PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Biomass Based Thermal Energy Generation

By Dr. Reddy's Laboratories Limited, at FTO-11, Devunipalavalasa, Srikakulam, AP

Version 1.0

Date 15/08/2023

First CoU Issuance Period: 0 years, 09 months

Date: 15/09/2022 to 30/06/2023

Project Concept Note (PCN)
CARBON OFFSET UNIT (CoU) PROJECT

BASIC INFORMATION

Title of the project activity	**Biomass Based Thermal Energy Generation** By Dr. Reddy's Laboratories Limited, at FTO-11, Devunipalavalasa, Srikakulam, AP
Scale of the project activity	Small Scale
Date of commissioning	15/09/2022
Completion date of the PCN	15/08/2023
Project participants	**Project Proponent:** Dr Reddys's Labortories Ltd. (FTO -HO) Survey No. 42,45,46 & 54, Bachupally , Qutubullapur Mandal, Ranga Reddy District, Telengana,500100. **Aggregator:** Dr Reddys's Labortories Ltd. (FTO -HO) Survey No. 42,45,46 & 54, Bachupally , Qutubullapur Mandal, Ranga Reddy District, Telengana,500100. Email: albinsonvtenny@drreddys.com **Consultant:** Energy Advisory Services Pvt. Ltd. Mumbai, Maharashtra Email: yogesh@easpl.co.in
Host Party	INDIA
Applied methodologies and standardized baselines	AMS-I.C.: Thermal energy production with or without electricity --- Version 22.0 UCR Standard for emission factor
Sectoral scopes	SELECTED SCOPE 01 Energy industries (Renewable/Non-Renewable Sources)
Estimated amount of total GHG emission reductions	An ex-ante estimate is 11,700 CoUs (11,700 tCO2eq) per year

SECTION A. Description of project activity

A.1. Purpose and general description of Carbon offset Unit (CoU) project activity >>

The project **Biomass Based Thermal Energy Generation** is in Village Devunipalavalasa, Tehsil Ranasthalam, District Srikakulam, State Andhra Pradesh, Country INDIA.

The details of the registered project are as follows:

Purpose of the project activity:

Dr. Reddy's Laboratories (DRL), a leading multinational pharmaceutical company based in India and overseas, committed to providing affordable and innovative medicines.

Dr. Reddy's Laboratories started in 1984 with a modest investment and a bold vision. Today, with research and development centres, manufacturing facilities and commercial presence across the globe, we serve over half a billion patients worldwide. Dr. Reddy's Laboratories aspire to triple our reach and touch over 1.5 billion patients by 2030

The UCR project activity consists of the generation of thermal energy by utilizing renewable biomass process boilers of total installed capacity of 05 TPH at the Formulation Tech-Ops-11 (FTO-11), owned and operated by the Project Proponent (PP). The project activity involves the installation of one (01) Biomass Briquette fired steam boilers with a steam output capacity of 05 TPH (at F & A 100^0C). This project activity uses renewable biomass briquettes as fuel and supplies the process steam throughout the plant for an important process of manufacturing. sterilization and clean steam generation for advanced procedures within the project boundary at FTO-11, Devunipavalas, Srikakulam.

The boiler installed is "Stepped grate" types that ensure 100% firing of biomass briquettes/rice husk, through intelligent combustion manager.

Conventionally, steam required for the processes in FTO-11 was met through a coal fired co-gen plant which is operating in an adjacent plant. Fossil fuel combustion produces greenhouse gases (GHGs). This project activity displaces/avoids the use of fossil fuel (coal) with briquette (renewable biomass) which is a clean and carbon neutral energy source. Thus, the project activity helps in reduction of GHG emissions. Also, there was a loss of around 50% thermal energy in the steam supply lines from the co-gen power plant to the PP's process units.

The primary technology for the project activity involves installation of 1*5 TPH biomass fired boilers. The direct combustion of biomass in the boiler is converted into thermal energy, which is utilized for steam generation. The boiler (**5 TPH**) in the project activity was commissioned on **15.09.2022**.

The briquettes, used in the boiler within the project activity, are composed of mainly agro-based industrial residues and crop residues, based on their availability from the surrounding region outside the project boundary (the PP is not the producer of the processed solid biomass fuel as specified in the requirements of the UCR CoU Standard for inclusion in the updated eligibility conditions specified in the UCR biomass program).

The Stepped grate offers progressive combustion with distinct combustion zones making it the ideal solution for biomass briquette combustion with higher moisture. This grate offers the fuel flexibility and can burn complex agricultural biomass fuels like forest wastes, empty fruit bunches, spice waste, soya stock, and many other biomasses.

The project activity consumes about **7200 tonnes** of biomass briquettes per year.

