project boundary;

There are no other significant emissions from the project activity. All the emissions associated with the project activity are already discussed.

4. For geothermal project activities, project participants shall account for the following emission sources, where applicable: fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam; and, carbon dioxide emissions resulting from combustion of fossil fuels related to the operation of the geothermal power plant.

The project activity is not a geothermal project activity. Hence this is not applicable.

3.3 Leakage

Leakage emissions (LEy):

The biomass is available in the region surrounding the project site. In Accordance with § 48 of the applied approved methodology AMS-I.C., version 19 "If biomass residues are transported over a distance of more than 200 kilometers due to the implementation of the project activity then this leakage source attributed to transportation shall be considered, otherwise it can be neglected." A survey has conducted at the project activity site and it has been confirmed in the report made available that there is adequate availability of rice husk within a radius of 100 km, around the project site[21]. . Furthermore, there is no technology transfer involved in the project activity. Therefore the emission due to transportation of biomass utilized in the project activity can be assumed to be negligible. Hence leakage is considered to be zero.

$LEy = 0$

3.4 Net GHG Emission Reductions and Removals

The baseline emissions are calculated as follows[22]:

Boiler 1

$$BE_{thermal,\ CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO2}$$

$$= 22{,}612\ tCO_2e$$

Boiler 2

$$BE_{thermal,\ CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO2}$$

$$= 22{,}612\ tCO_2e$$

Boiler 3

$$BE_{thermal,\ CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO2}$$

$$= 5{,}618\ tCO_2e$$

[21] Biomass Assessment report prepared by True Biomass International Certification. Please refer section 2.3 (page 39) of the report which concludes 133% surplus rice husk availability within 100 km area of MDL.
[22] For the source of values of different parameter, please refer to section 4.1 and 4.2 of this PD.

Total Baseline Emissions (BEy) = 22,612 + 22,612 + 5,618 = **50,843 tCO_2e**

Project Emissions on account of Import of electricity is calculated as follows[23]:

$PE_{EC,\,y} = \Sigma EC_{PJ,i,y} \times EF_{EL,j,y} \times (1+TDL_{j,y})$

$PEy = PE_{EC,\,y} = 0 \text{ X } 0.98 \text{ X } (1+0.2)$

$= 0\ tCO_2/yr$

Therefore, Project Emission Reduction (PEy) = 0 tCO_2/yr

Note: The value of $\Sigma EC_{PJ,i,y}$ (i.e. Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr) has been considered "0" for the ex-ante calculations. However, actual electricity consumption will be monitored and accounted for during periodic verifications.

Leakage Emission Reductions (LEy) = 0

Net Emission Reduction = ERy = BEy – PEy – LEy

= 50,843 - 0 - 0

= **50,843 tCO_2e**

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2012-2013	**50,843**	0	0	**50,843**
2013-2014	**50,843**	0	0	**50,843**
2014-2015	**50,843**	0	0	**50,843**
2015-2016	**50,843**	0	0	**50,843**
2016-2017	**50,843**	0	0	**50,843**
2017-2018	**50,843**	0	0	**50,843**
2018-2019	**50,843**	0	0	**50,843**
2019-2020	**50,843**	0	0	**50,843**
2020-2021	**50,843**	0	0	**50,843**
2021-2022	**50,843**	0	0	**50,843**
Total	**508,430**	**0**	**0**	**508,430**

[23] For the source of values of different parameter, please refer to section 4.1 and 4.2 of this PD.

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$\eta_{BL, thermal}$
Data unit	%
Description	The efficiency of the baseline pet coke based boiler.
Source of data	This value is as per para 30 (c) of applied methodology. This is the most conservative value for the efficiency.
Value applied:	100%
Justification of choice of data or description of measurement methods and procedures applied	This value is as per para 30 (c) of applied methodology. This is the most conservative value for the efficiency.
Purpose of Data	For calculation of baseline emissions
Comments	This parameter would be fixed ex ante for whole crediting period.

