PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: 3 MW Biomass-fired cogeneration project at Tamil Nadu

Version 1.0

Date 19/10/2023

First CoU Issuance Period: 9 years, 07 months

Date: 10/05/2013 to 31/12/2022

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

BASIC INFORMATION	
Title of the project activity	3 MW Biomass-fired cogeneration project at Tamil Nadu
Scale of the project activity	Small Scale
Completion date of the PCN	19/10/2023
Project participants	1. GVG Paper Mills Pvt. Ltd 2. First Climate (India) Private Limited (Aggregator)
Host Party	India
Applied methodologies and standardized baselines	CDM Methodology AMS- I.C. - Thermal energy production with or without electricity (Version 22.0)
Sectoral scopes	Sectoral Scope: 01 Energy industries (renewable - / non-renewable sources)
Estimated amount of total GHG emission reductions	75,744 CoUs / year (75,744 tCO_{2eq} / year)

SECTION A. Description of project activity

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

The project 3 MW Biomass-fired cogeneration project at Tamil Nadu is located in Village Pushpathur, Tehsil Palani, District Dindigul, State Tamil Nadu, Country India.

The details of the registered project are as follows:

Purpose of the project activity:

The project activity includes the installation of a biomass-fired boiler, of 28 TPH in Pushpathur village, Palani tahsil, Dindigul district, for generation of thermal energy and electricity. The boiler is further connected to 3 MW turbine. The project activity is commissioned to simultaneously generate steam for meeting the process requirements, as well as to run the turbine and generate electricity which is used for captive consumption.

The purpose of the project activity is to generate thermal and electrical energy from biomass and replacing non- renewable fossil fuels like coal with renewable biomass. The preferred biomass for the project activity here is rice husk which is available in good quantity.

In absence of the project activity thermal and electrical energy would have been generated by using coal, which is the most common industrial practise in India. By using biomass it is not only reducing the coal demand but also avoiding Greenhouse gas (GHG) emissions from burning of coal which would otherwise have been emitted in the atmosphere. Biomass is a carbon neutral substance hence it has positive impact on the environment.

The project activity was commissioned in 10/05/2013, which is also the commissioning date the 3 MW turbine. By installing the project activity, the project owner aims to avoid 75,744 tonnes of CO_2 equivalence of GHG emissions annually. Emission reductions shall be claimed by the project owner for both the thermal and electrical component of energy so generated from choosing biomass as a fuel instead of fossil fuel.

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 is mentioned below:

SDG	The Project contributes to	Description of contribution
7 AFFORDABLE AND CLEAN ENERGY **SDG 7: Affordable and Clean Energy**	Target: 7.1 Indicator: 7.1.2 Target: 7.b Indicator: 7.b.1	Biomass fired cogeneration system is a carbon neutral system. Also, rice being cultivated year round, rice husk fired systems are considered as sources of renewable energy.

SDG 8: Decent work and Economic Growth	Target: 8.4 Indicator: 8.4.1	By using renewable energy sources for economic productivity to achieve same outcomes at the process level- the project owner aims to decouple environmental degradation, global warming and climate crisis from economic productivity.
SDG 9: Industry, Innovation and Infrastructure	Target: 9.4 Indicator: 9.4.1	The project directly contributes to abatement of carbon dioxide emissions.
SDG 12: Responsible Consumption and Production	Target: 12.2 Indicator: 12.2.1 Target: 12.5 Indicator: 12.5.1 Target: 12.a Indicator: 12.a.1	Rice husks, 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 rice husks help in repurposing of waste and also contributes to the share of renewable energy in the country and reduces footprint.
SDG 13: Climate Action	Target: 13.2 Indicator: 13.2.2	Biomass based cogeneration systems reduce the GHG emissions of the planet at large.

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

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

- **Social benefits:**
- Employment for skilled and unskilled labour in the project locality for operational and maintenance of the equipment.
- By discouraging use of coal and thereby mining of coal, the project activity reduces the exposure of coal miners to dangerous working conditions and occupational health hazards caused by chronic exposure to the mining environment.
- The plant will inspire many such projects to be implemented in the nearby area to adopt renewable resources.

- **Environmental benefits:**
- In this project activity, both the electrical and thermal energy is generated by the biomass-based cogeneration plant which replaces fossil fuels. As renewable biomass is considered to be carbon neutral fuel, combustion of paddy husk in this project activity does not result in net increase of GHG emissions.
- Project activity uses rice husk as a fuel to fire boilers which is a waste of rice milling process which is utilized or else would have been dumped and caused air pollution in the nearby surroundings.
- The project activity helps in generating and utilizing green electricity.