The estimated annual average emission reductions due to the project activity are **11,700** tCO_2e.

The project activity is thus the thermal energy production using renewable energy sources that displaces fossil fuel use and avoids GHG emissions (CO_2). In the pre-project scenario, the process steam demand of the plant was met by a coal fired boiler (co-gen power plant from an adjacent facility). The project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change.

A.2 Do no harm or Impact test of the project activity>>

This project is a stem generation plant utilising biomass briquettes as an energy source, where a coal-based co-gen plant is the baseline.

The Government of India has stipulated following indicators for sustainable development in the interim approval guidelines for such projects which are contributing to GHG mitigations. The Ministry of Environment, Forests & Climate Change, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. It has been envisaged that the project shall contribute to sustainable development using the following ways:

There are social, environmental, economic and technological benefits which contribute to sustainable development.

- **Social benefits:**
  - The project activity helped to alleviate poverty in the area by creating employment opportunities for the local people during the construction, operation and maintenance phases and through handling/supply of biomass material to the project plant.
  - The project activity contributed to employment generation in the local area for both skilled & unskilled people for operation and maintenance of the plant.
  - The project activity is contributing to the national energy security by reducing consumption of fossil fuels.
  - The technology being used in the project is proven and safe for steam generation. An increase in such kind of projects shall enable all the technology suppliers to continuously innovate and modernize on the technology front.
  - The local people will know the technological advancement and will help in capacity building.
  - By discouraging use of coal and thereby mining of coal, the project activity reduces the exposure of coal miners to dangerous working conditions and toxic work environments.

- **Environmental benefits:**
  - The project activity is a renewable energy project, which utilizes biomass briquette as a fuel for steam generation, a move that is voluntary and not mandated under current environmental laws of India.
  - Since this project activity generates steam from green energy (biomass briquette), it has positively contributed towards the reduction in (demand) use of finite natural resources like coal and furnace oil, minimizing depletion of these resources and in turn increasing its availability to other important purposes of the Indian economy and energy security. Therefore, this project activity helps to environment sustainability by avoiding GHG emissions in the atmosphere.
  - Avoids global and local environmental pollution, leading to reduction of GHG emissions.
  - The biomass from agricultural based industries in the vicinity are generally in excess and hence get disposed in unplanned ways including dumping into nearby rivers. Because of such disposal and due to natural decay, in the absence of the project activity, the agricultural waste used in the project would otherwise have emitted methane in an uncontrolled open landfill site.

- **Economic benefits:**
  - The project is a clean technology investment decided based on carbon revenue support, which signifies flows of clean energy investments into the host country.

- The project activity requires temporary and permanent, skilled and semi-skilled manpower at the project location; this will create additional employment opportunities in the region.
- The fuel replaced by the project activity will be available for other important purposes of the Indian economy and energy security.
- Success of these kind of projects will provide new opportunities for industries and economic activities to be setup in the area. Apart from getting better employment opportunities, the local people will get better prices for their biomass waste, thereby resulting in overall economic development.
- The project activity helps in conservation of fast depleting natural resources like coal and oil thereby contributing to the economic wellbeing of country.
- The increase in demand of biomass exerted by the project activity has had a local effect on its price and generates additional revenue for the agricultural based industry, which in turn benefits the local farmers in the area.
- Reduction in energy cost
- Lower operation cost of the plant

- **Technological benefits:**
  - The successful operation of project activity would lead to promotion of biomass energy-based steam generation and would encourage other entrepreneurs to participate in similar projects.
  - Increased interest in low cost biomass energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future.
  - The project activity leads to the promotion and demonstrates the success of biomass energy-based projects in the region which further motivate more investors to invest in such projects.

The project activity also contributes to the following sustainable development goals (SDGs):

Table 1: Contribution to the SDGs

SDG Goals	Description
	• The project activity will generate clean energy, which with increased share will increase the affordability of thermal energy at a cheaper rate to end user. • The project activity will utilize biomass energy to generate steam. The project activity will increase the share of renewable energy resource-based steam generation to global mix of energy consumption • Improvement in energy efficiency
	• Decent work and economic growth. • This project activity generates additional employment for skilled and unskilled, also the project situated in remote area will provide employment opportunities to unskilled people from villages. • The training on various aspect including safety, operational issues and developing skill set will also be provided to employees • This project will achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value
	• Support domestic technology development, research and innovation in developing countries, by ensuring a conducive policy environment for inter alia, industrial diversification and value addition to commodities • Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries • Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes.

