PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Renewable Biomass Based Thermal Energy Generation By SIIPL, Manjri, Pune, Maharashtra

Version 1.0

Date of PCN: 11/01/2023

1st CoU Issuance Period: 04 Years, 01 Months

1st Crediting Period: 01/12/2018 to 31/12/2022

Project Activity meets the following UN SDGs

PROJECT CONCEPT NOTE

BASIC INFORMATION	
Title of the project activity	**Renewable Biomass Based Thermal Energy Generation By SIIPL, Manjri, Pune, Maharashtra**
Scale of the project activity	Small Scale
Completion date of the PCN	11/01/2023
Project participants	**Project Owner**: Serum Institute of India Pvt Ltd (SIIPL), Pune, Maharashtra **Aggregator**: Egis India Consulting Engineers Pvt Ltd **UCR ID**: 467947294
Host Party	India
Applied methodologies and standardized baselines	**CDM UNFCCC Methodology** **AMS-I.C**.: Thermal energy production with or without electricity (Ver.21.0)
Sectoral scopes	01 Energy industries (Renewable/NonRenewable Sources)
Estimated total amount of average GHG emission reductions per year	**43814** CoUs/yr (**43814** tCO_{2eq}/yr)

SECTION A. Description of project activity

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

The project **Renewable Biomass Based Thermal Energy Generation By SIIPL, Manjri, Pune, Maharashtra** is located at Village: Manjri, Taluka: Haveli, District: Pune, State: Maharashtra, Country: India

The details of the registered project are as follows:

Purpose of the project activity:
Serum Institute of India Pvt Ltd (SIIPL), the project proponent (PP), is an Indian biotechnology and biopharmaceuticals company founded in 1966 and since then it has established itself as the world's largest manufacturer of vaccines.

The UCR project activity consists of the generation of thermal energy by utilizing renewable biomass (Briquettes) boilers of total installed capacity of **19 TPH** at the Manjri campus site (Pune) biotechnology plant owned and operated by the PP. The project activity currently involves the installation of one (1) biomass briquette fired steam boiler with a steam output capacity of **15 TPH**.

15 TPH (Manjri)	1.5 TPH (Manjri)	1.5 TPH (Manjri)	1.0 TPH (Manjri)
Type	**Type**	**Type**	**Type**
Combipac (Water + Smoke Tube)	Smoke Tube	Smoke Tube	Smoke Tube
Commissioning Date	Commissioning Date	Commissioning Date	Commissioning Date
14/06/2021	01/12/2018	01/02/2019	01/12/2018
In operation since installation	Not in operation since August-21	Not in operation since August-21	Not in operation since August-21

The start date of the project activity is **01/12/2018**. This project activity uses renewable biomass briquettes as fuel and supplies the process steam throughout the plant for an important process of sterilization and clean steam generation for advanced procedures within the project boundary at the Manjri campus. The one boiler installed is "Combipac Reciprocating" grate type that ensures 100% firing of biomass briquettes.

Conventionally, thermal energy required for steam generation in a boiler is obtained by the combustion of fossil fuels such as coal, FO, etc. 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. The primary technology for the project activity involves direct combustion of biomass in the boiler to generate thermal energy. During combustion chemical energy contained in the biomass is converted into thermal energy, which is utilized for steam/hot air generation.

The briquettes, used in all the installed boilers within the project activity, are composed of mainly agro based industrial residues (bagasse) and crop residues (soya bean waste and groundnut shells) 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). Reciprocating grate offers progressive combustion with distinct combustion zones making it the ideal solution for biomass combustion with moisture up to 60%. This grate offers huge fuel flexibility and can burn complex agricultural biomass fuels like forest wastes, empty fruit bunches, spice waste, soya stock, and many other biomasses.

Reciprocating utilizes successive oscillation of grate castings mounted on different trolleys for the continuous movement of fuel. These trolleys are driven by independent hydraulic cylinders and alternate movement of grate blocks pushes the fuel in the distinct combustion zones of the grate. This gives toppling action to the fuel a particle hence ensures complete combustion. The project activity consumes about **10700 tonnes** of biomass per year.