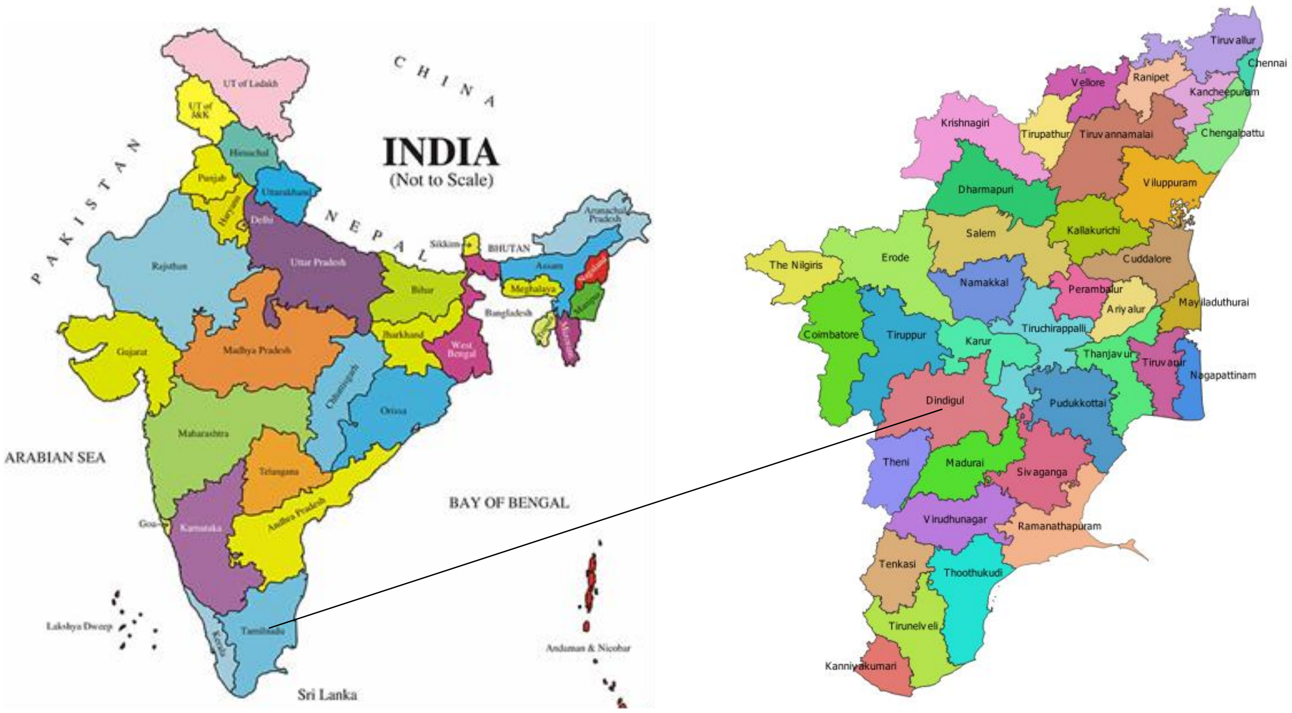
- **Economic benefits:**
- Employment generation for the local population which results in economic wellbeing-including better health, better education, better standard of living, etc.
- The project activity promotes circular economy and effective utilisation of wastes, thereby increasing the resource efficiency of the region and also promoting wealth / economic value generation from waste. This also reduces demand for fresh resources of the land, thereby preserving it for future exigencies.

- **Technological well-being:**
- The technology facilitating use of biomass material for cogeneration is environmentally safe and not difficult to operate, compared to non-renewable energy utilizing facility of similar kind.
- The technology being adopted is a good example of application of established technologies developed within the country for power generation, thus positively contributing to the technological well-being.

A.3. Location of project activity >>

Country: India
District: Dindigul
Village: Pushpathur
Tehsil: Palani
State: Tamil Nadu
Code: 624618

The geographical coordinates of the project site are:
Latitude: 10.528102 ºN
Longitude: 77.394131 ºE



A.4. Technologies/measures >>

The project activity has installed a cogeneration system involving a 28 TPH biomass fired boiler connected to turbine of 3 MW capacity to produce both steam and electricity. The electricity generated by the plant is used for captive consumption.

The entire system is fuelled using renewable biomass like rice husk sourced locally. By using locally sourced carbon-neutral biomass, the project owner is successfully able to avoid the fossil fuel consumption and thereby Greenhouse Gas (i.e., GHG) emissions that would have otherwise occurred due to in-house operations of cogeneration energy requirements using fossil fuels.

Technical details of boiler and turbine:

Boiler:

Parameter	Unit	Value
Boiler rated capacity	TPH	28
Steam Pressure	Kg/cm^2	46
Steam Temperature	Deg. C	430 ± 10
Fuel Type	-	Rice husk

Turbine:

Parameter	Unit	Value
Rated capacity	KW	3000
Inlet steam pressure	Kg/cm^2	46
Inlet temperature	Deg. C	430
Outlet pressure	Kg/cm^2	2.5
Type of turbine	Back pressure	