	• Biomass based briquette is used in the project activity, unless otherwise channelized into projects like the one discussed in this document, do not find any major use elsewhere- and hence become waste products. • Using renewable (biomass briquette) energy helps in repurposing of waste and contributes to the share of energy efficiency and reduction in GHG emissions.
	• Biomass based steam generation systems reduce the GHG emissions. • This project is expected to reduce CO_2e emission 11,700 ton per year. • This project meets the SDG 13 goal by saving fossil fuel and produce clean energy.
	• Submission of this document in a global GHG reduction / removal standard (UCR), involving multiple agencies and partners across the globe (independent third-party auditors), for bringing in sustainable financing through the sale of carbon credits that can be generated from the project activity stands testimony to SDG 17.

A.3. Location of project activity >>

Country:	INDIA
Village:	Devunipalavalasa
Tehsil:	Ranasthalam
District:	Srikakulam
State:	Andhra Pradesh
Pin code	532409
Coordinates	18^0 08’ 57.72” N 83^0 37’ 15.03” E

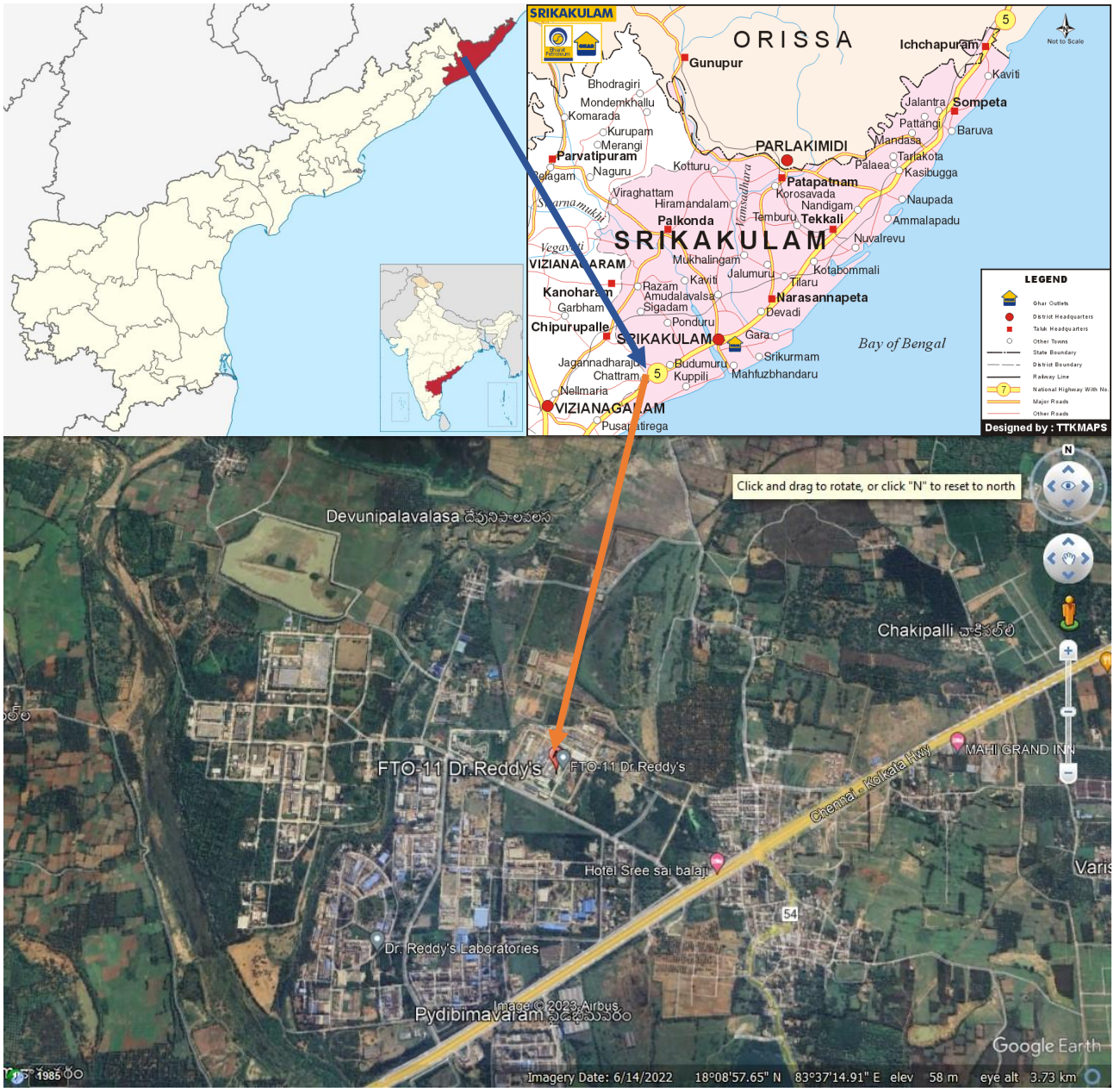


Figure 1- Location co-ordinates

A.4. Technologies/measures >>

The ministry of Environment and forests (MoEF), Government of India, under the Environment Impact Assessment Notification has listed a set of industrial activities in schedule of the notification which for setting up new projects or modernization /expansion will require environmental clearance and will have to conduct an Environmental Impact Assessment (EIA) study.