The estimated annual average emission reductions due to the project activity are **43814** tCO2e.

Biomass Briquettes

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 demand of steam would have been met by a coal fired boiler. The project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change.

Assured supply of biomass fuel and other barriers to biomass boiler implementation

The project activity could have used coal instead of biomass. In India, the continuous and uninterrupted supply of fossil fuel (coal and FO) from nearby depots does not require SIIPL to deploy manpower and is the cheaper alternative. On the other hand, bagasse being an agricultural produce is dependent on the vagaries of the nature, has to be sourced from a large number of suppliers and is seasonal in nature. Getting assured supply of biomass is dependent on many uncontrolled parameters thereby increasing the risk of shutdown for the project activity.

Considering the criticality of supply of steam, SIIPL would have ideally used a coal fired boiler for their in house activities at the manufacturing unit. This source of fossil fuel derived steam is more reliable, well proven, easier to operate and is subject to minimal breakdown as opposed to a biomass based boiler. Although fossil fuel based energy generation sources are more reliable but are carbon intensive and lead to emissions of greenhouse gases in the atmosphere, the project proponent being an environment conscious organization, decided to implement a biomass based boiler in light of concerns on global warming caused due to accumulation of greenhouse gases. The biomass based boiler helps avoid and mitigates GHG emissions that would have been generated from the coal fired boiler. The project activity has the following ongoing technological and operational risks:

- The ash generated after combustion of biomass contains high percentage of silica which leads to rapid erosion of the equipments. Due to high silica content, equipments like ID fan, cone portion of air preheater and top portion of the stack get eroded which leads to high maintenance cost, frequent breakdown and increased downtime.
- The fuel flow control with respect to the steam output is difficult in biomass fired boilers.
- The problems with biomass are further aggravated due to the higher level of moisture and at times presence of impurities added. Many a times, the biomass procured is mixed with impurities such as dust particle, stones and pebbles, and other biomass such as leaves, straw etc. The impurities present can damage the machinery and also provide incorrect estimates of the biomass requirement for steam generation. In addition to this the effective cost of biomass

is also increased affecting project's viability. The perceived technological and operating risks of project activity has lead to events of boiler breakdown and the revenue from the sale of UCR carbon credits would help in covering these technological and operational ongoing risks.

- There is a lot of manpower and logistical efforts required from the project proponent in collection and transportation of the biomass.
- There has to be further precautions taken by the PP to store the fuel from adverse weather conditions.
- An in-house facility has been setup to check the quality of biomass and to take immediate necessary action with respect to the storage of biomass.

Projects using biomass for captive energy generation in India are generally considered to have a high risk of discontinuation, since the price of biomass as well as the unreliability of the supply chain favour a switch to coal fired energy generation in most cases (source: https://newclimate.org/wp-content/uploads/2017/05/vulnerability-of-cdm.pdf, May 2017).

The sale of voluntary carbon credits and revenue from the same will increase the financial attractiveness for the continued use of biomass at captive energy industries across India. From the above paragraphs, it is clear that the project activity has and continues to face barriers, but in spite of that, SIIPL decided to implement this project and revenue from the sale of UCR carbon credits would help mitigate the above barriers and showcase de-carbonizing efforts such as fossil fuel switch to biomass, is profitable and desirable as a necessary tool to fight global warming and climate change.

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

There are social, environmental, economic and technological benefits associated with this project activity that meet the UCR positive impact test as below:

- **Social benefits:**
- The project activity contributes to employment generation in the local area for both skilled & unskilled people for operation and maintenance of the equipments.
- It has created steady higher value jobs and skilled workers at the facility. 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. 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 also through handling of biomass material to the project plant.

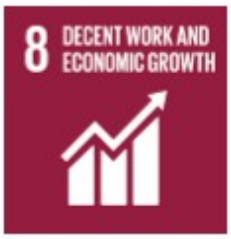
  By discouraging use of coal and thereby mining of coal, the project activity reduces the exposure of coal miners to dangerous working conditions and toxic work environments.