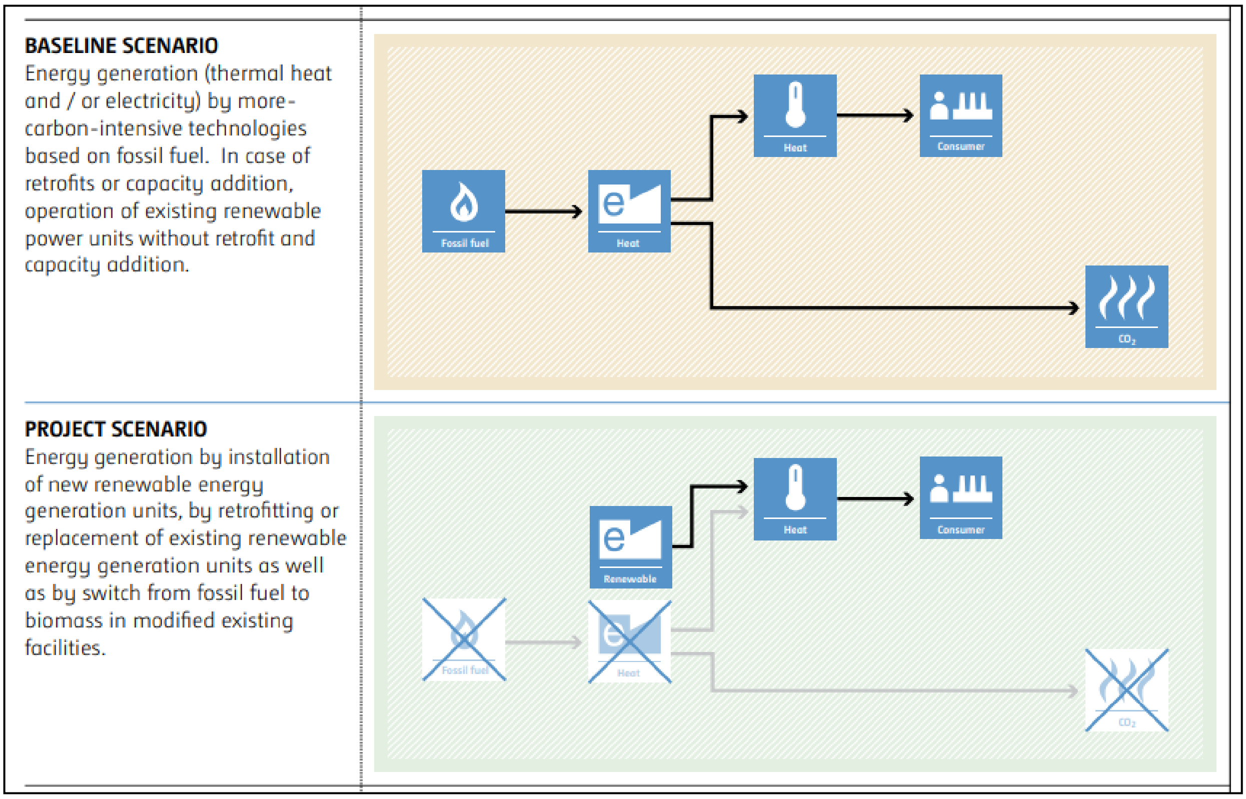
A.5. Parties and project participants >>

Party (Host)	Participants
India	**First Climate (India) Private Limited (AGGREGATOR)** Contact person: Partha P Chaudhuri Mobile: +91 9831012824 Address: 903, ERGO Tower, Plot No. A1-4, Block EP & GP, Sector V, Salt Lake, Kolkata 700 091 **GVG Paper Mills Private Limited**

	(DEVELOPER) Phone: 04252 – 252327 Address: Nallur, Pushpathur Village, Palani Tk – 624 618, Dist.: Dindigul Tamilnadu, India

A.6. Baseline Emissions>>

The baseline scenario identified at the PCN stage of the project activity is a coal based co-generation system.



A.7. Debundling>>

This “3 MW Biomass-fired cogeneration project at Tamil Nadu” is not a debundled 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- Clean Development Mechanism (CDM)
AMS- I.C Small Scale Methodology
Thermal energy production with or without electricity (Version 22.0)

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

The project activity is a biomass based co-generation system set to cater the electricity and thermal demand of the plant.

Applicability of AMS- I.C	Justification of its application or non-application with respect to the Project
"Biomass-based cogeneration and trigeneration systems are included in this category."	**Applicable and fulfilled** The project involves biomass (renewable) based cogeneration unit for captive usage, thereby displacing fossil fuel-based cogeneration for the purpose. Hence this condition is applicable.
"Emission reductions from a biomass cogeneration or trigeneration system can accrue from one of the following activities: (a) Electricity supply to a grid; (b) Electricity and/or thermal energy production for on-site consumption or for consumption by other facilities; (c) Combination of (a) and (b)."	**Applicable and fulfilled** The project involves simultaneous generation of electricity and thermal energy through biomass based cogeneration plant for captive usage. Hence, point (b) fulfilled.
"Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category."	**Not Applicable** Project activity is a Greenfield project activity and does not seek to retrofit or modify an existing facility for renewable energy generation.
"In the case of new facilities (Greenfield projects) and project activities involving capacity additions the relevant requirements	**Applicable and fulfilled**

<table>
<tr><td>related to determination of baseline scenario provided in the “General guidelines for SSC CDM methodologies” for Type-II and Type-III Greenfield/capacity expansion project activities also apply.”</td><td>The project activity is installation of a Greenfield cogeneration unit. Compliance with the “General Guidelines to SSC CDM methodologies” has been demonstrated at relevant places throughout the PCN.</td></tr>
<tr><td>“The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal”</td><td>Applicable and fulfilled