DRL project activity does not require EIA to be conducted as the activity is not included in schedule I.

The project activity is the installation of biomass briquette fired boiler for steam generation. The generated steam is utilized for meeting the process requirement in the plant.

In the baseline scenario the steam was generated through a coal-based co-gen power plant, to meet DRL's process requirement. The project activity has replaced coal-based steam generation with biomass-based boiler for steam generation thus the project activity is environment friendly and leads to GHG emission reduction.

The CO_2 emission due to the combustion of biomass briquettes is neutralized by the photosynthesis process of agricultural crops. Hence, it "recycles" atmospheric carbon and does not add to the greenhouse effect.

Also, the biomass contains negligible quantities of nitrogen and sulphur, hence the other greenhouse gases from the combustion of biomass can be neglected. The coal being a carbon intensive fuel leads to GHG emissions hence implementation of the project activity leads to GHG emission reductions.

No transfer of technology is involved to host country because technology is available within India from reputed manufacturers.

Technical Specification and Performance parameter of the Boiler		
Type of boiler		Water + Smoke Tube Type
Model		**FV-DSG**
Design Code		IBR 1950 with latest amendment
Type of grate		**Step Grate**
Combustion Control		**Through Intelligent Combustion Manager**
Boiler capacity (F & A 100 Deg C)	TPH	5
Boiler Design Pressure	Kg/cm^2	10.54
Steam Pressure		
Safety valve Set Pressure	Kg/cm^2	10.2 / 10.5
Feeding Cut Off pressure switch setting	Kg/cm^2	9.5
Modulating pressure control range	Kg/cm^2	9 – 9.5
Net pressure available at the outlet of MSSV	Kg/cm^2	9
Fuel Used		100% Briquette 100% Imported coal 100% Rice Husk
Fuel Ultimate Analysis		As received from DRL
Ash Fusion Temp. ^0C		> 1200 deg.C
Calorific Value	Kcal/kg	4200- 3800
Fuel Size	Mm	Max 25mm. Fines Less than 6 mm max 10% allowed
Boiler Thermal Efficiency(NCV Basis)	%	84 (+ / - 2)
Boiler Turn Down (On Total Steam Generation)	%	40 to 100
Dryness Fraction	%	98
Mechanical Details of the Boiler		
Convection Tubes Thickness	mm	3.4
Tube Diameter	mm	57.15/63.5

A.5. Parties and project participants >>

Party (Host)	Participants
INDIA	**Project Proponent:** Dr Reddys's Labortories Ltd. (FTO -HO) Survey No. 42,45,46 & 54, Bachupally , Qutubullapur Mandal, Ranga Reddy District, Telengana,500100. **Plant Location:** Formulation Tech-Ops-11 (FTO-11), M/s Dr. Reddy's Laboratories Limited, Devunipalavalasa, Srikakulam, AP **Aggregator:** Dr Reddys's Labortories Ltd. (FTO -HO) Survey No. 42,45,46 & 54, Bachupally , Qutubullapur Mandal, Ranga Reddy District, Telengana,500100. Email: albinsonvtenny@drreddys.com **Consultant:** Energy Advisory Services Pvt. Ltd. Mumbai, Maharashtra Email: yogesh@easpl.co.in

A.6. Baseline Emissions>>

The baseline scenario identified at the PCN stage of the project activity is:

Energy generation (thermal heat and / or electricity) by more carbon- intensive technologies based on fossil fuel.

The approved baseline methodology has been referred from the indicative simplified baseline and monitoring methodologies for selected small-scale UNFCCC CDM project activity categories.

The applicable methodology and simplified modalities and procedures for small scale CDM project activities, states that "*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 coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used*"

Emission coefficient of fuel used in the baseline scenario

In absence of the project activity, the baseline scenario is steam generation from fossil fuel (coal) based co-gen plant. Thus, to determine emission co-efficient for DRL, emission factor for coal as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories for GHG emissions is used, which is 96.1 tCO2 /TJ.

Emission coefficient of fuel used in the project activity

The fuel used in the project activity is the biomass briquettes, which are a carbon neutral fuel and therefore the emission coefficient (tCO_2/TJ) is zero.

BASELINE SCENARIO

Energy generation (thermal heat and / or electricity) by more carbon-intensive technologies based on fossil fuel. In case of retrofits or capacity addition, operation of existing renewable power units without retrofit and capacity addition.