- **Environmental benefits:**
- The project activity is a renewable energy project, which utilizes biomass 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 green energy in the form of steam, it has positively contributed towards the reduction in (demand) use of finite natural resources like coal and furnace oil, minimizing depletion 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 bagasse from agricultural industrial mills in the vicinity are generally in excess and hence get disposed in unplanned ways including dumping into nearby rivers. As a result 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 activity creates employment opportunities during the project stage and operation and maintenance of the boiler.
- The project activity helps in conservation of fast depleting natural resources like coal and oil thereby contributing to the economic well being of country as a whole.
- 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 millers, which in turn benefits the local farmers in the area. The project activity results in saving the coal and allowing it to be diverted to other needy section of the economy.

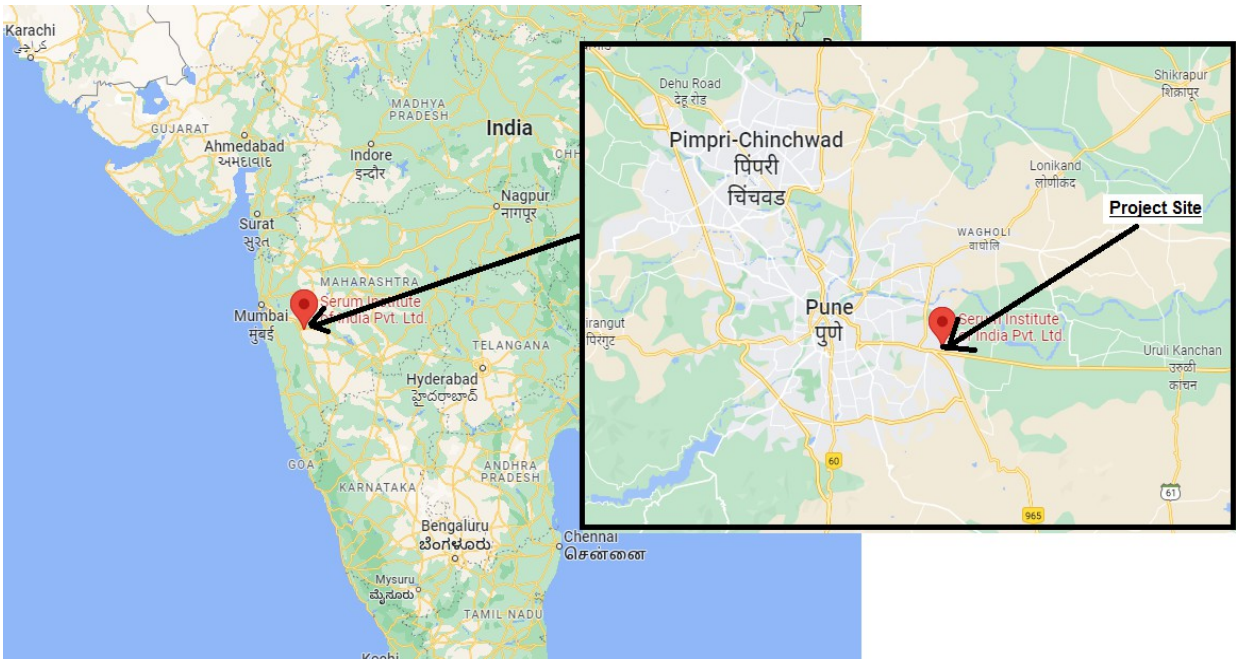
Contribution to UN SDGs: The project activity, beside "Climate action' (i.e., SDG 13), addresses multiple other UN SDGs too. The list of the SDGs addressed through the project activity is mentioned below:

SDG	Description of Contribution
SDG 7: Affordable and Clean Energy 	Biomass fired cogeneration system is a GHG neutral system and by requesting submission of this project under UCR, the project owner is evidently seeking international cooperation to facilitate FDI into clean energy infrastructure of India. The briquettes used in the project activity are composed of mainly agro based industrial residues (Bagasse) and crop residues (soya bean waste, groundnut shell) based on their availability locally. Hence the briquette is made from "biomass residue" as per "Definition of renewable Biomass" EB23, Annex 18.
SDG 12: Responsible Consumption and Production 	Biomass 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 biomass from agricultural waste helps in repurposing of waste and also contributes to the share of renewable energy in the country and reduces the carbon footprint
SDG 13: Climate Action 	Biomass based cogeneration systems reduce the GHG emissions of the planet at large.
SDG: 17 Partnership for the Goals 	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.