This is a cogeneration project and the total rated thermal energy generation capacity of boiler is 22.07 MW_{th} which is less than 45 MW_{th} as shown in the following table:

<table>
<tr><td>Boiler capacity</td><td>28 TPH = 7.777 kg/sec</td></tr>
<tr><td>Enthalpy of steam (at 46 kg/cm^2 and 430°C)</td><td>3274.98 kJ/kg = 3.27 MJ/kg</td></tr>
<tr><td>Enthalpy of feed water (at 103°C)</td><td>431.8 kJ/kg = 0.432 MJ/kg</td></tr>
<tr><td>Total thermal output from the 28 TPH boiler</td><td>22.07 MW_{th}</td></tr>
</table>

Therefore, the proposed project meets and fulfils the prescribed criterion under this applicability clause.</td></tr>
<tr><td>“For co-fired 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”</td><td>Not Applicable

The project activity is solely renewable biomass based cogeneration system and co-firing is anticipated for this project activity.
Hence the criteria is not applicable.</td></tr>
<tr><td>“The following capacity limits apply for biomass cogeneration and trigeneration units:
(a) If the emission reductions of the project activity are on account of thermal and electrical energy production, the total installed thermal and electrical energy generation capacity of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating the 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 installed capacity of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant);</td><td>Applicable and fulfilled

The project activity involves biomass based cogeneration system, which results in emission reduction of both thermal and electrical energy production. The total thermal energy generation capacity of project activity is 22.07 MW_{th} which is less than 45 MW_{th} as per the methodology used hence this criteria is applicable.</td></tr>
</table>

(b) If the emission reductions of the 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 shall not exceed 45 MW thermal; (c) If the emission reductions of the 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 shall not exceed 15 MW.”	
“The capacity limits specified in paragraphs 7 to 9 above 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 shall comply with capacity limits specified in the paragraphs 7 to 9, and shall be physically distinct2 from the existing units.”	**Applicable and fulfilled** The project activity has installed a new captive cogeneration unit and does not involve the addition of renewable energy units at an existing renewable energy facility. The total rated thermal energy generation capacity of boiler is 22.07 MW_{th} which is less than 45 MW_{th} and within specific limits.
“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.”	**Not Applicable** The project activity does not involve usages of solid biomass fuel such as briquette, but biomass (renewable) residue and hence this criteria is not applicable. Hence this clause is not applicable to the given Project.
“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.”	**Not Applicable** The project so proposed does not intend to use any processed biomass as a fuel source and hence the given clause in its entirety does not apply to the Project.
“If electricity and/or thermal energy 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	**Not Applicable**

supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions."	The Project so proposed intends to use the generated thermal energy, steam and electrical energy for in-house captive use only. Hence, there is no provision of delivering the generated energy to any third party and hence all the mentioned concerns within this clause does not apply to the given Project.
"If the project activity recovers and utilizes biogas for producing electricity and/or thermal energy 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 account either as project or leakage emissions as per relevant procedures in the tool "Emissions from solid waste disposal sites" and/or "Project emissions from flaring". In the event that the biomass fuel (solid/liquid/gas) is sourced from an existing CDM project, then the emissions associated with the production of the fuel shall be accounted with that project."	**Not Applicable** The project neither targets biogas generation nor does it involve the use of biogas as a fuel source for energy generation purpose. Hence, the clause so mentioned here is not applicable to the given Project.
"If project equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP)."	**Not Applicable** The Project does not involve the use of any refrigerant within its boundaries and hence the given applicability clause is not fulfilled here. So, the concerns of the given applicability clause also do not apply for the project.
"Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources, 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.: Avoidance of methane release from charcoal production by shifting	**Not Applicable** The project activity does not use charcoal for its operation. Hence, this criterion is not applicable.

from traditional open-ended methods to mechanized charcoaling process". 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."	
"In the case the project activities utilizes biomass, the "TOOL16: Project and leakage emissions from biomass" shall be applied to determine the relevant project emissions from the cultivation of biomass and the utilization of biomass or biomass residues."	**Applicable and fulfilled** The project is utilizing biomass residue and the project and leakage emission has been taken in to account in line with TOOL 16 at the relevant sections of the PCN.

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

There is no double accounting of emission reductions in the project activity due to the following reasons:

- The project is a new project and neither registered previously in any other voluntary or compliance program, nor a de-bundled component of any large scale project or Programme of Activities (PoA).

- No previous project was located at the same location. However, another co-generation system of capacity 2.05 MW has been installed within the premises which has also been submitted to UCR. This 3 MW project has its separate commissioning certificate, obtained separate consent to establish and operate, pay separate generation tax. The steam header of those two boilers are also not connected to each other. Hence, this project can be considered as a separate standalone project.