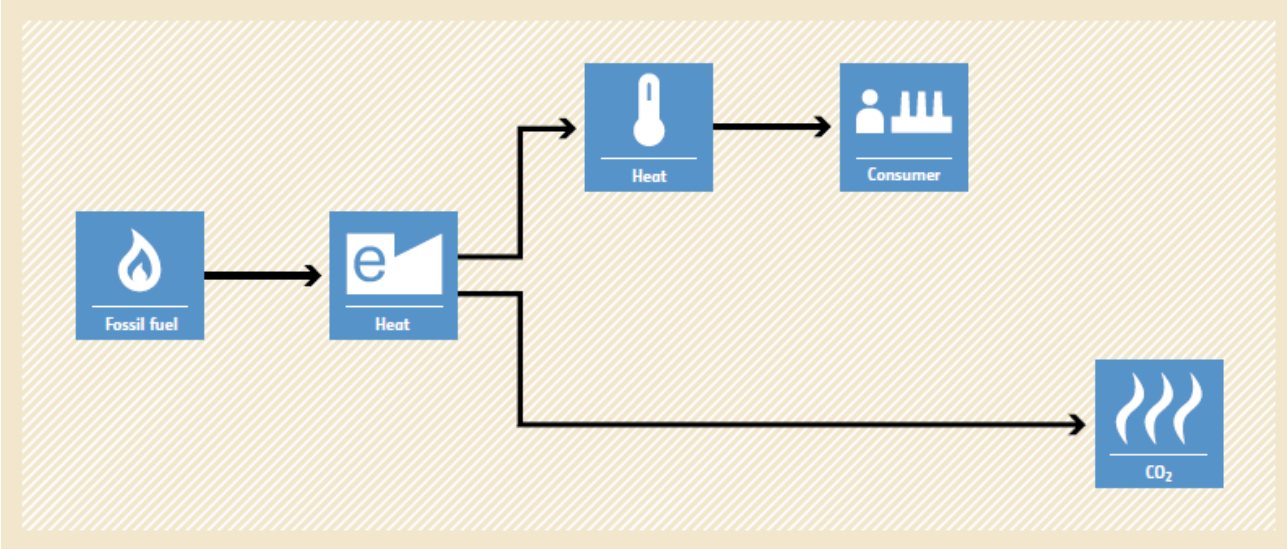


Figure 2- Baseline scenario

A.7. De-bundling>>

This **Biomass Based Thermal Energy Generation** project is not a de-bundled component of a larger project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE	01, Energy industries (Renewable/Non-renewable sources)
TYPE	I – Renewable Energy Projects
CATEGORY	AMS. I.C. (Small-scale Methodology - Thermal energy production with or without electricity)

B.2. Applicability of methodologies and standardized baselines >>

The project activity is thermal energy generation project using a biomass briquettes-based boiler that displaces equivalent amount of thermal energy that would have been generated by a fossil fuel-based co-gen power plant. Since the project activity utilises biomass for the generation of thermal energy by displacing fossil fuel (coal), it meets the primary applicability criteria of the methodology.
The thermal generation capacity of project activity is currently 15 MWthermal which is less than the threshold of 45 MWthermal as per the applied methodology. The capacity limits specified in the methodologies apply to both existing and additional units within the project activity. In the present case of the project activity, a 5 TPH boiler is installed (greenfield)
The biomass used by the project plant is not stored for more than one year.
The project activity is neither a co-generation nor co-firing system, therefore this condition is not applicable in the case of current project activity.
Steam generated using the biomass, is used for captive use. The steam produced in the project activity is utilized in the process of DRL. It is not delivered to any third party.
The project activity does not involve the use of any refrigerant within its boundaries and hence the given applicability clause in the methodology is not fulfilled here.
The PP is not the producer of the processed solid biomass fuel. The PP has a contract with the biomass briquette supplier for the supply of the same which will ensure that there is no double counting of emission reductions by the supplier.
Thermal energy generation capacity is determined by taking the difference between enthalpy of total output steam leaving the boiler and the total enthalpy of input feedwater entering the boiler.
The installed biomass boiler generates steam to meet the steam demand of the plant and displaces fully the use of fossil fuel-based boilers. The project technology utilizes appropriate treatment systems to ensure exhaust gas and discharged water in compliance with national environmental regulations. The service level (e.g. temperature, pressure) of supplied steam in case of utilizing different types of renewable biomass residues is ensured by qualified boiler operators and is monitored by steam flow meter in the plant. The project activity will thus reduce Greenhouse Gas (GHG) emissions associated with the combustion of fossil fuels in baseline boilers.
The project activity claims emission reduction for the thermal energy production by renewable energy technologies (biomass briquette fired boiler) that displace the use of fossil fuel-based boilers. This is in line with the applied methodology AMS I.C requirements.