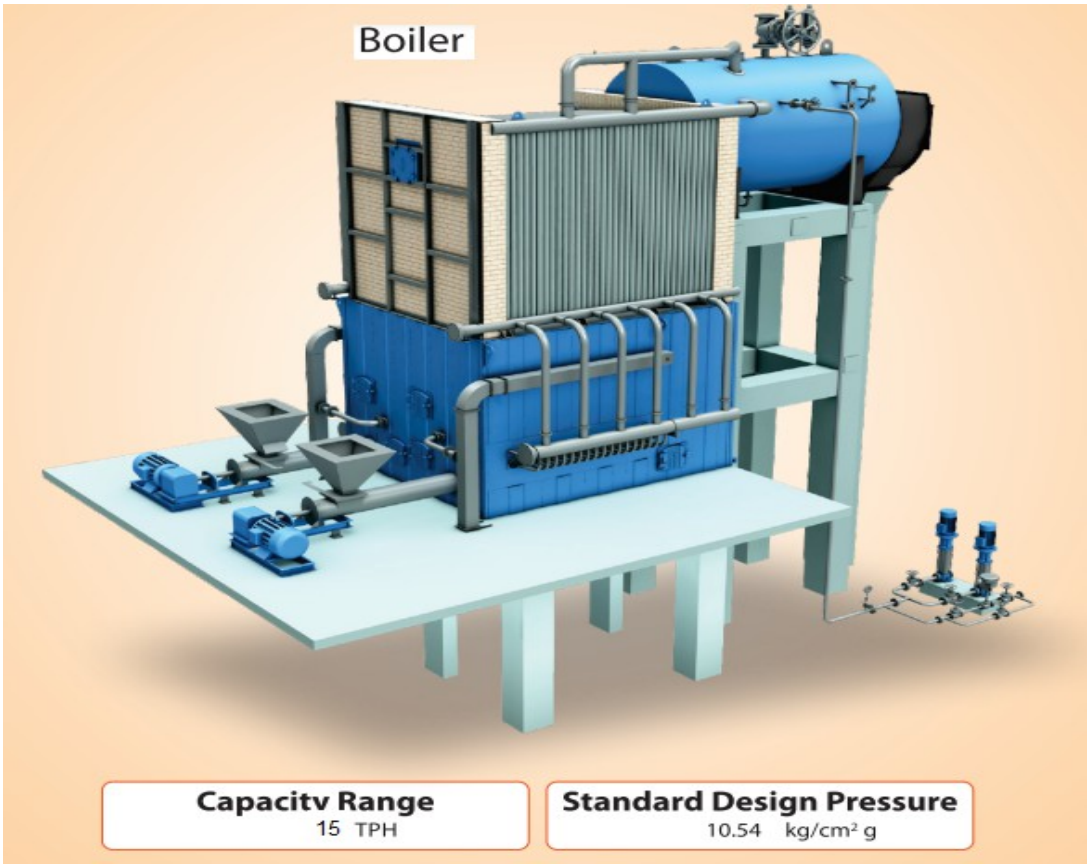
SDG 8: Decent work and Economic Growth 	By using renewable energy sources for economic productivity to achieve same outcomes at the process level- the PP aims to decouple environmental degradation, global warming and climate crisis from economic productivity.
SDG 9: Industry, Innovation and Infrastructure 	The project activity directly contributes to abatement of carbon dioxide emissions.