Data / Parameter	$TDL_{j,y}$
Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to the source j in year y
Source of data	Section III, Page 12, of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 1
Value applied:	0.2
Justification of choice of data or description of measurement methods and procedures applied	The value applied is a default value provided by the associated tool i.e. "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 1
Purpose of Data	For calculation of project emissions
Comments	Nil

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin emission factor for the NEWNE grid in the year y
Source of data	CEA, CO_2 Baseline Emission Factor for Indian Power Sector,

	Version 09 (http://www.cea.nic.in)
Value applied:	0.98
Justification of choice of data or description of measurement methods and procedures applied	The same is arrived at using the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 1. Furthermore, the value is provided by the CO_2 Baseline Emission Factor for Indian Power Sector, Version 09 issued by the Central Electricity Authority (CEA). Since project is situated in North region of India which comes under NEWNE grid scope, this emission factor is most suitable.
Purpose of Data	For calculation of project emissions
Comments	This value is considered ex ante fixed for crediting period,

4.2 Data and Parameters Monitored

Data / Parameter	$NCV_{biomass}$
Data unit	kcal/kg
Description	Net calorific Value of biomass residues
Source of data	Third party (lab test of biomass)
Description of measurement methods and procedures to be applied	Monitoring: Net calorific value of biomass will be checked through independent accredited laboratory. Measured quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period. Data type: Measured. Archiving policy: Paper /Electronic Recording Frequency: Once in a first year of crediting period Responsibility: Manager would be responsible for regular testing of the NCV as per the recording frequency.
Frequency of monitoring/recording	Annual
Value applied:	2,800
Monitoring equipment	-
QA/QC procedures to be applied	Not Applicable
Purpose of data	-
Calculation method	Not Applicable
Comments	-

Data / Parameter	$EF_{FF,CO2}$
Data unit	tCO_2/ TJ
Description	The CO_2 emission factor per unit of energy of pet coke that would have been used in the baseline plant in absence of the project activity
Source of data	As per 2006 IPCC Guidelines for National Greenhouse Gas Inventories , Vol. 2, Chapter 2 (Table 2.2), pg 1.23 (IPCC default emission factors has been used as Local and National data on the emission factor of pet coke is not available)
Description of measurement methods and procedures to be applied	Monitoring: This factor will be sourced from latest available IPCC Guidelines for National Greenhouse Gas Inventories. Data type: Calculated Archiving policy: Paper /Electronic Recording Frequency: Annually Responsibility: Manager would be responsible for regular updation of emission factor per unit of energy of petcoke.
Frequency of monitoring/recording	Annual
Value applied:	97.5
Monitoring equipment	Third party source
QA/QC procedures to be applied	Not Applicable
Purpose of data	For calculation of baseline emissions
Calculation method	Not Applicable
Comments	Nil

Data / Parameter	$\mathbf{Q_{steam}}$
Data unit	Tonnes
Description	Quantity of steam generated from project activity biomass fired boiler
Source of data	Log book
Description of measurement methods and procedures to be applied	Reading will be directly taken from steam flow meters by boiler attendant supervisor on hourly basis for each of the boilers. Monitoring: steam flow meters (a separate meter for each boiler). Data type: Measured. Archiving policy: Paper /Electronic Recording Frequency: Continuous monitoring, integrated hourly

	and at least monthly recording Responsibility: Manager is responsible for regular calibration of the meter. Calibration Frequency: Once in three year.
Frequency of monitoring/recording	Continuous monitoring, integrated hourly and recorded at least monthly
Value applied:	Boiler 1: 95,040 Boiler 2 : 95,040 Boiler 3: 23,760
Monitoring equipment	Steam flow meters with accuracy class ± 0.5%
QA/QC procedures to be applied	Steam flow meters will be calibrated by external competent agencies once in three year.
Purpose of data	For calculation of baseline emissions.
Calculation method	Not Applicable
Comments	Data will be kept for crediting period + 2 years. In case of failure of meter, either most conservative value will be used or corresponding emission reductions will not be claimed.

Data / Parameter	T_{steam}
Data unit	℃
Description	Temperature of steam generated
Source of data	Log book
Description of measurement methods and procedures to be applied	Reading will be directly taken from temperature gauges by boiler attendant supervisor on hourly basis. Monitoring: temperature gauge Data type: Measured. Archiving policy: Paper /Electronic Recording Frequency: daily Responsibility: Manager is responsible for regular calibration of the meter. Calibration Frequency: Once in three year.
Frequency of monitoring/recording	Continuous monitoring, integrated and recorded hourly
Value applied:	Boiler 1: 204 Boiler 2 : 204 Boiler 3: 179
Monitoring equipment	Temperature gauges with a accuracy class of + 0.2%
QA/QC procedures to be	Temperature gauges will be calibrated internally at the project

applied	activity site. The same will be calibrated against a standard that will be calibrated by external accredited agency.
Purpose of data	For calculation of baseline emissions.
Calculation method	Not Applicable
Comments	Data will be kept for crediting period + 2 years. In case of failure of meter, either most conservative value will be used or corresponding emission reductions will not be claimed.