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

The project boundary includes biomass storage which is brought from outside, biomass fired boiler, turbine generating electrical energy and process where the thermal and electrical energies are utilized. The schematic diagram enclosing project boundary is shown below:

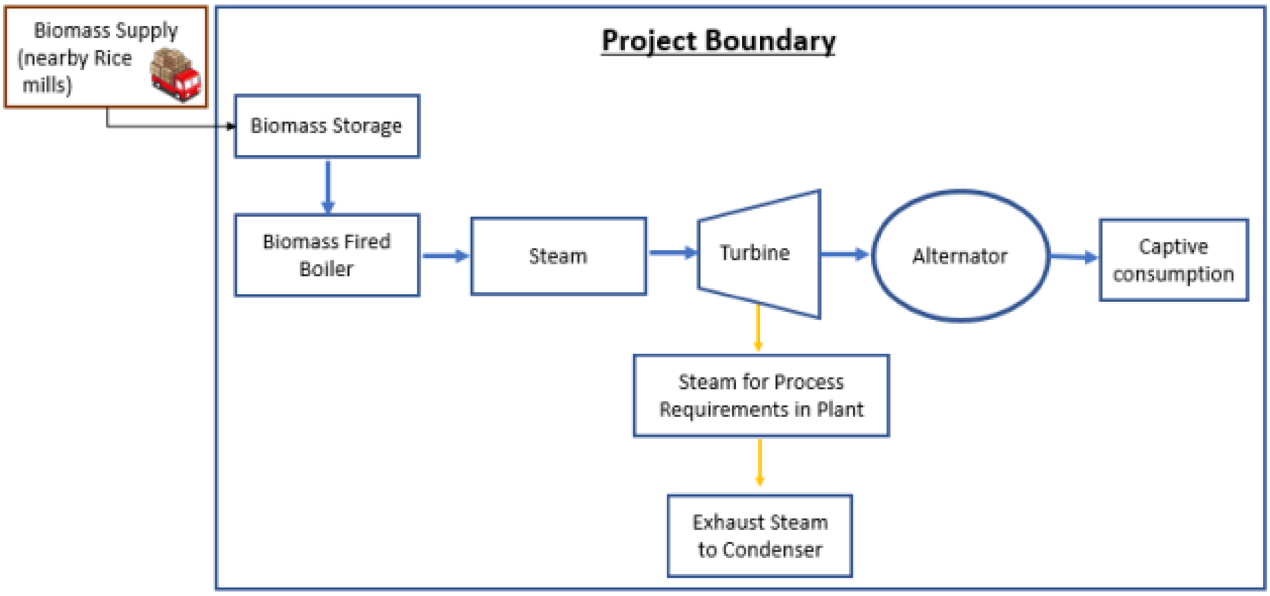


Figure 1: Project boundary of the project activity

The table below provides an overview of the emissions sources included or excluded from the project boundary for determination of baseline and project emissions.

	Source	Gas	Included	Justification/Explanation
Baseline	Emissions from burning fossil fuel like coal within project boundary	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
Project activity	Biomass based Co-generation for thermal energy and electrical energy generation	CO_2	No	Biomass is a carbon neutral fuel. Hence the emissions are not considered.
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative

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

As per the paragraph 29 of approved methodology AMS – I.C., version 22, "*Project activities producing both heat and electricity shall use one of the following baseline scenarios*".

Baseline Scenarios	Justification for choosing the most suitable baseline option
Electricity is imported from a grid and thermal energy is produced using fossil fuel;	Purchasing electricity from grid and thermal energy generation using fossil fuel may be an alternative to the project activity.

	However, unit cost of grid electricity in Tamil Nadu is on higher side. Further there is constant power shortages and power cuts during peak hours. Thus, depending on the grid based electricity supply for operation of the plant is not a feasible option. Hence, this scenario is considered.
Electricity is produced in an on-site captive power plant using fossil fuel (with a possibility of export to the grid) and thermal energy is produced using fossil fuel;	The combined system efficiency for separate heat and power generation would be lower compared to cogeneration plant. The captive power plant and fossil fuel-based steam generation system on account of its lower operating efficiency would result in higher fuel consumption than the cogeneration plant and hence results in higher cost of generation than the cogeneration system. Hence, this scenario is not considered as a plausible baseline alternative.
A combination of (a) and (b);	Since, option (a) and (b) has been eliminated, thus, this option is also not considered.
Electricity and thermal energy are produced in a cogeneration or trigeneration unit using fossil fuel (with a possibility of export of electricity to a grid/other facility and/or thermal energy to other facilities)	For the project activity, fossil fuel-based cogeneration unit can be a possible alternative. Abundant availability and usage of coal in the state for energy generation is a prevailing practice. Hence, this option is considered as an alternative baseline scenario for project activity.
Electricity is imported from a grid and/or produced in an on-site captive power plant using fossil fuels (with a possibility of export to the grid); thermal energy is produced using biomass;	As discussed against point (b) and (a) above, separate generation of energy is less efficient and more fuel consuming leading to higher cost of energy generation. Hence, this scenario is not considered as a plausible baseline alternative.
Electricity is produced in an on-site captive power plant using biomass (with a possibility of export to a grid) and/or imported from a grid; thermal energy is produced using fossil fuel;	As discussed against point (b) above, separate generation of energy is less efficient and more fuel consuming leading to higher cost of energy generation. Hence, this scenario is not considered as a plausible baseline alternative.
Electricity and thermal energy are produced in a biomass fired cogeneration or trigeneration unit	As per AMS – I.C. version 22, paragraph 30, this scenario applies to a project activity that installs a new grid connected biomass cogeneration or