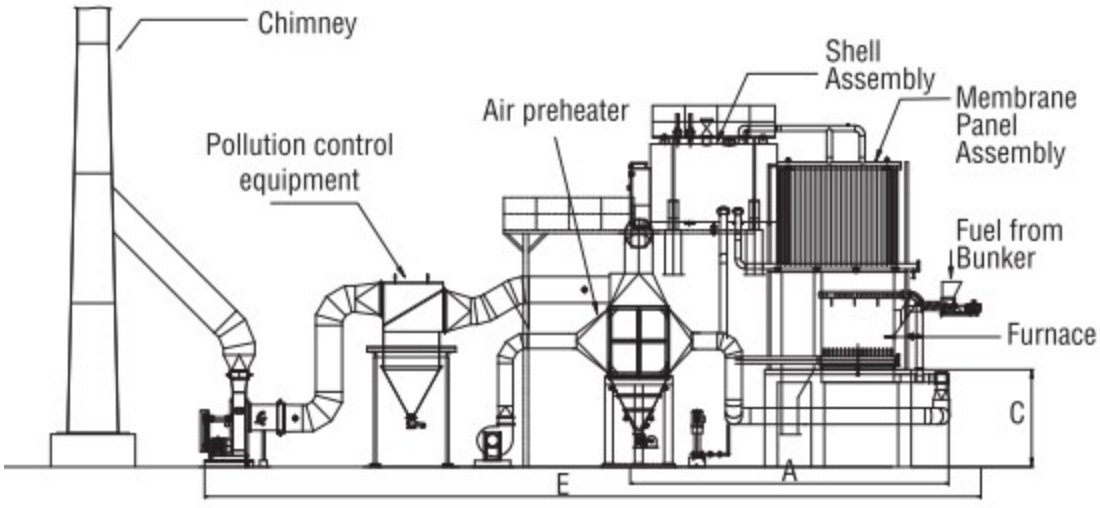
A.3. Location of project activity >>

Country : India
Village : Manjri
District : Pune
State: Maharashtra (Pincode 412307)
Latitude: 18°30'12.4”N
Longitude: 73° 56'44.9"E



A.4. Technologies/measures >>





The project activity is the installation of biomass fired boilers for steam generation. The generated steam is utilized for meeting the process requirement. In the baseline scenario the steam was to be generated through a coal based boiler, to meet SIIPL's process requirement. The project activity has hence replaced coal based boiler with biomass based boiler for steam generation thus the project activity is environment friendly and leads to GHG emission reduction. The CO2 emission due to the combustion of biomass is neutralized by the photosynthesis process of agricultural crops. Hence, it "recycles" atmospheric carbon and does not add to the greenhouse effect. And also the biomass

contains negligible quantities of nitrogen and sulphur, hence the other green house gas 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 biomass boiler technology is available within India from reputed manufacturers.

Description	Data
Capacity of Current Boilers	15 TPH (4.1 kg/sec)
Number of Boilers	1
Pressure	10.5 kg/cm^2
Model	CPRG 150/12.5/1001
Enthalpy of Steam (Boiler outlet temp 280 ^oC)*	3.00 MJ/kg
Operation days/annum	330 days/yr (24hrs/day)
Enthalpy of water @100 ^0C	0.418 MJ/kg
Boiler Rating	15*(3.0-0.418)/3.6 = 10.75 $MW_{thermal}$
NCV of Biomass	4000 kcal/kg

Description	Data
Total Capacity of Replaced Boiler/s	4 TPH (1.1 kg/sec)
Number of Boilers	3 (Discontinued)
Pressure	10.5 kg/cm^2
Enthalpy of Steam (Boiler outlet temp 280 ^oC)*	3.00 MJ/kg
Operation days/annum	330days/yr (2018-2021)
Enthalpy of water @100 ^0C	0.418 MJ/kg
Boiler Rating	4*(3.0-0.418)/3.6 = 2.86 $MW_{thermal}$

*https://www.spiraxsarco.com/resources-and-design-tools/steam-tables/superheated-steam-region