Data / Parameter	P_{steam}
Data unit	kg/cm^2
Description	Pressure of steam generated
Source of data	log book
Description of measurement methods and procedures to be applied	Reading will be directly taken from pressure gauges by boiler attendant supervisor on hourly basis. Monitoring: pressure gauge Data type: Measured. Archiving policy: Paper /Electronic Recording Frequency: hourly Responsibility: Manager is responsible for regular calibration of the meter. Calibration Frequency: Once in three year.
Frequency of monitoring/recording	Continuous monitoring, integrated and recorded hourly
Value applied:	Boiler 1: 17.5 Boiler 2 : 17.5 Boiler 3: 10.5
Monitoring equipment	pressure gauges with a accuracy class of $\pm$ 0.5%
QA/QC procedures to be applied	Pressure gauges will be calibrated internally at the project activity site. The same will be calibrated against a standard equipment that will be calibrated by external accredited agency.
Purpose of data	For calculation of baseline emissions.
Calculation method	Not Applicable
Comments	Data will be kept for crediting period + 2 years. In case of failure of meter, either most conservative value will be used or corresponding emission reductions will not be claimed.

Data Unit / Parameter:	T_{FW}
Data unit:	℃
Description:	Temperature of the feed water in the boiler.
Source of data:	log book

Description of measurement methods and procedures to be applied:	Monitoring: temperature gauges Data type: Measured Recording Frequency: hourly Archiving: Paper /Electronic Responsibility: Manager is responsible for regular calibration of the meter. Calibration Frequency: once in a three year.
Frequency of monitoring/recording:	Continuous monitoring, integrated and recorded hourly
Value applied:	Boiler 1: 85 Boiler 2 : 85 Boiler 3: 85
Monitoring equipment:	Temperature gauges with an accuracy class of $\pm$ 0.5%
QA/QC procedures to be applied:	Temperature gauges will be calibrated by external accredited agencies.
Purpose of data	Calculation of Baseline emissions
Calculation method:	-
Any comment:	Data will be kept for crediting period + 2 years. In case of failure of meter, either most conservative value will be used or corresponding emission reductions will not be claimed.

Data Unit / Parameter:	$EG_{thermal,y}$
Data unit:	TJ
Description:	Net quantity of thermal energy supplied by the project activity during the year Y
Source of data:	Calculated from monitored data quantity, temperature or pressure of steam and temperature of feedwater
Description of measurement methods and procedures to be applied:	Estimated value based on steam, temperature and pressure Data type: Estimated Recording Frequency: monthly Archiving: Paper /Electronic Responsibility: Manager is responsible for regular estimation Calibration Frequency: NA
Frequency of monitoring/recording:	The required data viz. Quantity, Temperature and Pressure are monitored continuously and the data is aggregated on an annual basis.

Value applied:	Boiler 1: 232 Boiler 2 : 232 Boiler 3: 58
Monitoring equipment:	Calculated
QA/QC procedures to be applied:	Continuous monitoring of said parameters i.e. temperature, pressure and flow of steam and annual data aggregation. Enthalpy of the steam will be derived from steam table.
Purpose of data	Calculation of Baseline Emission
Calculation method:	Thermal energy is calculated as a product of Quantity of steam produced and Enthalpy (a function of steam pressure and temperature). The values thus obtained are converted into TJ. Enthalpy will be based on either temperature or pressure as the steam is of saturated type. The enthalpy of steam used in the calculations for thermal energy has been derived from the steam table. The enthalpy of feed water will be deducted from the enthalpy of steam to arrive at the thermal energy generated.
Any comment:	-

Data Unit / Parameter:	$Q_{biomass, i,y}$
Data unit:	Tonnes
Description:	Quantity of rice husk consumed annually
Source of data:	Inventory Stock records
Description of measurement methods and procedures to be applied:	The quantity of biomass (rice husk) consumed will be monitored by inventory stocks maintained onsite. The incoming biomass from the purchasers will be measured by the weigh bridges. Monitoring: Weigh Bridges Data type: measured Archiving policy: Paper /Electronic Recording Frequency: Daily Responsibility: Manager would be responsible for regular calibration of the weigh bridges. Calibration Frequency: once in a three year.
Frequency of monitoring/recording:	Continuous monitoring, integrated and recorded daily
Value applied:	Boiler 1: 0[24] Boiler 2 : 0

[24] Actual values will be provided in periodic verifications. Zero has been considered for ex ante estimation.