(without a possibility of export of electricity either to a grid or to other facilities and without a possibility of export of thermal energy to other facilities);	trigeneration system that produces surplus electricity and this surplus electricity is exported to a grid. Hence, this scenario is not considered as a plausible baseline alternative.
Electricity and/or thermal energy produced in a co-fired system;	This alternative is similar to the project option with the only difference being the provision of co-firing. Unit cost of generation with coal is lower than that using biomass, evidently the unit cost of generation in a co-fired system will be higher than a coal-based system. Hence, this scenario is not considered as a plausible baseline alternative.
Electricity is imported from a grid and/or produced in a biomass fired cogeneration or trigeneration unit(without a possibility of export of electricity either to the grid or to other facilities); thermal energy is produced in a biomass fired cogeneration or trigeneration unit and/or a biomass fired boiler (without a possibility of export of thermal energy to other facilities);	As discussed in bullet point (a) and (b). above, separate generation of energy is less efficient and more fuel consuming leading to higher cost of energy generation. Hence, this scenario is not considered as a plausible baseline alternative.
Electricity is imported from a grid and/or produced in an on-site captive power plant using fossil fuel and thermal energy is produced using electricity.	As cost of electricity is high in Tamil Nadu, thermal energy generation using grid electricity is costlier than generating thermal energy through coal-based co-gen system. Apart from that separate generation of energy is less efficient and more fuel consuming leading to higher cost of energy generation. Hence, this scenario is not considered as a plausible baseline alternative.

Hence, the baseline condition for this project is Coal fired co-generation system. The emission reduction calculation has been done as per the SSC methodology AMS-I.C., Version 22.

Baseline Emission:

In the absence of project activity, steam and power would have been generated using coal in coal fired cogeneration unit of similar specifications. As per AMS-I.C., Version 22, paragraph 39, “For electricity and thermal energy (steam/heat) produced in a baseline cogeneration unit, using fossil fuel (case 19 (d)), the following equation shall be used to determine baseline emissions:”

$$BE_{cogen/trigen,CO2,y} = [(EG_{PJ,thermal,y} + EG_{PJ,electrical,y} \times 3.6 / \eta_{BL,cogen/trigen})] \times EF_{FF,CO2}$$

Where:

$BE_{cogen/trigen,CO2,y}$	=	Baseline emissions from electricity and thermal energy displaced by the project activity during the year y (t CO2)
$EG_{PJ,electrical,y}$	=	Amount of electricity supplied by the project activity during the year y; (GWh)
3.6	=	Conversion factor (TJ/GWh)
$EG_{PJ,thermal,y}$	=	Net quantity of thermal energy supplied by the project activity during the year y (TJ)
$EF_{FF,CO2}$	=	CO2 emission factor of the fossil fuel that would have been used in the baseline cogeneration plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used (t CO2/TJ)
$\eta_{BL,cogen/trigen}$	=	Total annual average efficiency of the cogeneration or trigeneration plant using fossil fuel determined as per paragraph

The project activity is a Greenfield project, therefore guidance for efficiency calculation is followed as given in para 41 of methodology AMS-I.C, version 22 which states that:

“In the case of a Greenfield project cogeneration or trigeneration plant where the baseline is a cogeneration or trigeneration plant (e.g. using a steam turbine and steam generator that would have been built in the absence of the project activity), the total annual average efficiency of the cogeneration or trigeneration plant using fossil fuel shall be defined as the ratio of thermal energy and electricity produced to total thermal energy value of the fuel use. This ratio shall be determined using one of the two following options (in preferential order):”

(a) Calculated as a single value with consideration of the following:

(i) Step 1:

(a) The total annual average efficiency of the cogeneration or trigeneration plant using fossil fuel is determined using documented efficiency specification for new steam turbines and steam generators provided by two or more manufacturers for each type of such equipment within in the region;

(b) Efficiency values for the steam turbine(s) and steam generator(s) shall be based on turbines and steam generators with specifications nearly equivalent to baseline units that would have been utilized in the absence of the project activity;

(c) The efficiency values utilized shall be the highest individual efficiency values (over the full range of expected operating conditions of the baseline cogeneration or trigeneration system) that can be achieved by the steam turbine(s) and steam generator(s);

(ii) Step 2:

(a) The total annual average efficiency of the cogeneration or trigeneration plant using fossil fuel is then calculated as the product of the highest efficiency value for the steam turbine(s) and the highest efficiency value of the steam generator(s), assuming both efficiencies are in the form of a percentage of output per input;

(b) Calculated as a single value with consideration of the following:

(i) Step 1:

(a) A default steam turbine efficiency of 100 per cent;

(b) Default steam generator efficiency determined using the values provided in appendix;

(ii) Step 2:

(a) The total annual average efficiency of the cogeneration or trigeneration plant using fossil fuel is then calculated as the product of the efficiency value for the steam turbine(s) and the efficiency value of the steam generator(s), assuming both efficiencies are in the form of a percentage of output per input.