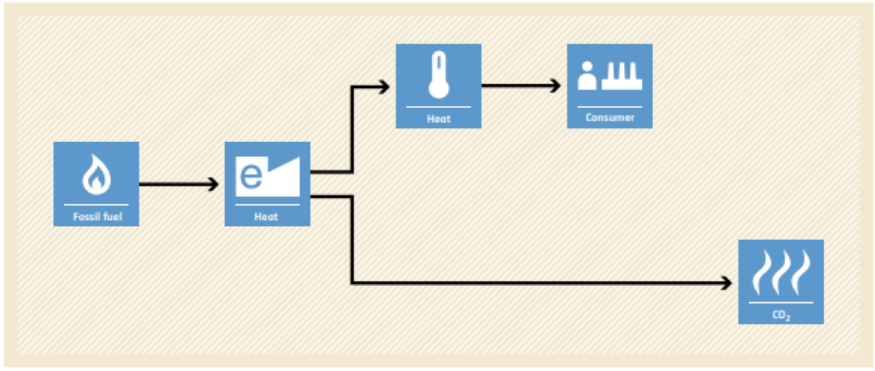
A.5. Parties and project participants >>

The project activity has been developed completely on the basis of in-house resources of the PP. Project activity does not involve any public funding from Annex I Party, which leads to the diversion of the official development assistance.

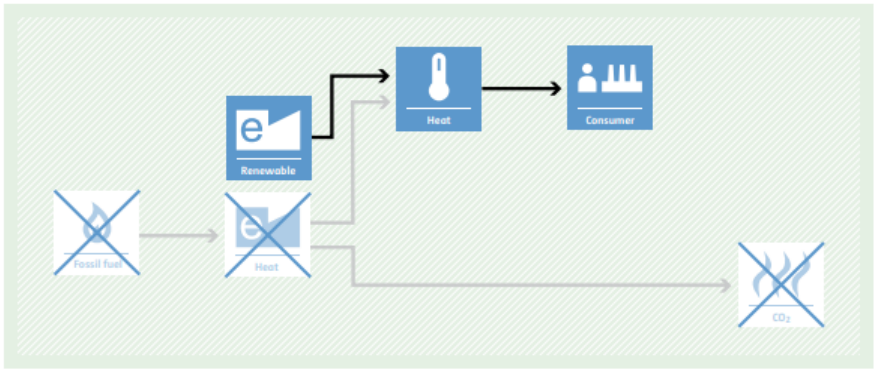
Party (Host)	Participants/Aggregator
India	**Project Owner**: Serum Institute of India Pvt Ltd (SIIPL), Pune, Maharashtra **Aggregator**: Egis India Consulting Engineers Pvt Ltd **UCR ID**: 467947294 Email: sneha.k@egis-india.com

A.6. Baseline Emissions>>

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.



PROJECT SCENARIO
Energy generation by installation of new renewable energy generation units, by retrofitting or replacement of existing renewable energy generation units as well as by switch from fossil fuel to biomass in modified existing facilities.



(The diagram has been sourced from the CDM Methodology Booklet; with reference to AMS-I.C. Methodology)

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 probable baseline scenario would have been steam generation using fossil fuel (coal). Thus to determine emission co-efficient SIIPL has used emission factor for coal as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories for GHG emissions 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 residues (bagasse/agricultural waste), which is a carbon neutral fuel and therefore the emission coefficient (tC/TJ) is zero.

A.7. Debundling>>
This project is not a debundled component of a larger registered carbon offset 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.: Thermal energy production with or without electricity (Ver. 21.0)***

This methodology comprises renewable energy technologies that supply users i.e. residential, industrial or commercial facilities with thermal energy that displaces fossil fuel use. These units include technologies such as energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.

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

The project activity is thermal energy generation project using a biomass (bagasse and crop residues i.e. soya bean waste, groundnut shell etc) based boiler that displaces equivalent amount of thermal energy that would have been generated by a fossil fuel based boiler. 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 10.75 $MW_{thermall}$ which is less than the threshold of 45$MW_{thermal}$ as per the applied methodology. The capacity limits specified in the methodologies apply to both discontinued/existing and additional units within the project activity. In the present case of the project activity, a 15 TPH boiler was added to the already 4 TPH (combined capacities) boilers, however, the total capacity of the units added within the project activity (since 2021), is 19 TPH, and this results in a thermal capacity generation of 13.61 $Mw_{thermall}$ which also complies with capacity limits of the methodology. All boilers were physically distinct from each other prior to discontinuation.
The biomass used by the project plant is not stored for more than one year.
The project activity does not involve recovery and utilization of biogas for power/heat production.
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.
Biomass generated steam is used for captive use. The steam produced in the project activity is utilized in the process of SIIL. 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 doublecounting of emission reductions by the supplier.
Thermal energy generation capacity are determined by taking the difference between enthalpy of total output leaving the project equipment and the total enthalpy of input entering the project equipment.