	Boiler 3: 0
Monitoring equipment:	Weigh Bridges with an accuracy class of ± 1%
QA/QC procedures to be applied:	The Weigh Bridges will be calibrated by the weights and measures department (Govt agency).
Purpose of data	=
Calculation method:	-
Any comment:	Data will be kept for crediting period + 2 years.

Data Unit / Parameter:	$EC_{PJ, i, y}$
Data unit:	MWh
Description:	Quantity of Electricity consumed by the project activity in the year y.
Source of data:	Measured
Description of measurement methods and procedures to be applied:	Monitoring: Energy meters Data type: measured Archiving policy: Paper. Recording Frequency: Daily Responsibility: Manager would be responsible for regular calibration of the meter. Calibration Frequency: once in a three year.
Frequency of monitoring/recording:	Continuous monitoring, integrated and recorded Daily hourly
Value monitored:	0(for the ex-ante purpose the value considered is zero, however actual electricity consumption will be reported during periodic verifications)
Monitoring equipment:	Energy meter with accuracy class 0.5s
QA/QC procedures to be applied:	Energy meters will be calibrated by External accredited agency.
Purpose of data	Calculation of Project Emissions
Calculation method:	-
Any comment:	Data will be kept for crediting period + 2 years. In case of failure of meter, most conservative value based on rated capacity of total installed electrical capacity will be used.

4.3 Monitoring Plan

For above stated parameters for which monitoring and measurements apply, Supervisors take measurements and records are being made.

Management of MDL ensures that appropriate equipment required for the measurement have been provided.

These measuring instruments viz., Weigh Bridge, temperature gauges, Pressure gauges and energy meters are calibrated from third party accreditated laboratories, once in every three years, and records of the same are maintained.

All the monitoring equipment required for the calculation of emission reductions have been installed after procedural check; therefore there is less possibility of defects. However, all these equipment are daily inspected by the concerned operator while taking the reading. In case of any irregular reading or unexpected reading the shift in charge is informed for further check and calibration of the equipment. Moreover, all the monitoring equipment were duly calibrated during installation.

Monitoring Data are archived properly. Plant records such as log books, purchase receipts, calibration certificates of measuring devices as well as public data such as IPCC and CEA are maintained systematically.

Operational & Management Structure-

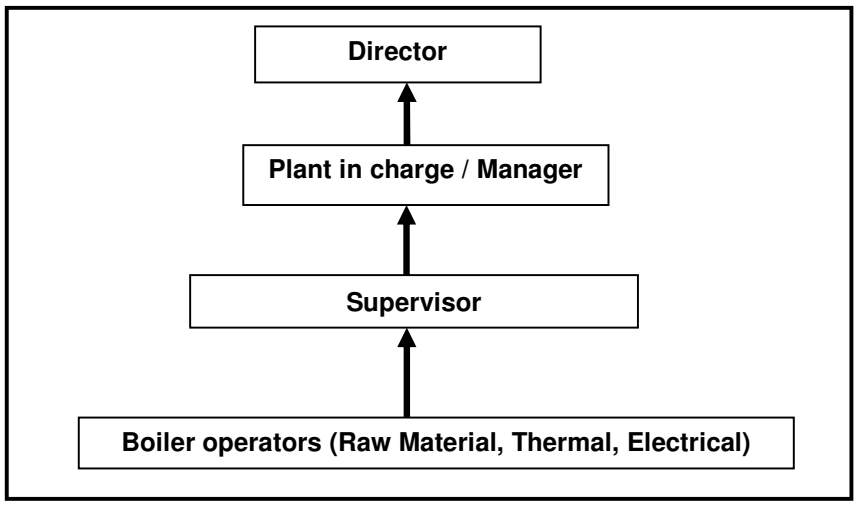
The project proponent has designed a measurement and verification plan in order to ensure the proper, regular measurement and recording of the data pertaining to the GHG emission reduction.