B.3. Applicability of double counting emission reductions >>

The biomass boilers are unique and constructed by the PP within the project boundary. The biomass boiler

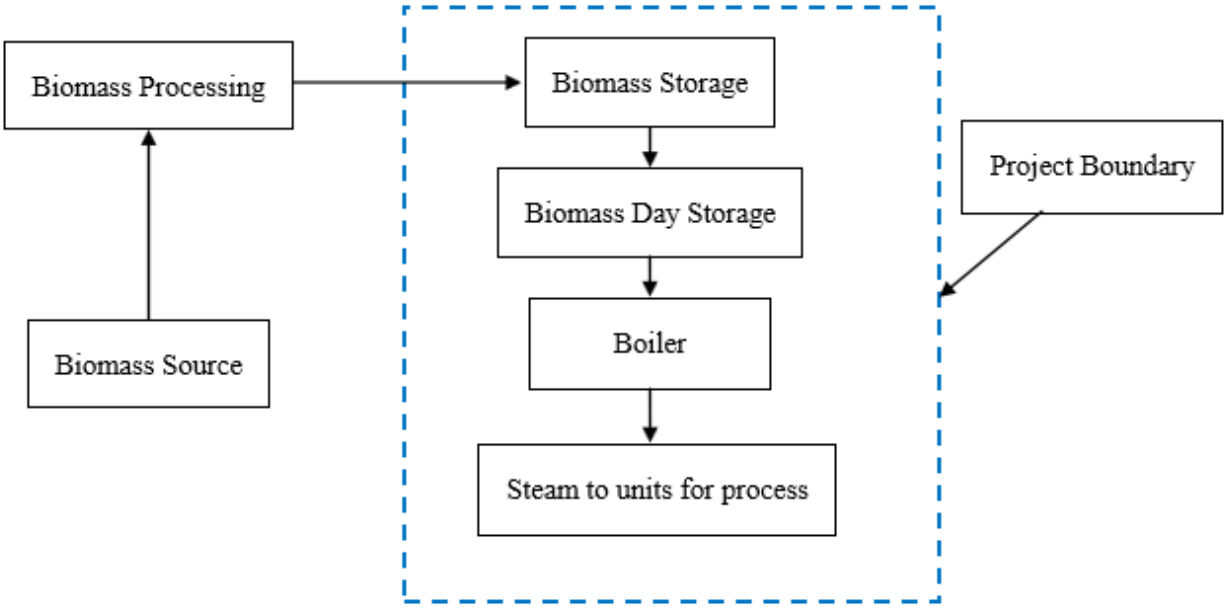
has a unique ID, which is visible on the unit. The Monitoring Report has the details and will be provided to the UCR verifier during the verification process.

The PP is not registered under any GHG mechanism for the current UCR monitoring and crediting period. Hence there is no double counting of the credits anticipated for the current project activity.

B.4. Project boundary, sources and greenhouse gases (GHGs) >>

The project boundary includes the physical, geographical site(s) of:

- Site of the renewable energy generation.
- Biomass based boiler, which starts from the biomass storage to the point of steam supply
- Biomass storage facility



Leakage Emissions is not applicable as the project activity does not use technology or equipment transferred from another activity.

There is no registered or an application to register another small-scale carbon project activity with the same project participants in the same project category within the project boundary, hence the project activity is not a de-bundled component of a large-scale project.

By using locally sourced GHG-neutral biomass briquettes, the PP is successfully able to avoid the fossil fuel emissions and thereby GHG emissions due to steam purchase from an adjacent cogeneration power plant, to meet the energy requirements of the PP and vehicular emissions avoiding sourcing of biomass fuel from a long distance.

	Source	GHG	Included?	Justification/Explanation
Baseline	Emissions from burning non-renewable fuel	CO_2	Included	Major source of emission
		CH_4	Included	Major source of emission
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	Emissions from on-site steam generation	CO_2	Excluded	Steam is generated using the biomass briquette, hence these emissions are not accounted for.
		CH_4	Excluded	Excluded for simplification. This is conservative

		N_2O	Excluded	Excluded for simplification. This is conservative

B.5. Establishment and description of baseline scenario (UCR Standard or Methodology) >>

The baseline scenario identified at the PCN stage of the project activity is:

- Renewable energy technologies that displace technologies using fossil fuels, wherein 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.

- In the case of an existing baseline cogeneration plant, the efficiency shall be calculated as the total annual energy produced over the last three years using the historical data as prescribed in paragraph 26 "of AMS-I.C. Small-scale Methodology: Thermal energy production with or without electricity Version 22.0 Sectoral scope(s): 01" (total electricity generated and total thermal energy extracted divided by the thermal energy value of the fuel use).