Following option (a) of the above guidance, efficiency of the turbine has been calculated based on the operational data and default efficiency of boiler as 85% has been taken. Thereafter, the total annual average efficiency of the cogeneration plant using fossil fuel has been calculated as the product of the calculated efficiency value for the steam turbine(s) and the default efficiency value of the steam generator.

Project emission:

As per para 66 of the methodology AMS-I.C, project emissions shall be calculated using the following equation:

$$PE_y = PE_{FF,} + PE_{Ec,} + PE_{Geo,} + PE_{ref,} + PE_{Biomass,y}$$

Where,

PE_y	=	Project emissions from the project activity during the year y (t CO2)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption during the year y (t CO2)
$PE_{Ec,y}$	=	Project emissions from electricity consumption during the year y (t CO2)

$PE_{Geo,y}$	=	Project emissions from a geothermal project activity in year y (t CO2)
$PE_{ref,y}$	=	Project emissions from use of refrigerant in project activity in year y (t CO2)
$PE_{Biomass,y}$	=	Project emissions associated with biomass and biomass residues in year y (t CO2e)

This is not a geothermal project. The project activity however does not envisage using any fossil fuel during the crediting period. Auxiliary power is supplied from the project itself. Hence, for ex-ante estimations project emissions due to consumption of fossil fuel and electricity consumption has been considered 0. As project does not use any refrigerant in the project activity, project emission related to refrigerant is considered as 0.
Hence,
$PE_y = PE_{Biomass,y}$

As per paragraph 14 of Tool 16, "Project emissions involve emissions resulting from the cultivation of biomass, transportation of biomass, processing of biomass, transportation of biomass residues and processing of biomass residues."

Project does not have any dedicated plantation or cultivation of biomass and raw biomass is being fired in the boiler without any further processing. Hence, project emission would only be calculated for transportation of biomass residue. As per Tool 16 para 31(a), project emission would be calculated based on the default emission factor of 0.0142 t-CO2/ton of biomass.

$PE_{Biomass}$ = Total Quantity of biomass used x 0.0142 t-CO2/ton

Leakage emission:

As per the paragraph 79 of AMS – I.C. version 22,

"If the energy generating equipment currently being utilized is transferred from outside the boundary to the project activity, leakage is to be considered."

For this project activity there is no transfer of equipment and therefore leakage due to equipment transfer has been taken to be zero.

As per the paragraph 80 of AMS – I.C. version 22,
"If the displaced refrigerant is a greenhouse gas as defined in annex A of the Kyoto Protocol or in paragraph 1 of the Convention and is not destroyed, emissions from its storage or usage in equipment must be considered as leakage."

In the project scenario, displacement and storage of refrigerant is not relevant for this project. Hence, this criterion is not applicable.

As per the paragraph 81 of methodology,

"For project activities utilizing biomass and/or biomass residues, the TOOL16 shall be applied to determine the leakage. Project participants shall indicate in the PDD which leakage sources are included. If emission sources are not considered, the project participants shall provide proper justification in the PDD"

As per the paragraph 49 of Tool 16 Methodological tool: Leakage in biomass small-scale project activities Version 05.0

"This section is applicable for project activities which utilise biomass residues. It quantifies leakage due to diversion of biomass residues to the project to be used as either fuel or feedstock. These biomass residues could have been used outside the project boundary in competing applications, and due to the implementation of the project activity these competing application might be forced to use inputs which are not carbon neutral."

In the project scenario, biomass residues being used as fuel is purchased by the project activity and transported from the nearby areas. As biomass is surplus near the project location, there is no leakage from competing uses of biomass.

Estimated Annual or Total baseline emission reductions (BEy) = 75,744 CoUs /year (75,744 tCO2eq/yr)

B.6. Prior History>>

The project activity has not applied to any other GHG program for registration or issuance of credits for the said crediting period. This is a green field project and has never got registered, de-registered or rejected in any other GHG emission reduction programme before. Also, the project has never been a part of any large scale project activity or a PoA.

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: 9 years, 07 months – 10/05/2013 to 31/12/2022

B.8. Monitoring plan>>

The following parameters are used for baseline emission calculations and are fixed ex-ante:

Data/Parameter	$\eta_{BL,cogen}$
Data unit	%
Description	Efficiency of the boiler supplying both thermal energy and electrical energy to the process
Source of data Value(s) applied	Default 85%

Measurement methods and procedures	Not applicable
Monitoring frequency	The value is fixed for the entire crediting period
Purpose of data	To calculate baseline emissions

Data/Parameter	$EF_{FF,CO2}$
Data unit	$tCO_{2\ equivalent}$ / TJ
Description	The CO_2 emission factor per unit of energy of the fuel (coal) that would have been used in the baseline plant
Source of data Value(s) applied	Default, as provided by IPCC in 2006 guidelines. 96.1
Measurement methods and procedures	Not applicable
Monitoring frequency	The value is fixed for the entire crediting period
Purpose of data	To calculate baseline emissions