For carrying out the task of monitoring, the responsibilities have been entrusted with well trained supervisors (raw material, thermal and electrical). Hourly and daily recording of all monitoring parameters are done by operators. Daily plant records are then properly reviewed by supervisor.

Monthly consolidated reports and periodical internal review reports are made available to the top management. Internal audit will be carried out by the top management once in a year. The effectiveness of the corrective actions as well as the preventive measure taken shall be assessed during the subsequent audit.

Responsibility and competence of persons involved in the process have been well defined and controls of records are established.

An organogram depicting the hierarchy for the monitoring system is given below:



5 ENVIRONMENTAL IMPACT

The Ministry of Environment and Forests (MoEF), Government of India, under the environment impact Assessment Notification vide S.O.1533, 14/09/2006 and S.O.195 (E)25 dated 19/01/2009 has enlisted a set of industrial activities in Schedule of the notification under which setting up new projects or modernization/expansion will require environmental clearance and will have to conduct an Environmental Impact Assessment (EIA) study. The project activity is not included in the referred schedule; hence an EIA study specific for the project activity is not required.

6 STAKEHOLDER COMMENTS

Invitations for stakeholder consultation meeting were sent out by MDL via an advertisement in the newspaper on 30 October 2013 and personal letters. A public notice for the same was also affixed at main gate of MDL.

MDL organized the stakeholder consultation meeting on 09th November, 2013 at its premises i.e. Post Box No.3, 136 KM, GT Road, Karnal District, Haryana. The meeting was attended by the members from the industrial complex, consultants, suppliers, contractors and the local residents[26] in the area. The objective of the meeting was to inform the stakeholders about the environmental and social impacts of the project activity and discuss their concerns regarding the same, if any. The comments and suggestions were invited throughout the period of Stakeholders meet.

The overall response to the project, from all invited stakeholders, was encouraging and positive. In all, no adverse reactions, comments, or clarifications were received during the Stakeholder Consultation process. The project participants did not recognize any need to make changes to the project design or monitoring plan.

[25] http://envfor.nic.in/legis/eia/so195.pdf
[26] list of attendees

APPENDIX 1: LIST OF ABBREVIATIONS USED

CC	Climate Change
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CO_2	Carbon dioxide
EIA	Environmental Impact Assessment
GHG	Green House Gas
HPCB	Haryana Pollution Control Board
IPCC	Intergovernmental Panel on Climate Change
Kgf	Kilogram-force
MDL	Modern Dairies Limited
MoEF	The ministry of Environment and forests
MT	Metric Ton
M&P	Modalities and Procedures
NABL	The National Accreditation Board for Testing and Calibration Laboratories
NATCOM (India)	India's Initial National Communication
NCV	Net Calorific Value
NOC	No Objection Certificate
PP	Project Proponent
QA/QC	Quality Assurance and Quality Control
TPH	Tonnes per Hour
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

APPENDIX 2: SOURCES OF INPUT PARAMETERS USED

Parameter	Value			Unit	Sources
Steam quantity	12	12	3	TPH	technical specifiifcation of boiler
Steam pressure	17.50	17.50	10.50	kg/cm2	technical specifiifcation of boiler
Steam temperature (Sat)	204.00	204.00	179.00	Deg C	technical specifiifcation of boiler
Efficiency of Petcoke based boiler (for baseline emission calculation purpose)	100%	100%	100%	%	as per para 30 c of applied methodology the efficiency has been taken as 100%
Efficiency of petcoke Based boiler (For investment analysis purpose)	80%	80%	80%	%	Feasibility note and Chartered engineer certificate
Design efficiency of biomass based boiler	0.74	0.74	0.74	%	Feasibility note and Chartered engineer certificate
Conversion factor	4.19	4.19	4.19	kJ/kcal	
Petcoke calorific value	7,770.00	7,770.00	7,770.00	kcal/kg	As per Invoices (average of last thee months at the time of Management decision)
Biomass calorific value	2,800	2,800	2,800	kcal/kg	As per supplier's quotations and Lab test reports
Petcoke emission factor	97.50	97.50	97.50	tCO2e/TJ	Calculated as shown
Running hours	7,920	7,920	7,920	Hrs per annum	As per information from M/S Modern dairies Limited