Emission Reductions (ERy) The emission reduction due to the project activity is calculated as the difference between the baseline emissions and the sum of the project emissions and the leakage:

ERy = BEy- (PEy+ LEy)

BEy= Baseline emissions in year y (t CO_2e)

As mentioned in the methodology AMS I.C, *"Small-scale Methodology: Thermal energy production with or without electricity Version 22.0 Sectoral scope(s): 01"*

The baseline emissions for steam produced using fossil fuels *are calculated as follows:*

$$BEy = (HGy * EFCO_2) / \eta_{th}$$

Where:

HGy = The net quantity of heat supplied by the project activity during the year in TJ. It is calculated as product of quantity of steam generated and net enthalpy of steam. The net enthalpy of steam is calculated as difference of enthalpy of steam and enthalpy of feedwater.
The enthalpy of steam is calculated from steam pressure and steam temperature.

$EFCO_2$ = The CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO_2/TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

η_{th} – The efficiency of the boiler using fossil fuel that would have been used in the absence of the project activity (TOOL09 - Methodological tool Determining the baseline efficiency of thermal or electric energy generation systems). For new coal fired boiler -0.85

PEy = Project activity emissions. The GHG emissions due to the combustion of biomass is neutralized by the sequestration done during the growth of the biomass, thereby making it a carbon neutral fuel. Further the rice husk and bagasse contain negligible quantities of nitrogen and sulphur, the other greenhouse gas from the combustion of biomass can be considered as negligible. Therefore, essentially there would not be any GHG emissions due to the project activity within the project boundary.

However, as per paragraph 31 under Section 5.2 of "TOOL16 Methodological tool: Project and leakage emissions from biomass Version 05.0", - "*For microscale and small-scale project activities, apply a default emission factor of 0.0142 tCO_2/tonne of biomass".*

Therefore, the project emissions are as follows

Description	Quantity
Quantity of dry biomass consumed	7,200 t/y @8000 h/y operation
Default emission factor	0.0142 tCO_2 / tonne of biomass
PEy	102.4 tCO_2/y

LEy = Leakage emissions. Leakages is to be considered if the energy generating equipment is transferred from another activity or if the existing is transferred to another activity. There is no transfer of energy generating equipment or existing equipment to another activity. Since biomass residues are not procured from (transported) over a distance of more than 200 kilometres due to the implementation of the project activity, leakage can be neglected.

Hence **LEy = 0**

Baseline Emission BEy

Description		Quantity
Enthalpy of team	=	2942.1 kJ/kg (at 10.50 kg/cm^2 and 250 ^0C)
Yearly steam production	=	40,000 TPY (@ 5TPH and 8000 h/y)
Enthalpy of Feed Water	=	334.9 kJ/kg (@ 80 ^0C)
HGy The net quantity of heat supplied by the project activity during the year in TJ.	=	$40,000*(2942.1-334.9)/10^6 = 104.29$ TJ
EF_{CO2} The CO_2 emission factor	=	96.1 tCO_2/TJ IPCC 2006 guidelines for National Greenhouse Gas inventories got stationary combustion
Boiler Efficiency	=	0.85% *(TOOL09-Methodological tool: Determining the baseline efficiency of thermal or electric energy generation systems, Version 03.0)*
BEy Baseline Emission	=	**104.29*96.1/0.85 = 11791 t CO_2e**

Estimated Emission Reduction ERy

ERy = **BEy- (PEy+ LEy)**

= 11,791 – (102.4+0) = **11,688 CoUs/y**

B.6. Prior History>>

The project activity has not applied to any other GHG program for generation or issuance of carbon offsets or credits for the said crediting period.

B.7. Changes to start date of crediting period >>

There is no change in the start date of crediting period.

B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

There are no permanent changes from registered PCN monitoring plan and applied methodology

B.9. Monitoring period number and duration>>

First Issuance Period: 0 years, 09 months – 15/09/2022 to 30/06/2023

B.8. Monitoring plan>>

USE THE FOLLOWING TABLES TO FOR PARAMETERS BEING MONITORED OR USED IN EMISSION REDUCTIONS DETERMINATION

According to the approved methodology AMS-I.C – Thermal energy production with or without electricity (Version 21), the following parameters will be monitored:

Parameters	Description
$Q_{S,y}$	Quantity of steam supplied per year measured at recipient's end
$T_{steam,y}$	Temperature of steam at the recipient's end
$P_{steam,y}$	Pressure of steam
$E_{steam,y}$	Enthalpy of the saturated steam supplied to the recipient
$T_{Feedwater,y}$	Temperature of boiler feed water
$E_{Feedwater,y}$	Enthalpy of feed water
$EG_{thermal,y}$	Net quantity of thermal energy supplied by the project activity during the year y
$B_{Biomass,y}$	Net quantity of biomass consumed in year y (on dry basis)
$MC_{biomass}$	Moisture content of the biomass

The PP and the biomass producer are bound by a contract that shall enable the PP to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract also ensures that there is no double-counting of emission reductions. The PP is not the producer of the processed solid biomass fuel.