The following parameters shall be monitored for estimation and calculation of CoUs:

Data / Parameter:	$EG_{PJ,\ electrical,\ y}$
Data unit:	MWh/year
Description:	Amount of electricity supplied by project activity in an year y
Source of data:	Onsite measurement
Measurement procedures (if any):	Measurement would be done by installing 3 phase energy meter at HT side or LT side of generation end.
Monitoring frequency:	Continuous monitoring with energy meters. Recording and archiving maybe periodic in an electronic format or manually.
QA/QC procedures:	Installed energy meter would be as per national or IEC standard. Calibration would be carried out once in every five years.
Any comment:	Generation data would be archiving electronically up to 2 years from the end of crediting period.

Data / Parameter:	T_{FW}
Data unit:	°C
Description:	Average temperature of feed water at boiler inlet.
Source of data:	Onsite Measurement
Measurement procedures (if any):	Measurement would be done by installed thermometer.
Monitoring frequency:	Continuous monitoring with thermometers. Recording and archiving maybe periodic in an electronic format or manually.
QA/QC procedures:	Temperature Gauge will be standard make and recalibrated at appropriate intervals according to manufacturer specifications. If any malfunction noticed, meter would be change with immediate effect.
Any comment:	Data would be archiving electronically up to 2 years from the end of crediting period.

Data / Parameter:	E_{FW}
Data unit:	KJ / kg
Description:	Average enthalpy of feed water at boiler inlet.
Source of data:	Steam Table
Measurement	N/A

procedures (if any):	
Monitoring frequency:	Monitoring procedure: Continuously from measured temperature of feed water. Data Type: Calculated Archiving method: Electronic
QA/QC procedures:	As value would be calculated from steam table, data would be authentic.
Any comment:	Data would be used to evaluate enthalpy change in boiler

Data / Parameter:	Q_{stream}
Data unit:	MT / year
Description:	Extracted steam from boiler supplied to process plant in the year y
Source of data:	Onsite Measurement
Measurement procedures (if any):	Net steam delivered = Present Reading – Previous Reading Archiving method: Electronic
Monitoring frequency:	Monitoring procedure: Daily from installed Steam flow meter. Data Type: Calculated Calculation method: Calculated by subtracting previous reading from present reading of steam flow meter reading.
QA/QC procedures:	Steam flow meter will be certified by third party as per national or international standards and recalibrated at appropriate intervals according to manufacturer specifications.
Any comment:	Data would be used to evaluate net quantity of thermal energy delivered by the project and would be archiving electronically up to 2 years from the end of crediting period.

Data / Parameter:	$P_{process}$
Data unit:	Kg / cm^2 (g)
Description:	Pressure of steam bleed extracted from turbine to supply to the process
Source of data:	Onsite Measurement
Measurement procedures (if any):	Measurement to be done by installed pressure gauge
Monitoring frequency:	Monitoring procedure: Daily from installed pressure gauge. Data Type: Calculated Recording frequency: Daily Average Archiving method: Electronic
QA/QC procedures:	Pressure gauge will be certified by third party as per national or international standards and recalibrated at appropriate intervals according to manufacturer specifications;
Any comment:	To calculate steam bleed enthalpy

Data / Parameter:	E_{stream}
Data unit:	KJ / kg
Description:	Enthalpy of extracted steam from boiler
Source of data:	Steam Table
Measurement procedures (if any):	N/A
Monitoring frequency:	Monitoring procedure: Continuous. Data Type: Calculated Recording frequency: Daily Average / monthly average Archiving method: Electronic
QA/QC procedures:	Not Applicable
Any comment:	To calculate steam enthalpy

Data / Parameter:	$B_{biomass, y}$
Data unit:	Tonne / year
Description:	Quantity (dry basis) of biomass (rice husk) combusted in year y
Source of data:	Onsite Measurement
Measurement	Measurement would be done for each batch of purchased

procedures (if any):	biomass during the entry inside the plant by installed mechanical weighbridge. Net biomass consumption can be calculated by subtracting closing stock of biomass from opening stock of biomass.
Monitoring frequency:	Monitoring procedure: for each batch of purchased biomass. Data Type: Measured Recording frequency: Daily / Monthly Average Archiving method: Electronic
QA/QC procedures:	Consumption of biomass can be cross checked by comparing purchased quantity from invoices and by conducting energy balance.
Any comment:	

Data / Parameter:	GCV_k
Data unit:	kCal / Kg
Description:	Gross calorific value of biomass combusted in year y
Source of data:	Laboratory Test report
Measurement procedures (if any):	Value can be obtained by testing the biomass sample from third party lab.
Monitoring frequency:	Measuring procedure: Quarterly for first year of the crediting period. Data Type: Calculated Archiving method: Electronic
QA/QC procedures:	Biomass sample would be sent to external lab for testing. Testing would be done quarterly for first crediting period. Average of the measured GCV of first crediting period would be fixed for entire crediting period.
Any comment:	To calculate energy generation