The installed biomass boiler generates steam to meet the demand of steam recipient plant and displace 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. Note that fossil fuel (i.e. furnace oil, coal, gas, etc) cannot be used for biomass fired boilers due to its specialized design of combustion chamber. 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 at recipient plant. The project activity will thus reduce Green house gas (GHG) emissions associated with the combustion of fuel oil in baseline boilers. The project activity claims emission reduction for the thermal energy production by renewable energy technologies (biomass boilers) 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 >>

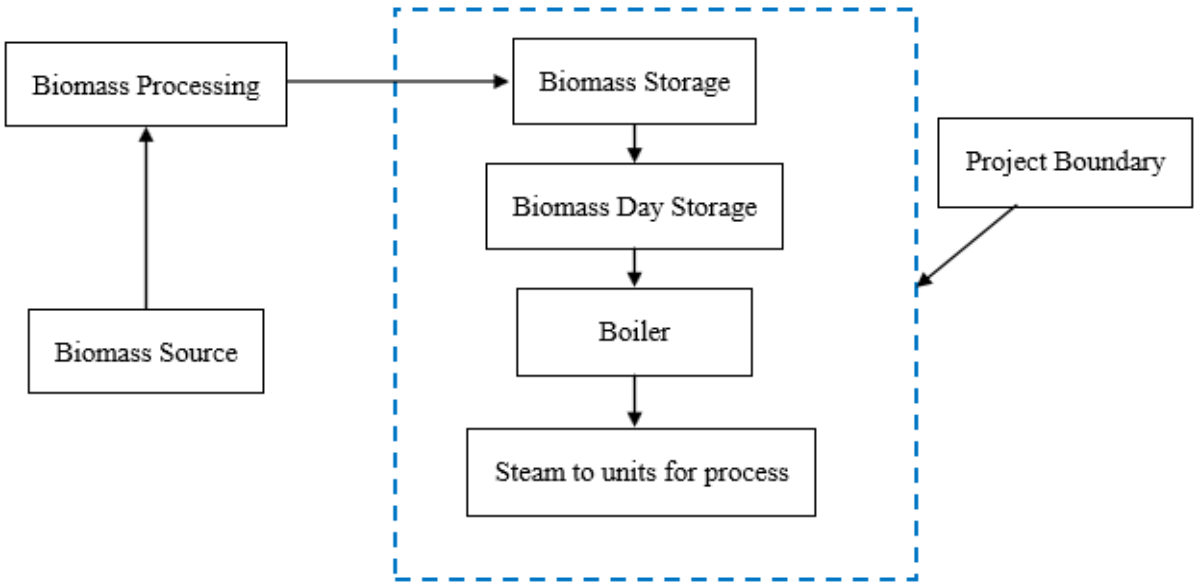
The biomass boilers are unique and constructed by the PP within the project boundary. Each biomass boiler has a unique ID, which is visible on the unit. The Monitoring Report has the details and will be provided to the UCR verifier during the verification process.

The PP has not applied for carbon credits under any other voluntary GHG mechanism for the project activity. 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 1 km of the current project boundary**, hence the project activity is not a debundled component of a large scale project.

By using locally sourced GHG-neutral biomass, the PP is successfully able to avoid the fossil fuel emissions and thereby GHG emissions due to in-house cogeneration energy requirements and also vehicular emissions avoiding sourcing of biomass fuel from a large distance.

	Source	GHG	Included?	Justification/Explanation
Baseline	Co2 Emissions from fossil fuel in boilers for heat	CO_2	**Included**	Major source of GHG emissions
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	Emissions from Biomass Project Activity	CO_2	Excluded	Excluded for simplification. This is conservative
		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 >>

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.