The monitoring and recording of the required parameters is carried out by trained personnel who are managed by the Project Managers at DRL. All measurements will use calibrated measurement equipment that are maintained regularly and checked for its functioning which will meet the minimum requirement of the methodology. All indicators of importance for controlling and reporting of projects performance have been incorporated in the monitoring plan (Monitoring Report during verification) as well as indicated in the planned formal set of monitoring protocol and work instructions.

Data/Parameter	Date of commissioning of biomass boiler
Data unit	Date as per boiler test report.
Description	Actual date of commissioning of the project
Source of data Value(s) applied	Monitoring Report As and when commissioned
Measurement methods and procedures	The construction processes are maintained from its initiation to completion dates for the boiler unit. Thus, the start date of each of the unit installed is recorded in the monitoring report.
Monitoring frequency	As and when commissioned and fixed and recorded in the monitoring report
Purpose of data	To estimate baseline emissions

Data / Parameter:	$Q_{biomass}$
Data unit:	MT
Description:	The quantity of biomass used to generate steam in the boiler
Source of data:	Plant records and log books receipts
Measurement procedures (if any):	Monitoring: The quantity of biomass fed into the boiler is controlled. Data type: Measured
Monitoring frequency:	Daily
QA/QC procedures:	The amount of biomass used can be cross checked by the purchase orders and stock inventory for briquette/rice husk
Any comment:	-

Data / Parameter:	Sp
Data unit:	Kg/cm^2 boiler
Description:	Pressure of the steam at the outlet of the biomass boiler
Source of data:	Log book
Measurement procedures (if any):	The steam pressure would be measured using pressure gauge. This parameter is used to calculate the Net Enthalpy of steam. Monitoring: Log book Data type: Monitored
Monitoring frequency:	Daily/hourly
QA/QC procedures:	The parameter is monitored and logged in log sheets. Based on the logged data, a report consisting of the parameter are prepared by Shift in charge in hard copy and are forwarded to manager on monthly basis. The data used is reviewed by conducting an inter department review meeting once in 6 months.
Any comment:	-

Data / Parameter:	T_{steam}
Data unit:	^0C
Description:	The temperature of steam
Source of data:	Plant Log Sheets
Measurement procedures (if any):	Steam temperature is measured in the plant premises by using temperature gauge. This parameter is used to calculate the Net Enthalpy of steam. Monitoring: Log book Data type: Monitored
Monitoring frequency:	Daily/hourly
QA/QC procedures:	The parameter is monitored and logged in log sheets. Based on the logged data, a report consisting of the parameter are prepared by Shift in charge in hard copy and are forwarded to manager on monthly basis. The data used is reviewed by conducting an inter department review meeting once in 6 months.
Any comment:	-

Data / Parameter:	$T_{feedwater}$
Data unit:	^0C
Description:	The temperature of feed water
Source of data:	Plant Log Sheets
Measurement procedures (if any):	Feed water temperature is measured in the plant premises by using temperature gauge. This parameter is used to calculate the Net Enthalpy of feedwater. Monitoring: Log book Data type: Monitored
Monitoring frequency:	Daily/hourly
QA/QC procedures:	The parameter is monitored and logged in log sheets. Based on the logged data, a report consisting of the parameter are prepared by Shift

	in charge in hard copy and are forwarded to manager on monthly basis. The data used is reviewed by conducting an inter department review meeting once in 6 months.
Any comment:	-

Data / Parameter:	h_g
Data unit:	kJ/kg
Description:	The enthalpy of steam
Source of data:	Plant Log Sheets
Measurement procedures (if any):	Type: Calculated Data type: Monitored
Monitoring frequency:	Daily/hourly
QA/QC procedures:	The parameter is monitored and logged in log sheets. Based on the logged data, a report consisting of the parameter are prepared by Shift in charge in hard copy and are forwarded to manager on monthly basis. The data used is reviewed by conducting an inter department review meeting once in 6 months.
Any comment:	-

Data / Parameter:	h_f
Data unit:	kJ/kg
Description:	The enthalpy of feed water
Source of data:	Plant Log Sheets
Measurement procedures (if any):	Type: Calculated Data type: Monitored
Monitoring frequency:	Daily/hourly
QA/QC procedures:	The parameter is monitored and logged in log sheets. Based on the logged data, a report consisting of the parameter are prepared by Shift in charge in hard copy and are forwarded to manager on monthly basis. The data used is reviewed by conducting an inter department review meeting once in 6 months.
Any comment:	-