Emission Reductions (ER_y) 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:

$$\mathbf{ERy = BE_y - (PE_y + LE_y)}$$

$\boldsymbol{BE_y}$= Baseline emissions in year y (t CO_{2e})

As mentioned in the methodology AMS I.C, for steam produced using fossil fuels the baseline emissions are calculated as follows:

$$\boldsymbol{BE_y} = \mathbf{(HG_y * EF_{CO2}) / \eta_{th}}$$

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..

EF_{CO2} = The CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2/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 (Table 1 below).

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 contains negligible quantities of nitrogen and sulphur, the other green house 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 the given methodology, the PP must "*For microscale and small-scale project activities, apply a default emission factor of 0.0142 tCO2/tonne of biomass"*.

Therefore, the project emissions are as follows

Description	Quantity
Quantity of dry biomass consumed	10700 t/yr
Default emission factor tCO2 / tonne	0.0142
PEy	152 tCO_2/yr

LE_y = 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

Enthaply of Steam	=	3003.42 kJ/kg (at 10.54 kg/cm^2 and 270 ^{0}C)
Yearly Steam Production (19TPH)	=	150480 T
Enthaply of Feed Water 100 ^{0}C	=	419.1 kJ/kg
Q_{steam} *Net Steam Quantity*	=	(3003.42-419.1) *150480/10^6 = 388.88 TJ

EF_{CO2}	=	96.1 tCO2/TJ IPCC 2006 guidelines for National Greenhouse Gas inventories got stationary combustion

Estimated $BE_{w,treatment,y}$ = (388.88 * 96.1) / 0.85 tCO_2 = 43966 tCO_2

Estimated ER_y = <u>43814</u> CoUs/yr

Table 1. Default baseline efficiency values for different technologies as per AMS IC Methodology

Technology of the energy generation system	Default efficiency
New natural gas fired boiler (w/o condenser)	92%
New oil fired boiler	90%
Old natural gas fired boiler (w/o condenser)	87%
New coal fired boiler	85%
Old oil fired boiler	85%
Old coal fired boiler	80.00%

B.6. Prior History>>

The project activity has no history of carbon credits generation in any other GHG program. Hence there is no double counting of the carbon credits anticipated for the current project activity.

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

There is no change in the start date of crediting period (01/12/2018).

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>>

1st First Issuance Period: 04 years, 01 months
1st Crediting Period: 01/12/2018 to 31/12/2022
1st Monitoring Period: 01/12/2018 to 31/12/2022

B.8. Monitoring plan>>

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
$T_{Feedwater}$	Temperature of boiler feed water
$E_{Feedwater}$	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
EF_{CO2}	The CO_2 emission factor of the coal (fossil fuel) that would have been used in the baseline plant.

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 SIIPL. 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 device
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 biogas 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 Value(s) applied	Plant records and log books receipts
Measurement methods and procedures	Monitoring: The quantity of biomass fed into the boiler is controlled. Data type: Measured Responsibility: Boiler Operator
Monitoring frequency	Daily
QA/QC	The amount of biomass used can be cross checked by the purchase orders and stock inventory for rice husk

Data/Parameter	S_P
Data unit	Kg/cm2 boiler
Description	Pressure of the steam at the outlet of the biomass boiler
Source	The steam pressure would be measured using pressure gauge. This parameter is used to calculate the Net Enthalpy of steam.
Measurement methods and procedures	Monitoring: Log book Data type: Monitored
Monitoring frequency	Daily/Hourly
QA/QC	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.

Data/Parameter	$T_{feedwater}$
Data unit	^0C
Description	The temperature of feed water
Source of data Value(s) applied	Plant Log Sheets
Measurement methods and procedures	Feed water 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
QA/QC	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.

Data/Parameter	h_f
Data unit	Kj/kg
Description	Feed water enthalpy
Source of data Value(s) applied	Plant Log Sheets
Measurement methods and procedures	Type: Calculated Data type: Monitored
Monitoring frequency	Daily
QA/QC	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.

Data/Parameter	h_g
Data unit	Kj/kg
Description	Steam enthalpy
Source of data Value(s) applied	Plant Log Sheets
Measurement methods and procedures	Type: Calculated Data type: Monitored
Monitoring frequency	Daily
QA/QC	The parameter is is calculated from the monitored steam pressure. 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.