PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: 4.4 MW Rice Husk based Cogeneration Project at Sangat Kalan, Punjab

Version 1.0

Date 20/05/2022

First CoU Issuance Period: 8 years, 04 months

Date: 01/01/2014 to 01/04/2022

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

BASIC INFORMATION	
Title of the project activity	4.4 MW Rice Husk based Cogeneration Project at Sangat Kalan, Punjab
Scale of the project activity	Small Scale
Completion date of the PCN	20/05/2022
Project participants	First Climate India Private Limited (AGGREGATOR) BCL INDUSTRIES LIMITED (Developer)
Host Party	India
Applied methodologies and standardized baselines	AMS-I.C.: Thermal energy production with or without electricity Standardized baseline: N/A
Sectoral scopes	01 Energy industries (Renewable/Non-Renewable Sources)
Estimated amount of total GHG emission reductions	To be estimated during verification [An ex-ante estimate is 1,00,086 CoUs per year]

SECTION A. Description of project activity

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

The project **4.4 MW Rice Husk based Cogeneration Project at Sangat Kalan, Punjab** is located in Village Sangat Kalan, Dabwali Road, Bathinda 151001, Punjab, India.

The details of the project are as follows:

Purpose of the project activity:

The proposed project activity is promoted by BCL Industries Limited (henceforth referred as BCL) in their distillery located at Sangat Kalan Village, Dabwali Road, Bathinda 151001, Punjab, India. The purpose of the project activity is to install one 35 TPH husk fired boiler with a back pressure turbine to cater the electricity and steam demand of distillery. The plant is expected to generate about 1,95,865 MT of process steam and 36.54 GWh of electricity per annum. In absence of this project, equivalent amount of energy and steam would have been sourced from more carbon intensive sources i.e. Coal. The project activity thus reduces 1,00,086 t-CO2e/annum greenhouse gas emissions (GHG) by avoiding fossil fuel combustion for steam and power generation.

This project will result in avoidance of GHG emissions associated with generation of equivalent amount of energy from a coal based captive co-generation plant. The proposed project activity will use the biomass which is carbon neutral and thus will prevent depletion of non-renewable natural resources like coal. Target Fulfillment of United Nations Sustainable Development Goals (SDG).

Sustainable Development Goals Targeted	**Project-level SDGs**	**SDG Impact**
		Contribution of Project-level Actions to SDG Targets
SDG 13. Climate Action	106689 tCO2/annum Emission reductions achieved per year.	- Emission reductions achieved per year by reduction of emission of GHGs by stopping combustion of coal and replacing fuel with Rice Husk. - The company purchase bio-mass from nearby areas which is a waste hence also utilises the waste as a fuel. - The plant purchase bio-mass from nearby areas and distance of round trip transportation is less than 200 km, the carbon emission due to transportation of bio-mass get negligible. - Rice husk which is waste for farmers, if the waste was not properly managed and residue would have been dumped then it would generate bad odour, methane and other GHGs. - The company generates its own electricity for its process and not from the national grid which would

		have otherwise generated electricity from the emission of fossil fuel mostly.
SDG 8. Decent Work and Economic Growth sustainable economic growth, employment and decent work for all	The project activity has created at least 2 permanent jobs in the renewable power sector i.e., local employment generation.	The biomass power plant contributes directly to achieve the SDG target, because the project activity The project activity creates jobs in the renewable energy sector, which diversify and upgrades the commonly used technology in the energy sector of India
Goal 5. Achieve gender equality and empower all women and girls	Equal pay for work of equal value" for both men and women and shall hire at least 1 women employee at the site.	Contribute to achieve equal rights for men & women. Number of women employed directly due to the project activity. As per company policy of Project implementer men & women have equal rights and no discrimination will be tolerated against women.
Goal 3. Ensure healthy lives and promote well-being for all at all ages	Target 3.9: "By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. The project has targeted to stop open burning of rice husk by the local farmers	The project will contribute to reduce respiratory health issues among the local population due to open burning of rice husk. Rice husk is a residue of rice crop which, considered waste by the local farmers and is disposed of by burning in the fields due to high cost of collection and lack of economically viable options to utilize the same. This causes air pollution in the State of Uttar Pradesh and also has detrimental impact to the neighbouring States. The burning of husk is the major contributor to greenhouse gases and degradation in soil quality besides health hazard to millions of people residing in neighbouring states. By using Husk in the project activity, the project owner intends to reduce the respiratory heath issues and improve the health condition of the population of the region.

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:

- The project activity would help to alleviate poverty in the area as it creates employment opportunities for the local people during the construction, operation and maintenance phases and also through handling of biomass material to the project plant

Environmental benefits:

- The project activity will help to bridge the gap of electricity demand and supply at local as well as national level
- Employment generation for the local population which results in economic well being
- The project activity will help in conservation of fast depleting natural resources like fossil fuels, thereby contributing to the economic well-being of country as a whole.

Economic benefits:

- In this project activity, the electrical and thermal energy is generated by the biomass-based cogeneration plant which replaces carbon emission intensive fossil fuels. As renewable biomass is considered to be GHG neutral fuel, combustion of biomass in this project activity does not result in net increase of GHG emissions. Besides the GHG emission reduction, the project activity also reduces emission of SOx, NOx, etc. associated with the combustion of fossil fuels.
- As the plant purchase bio-mass from nearby areas and distance of round trip transportation is less than 200 km, the carbon emission due to transportation of bio-mass get reduced.

Technological well-being:

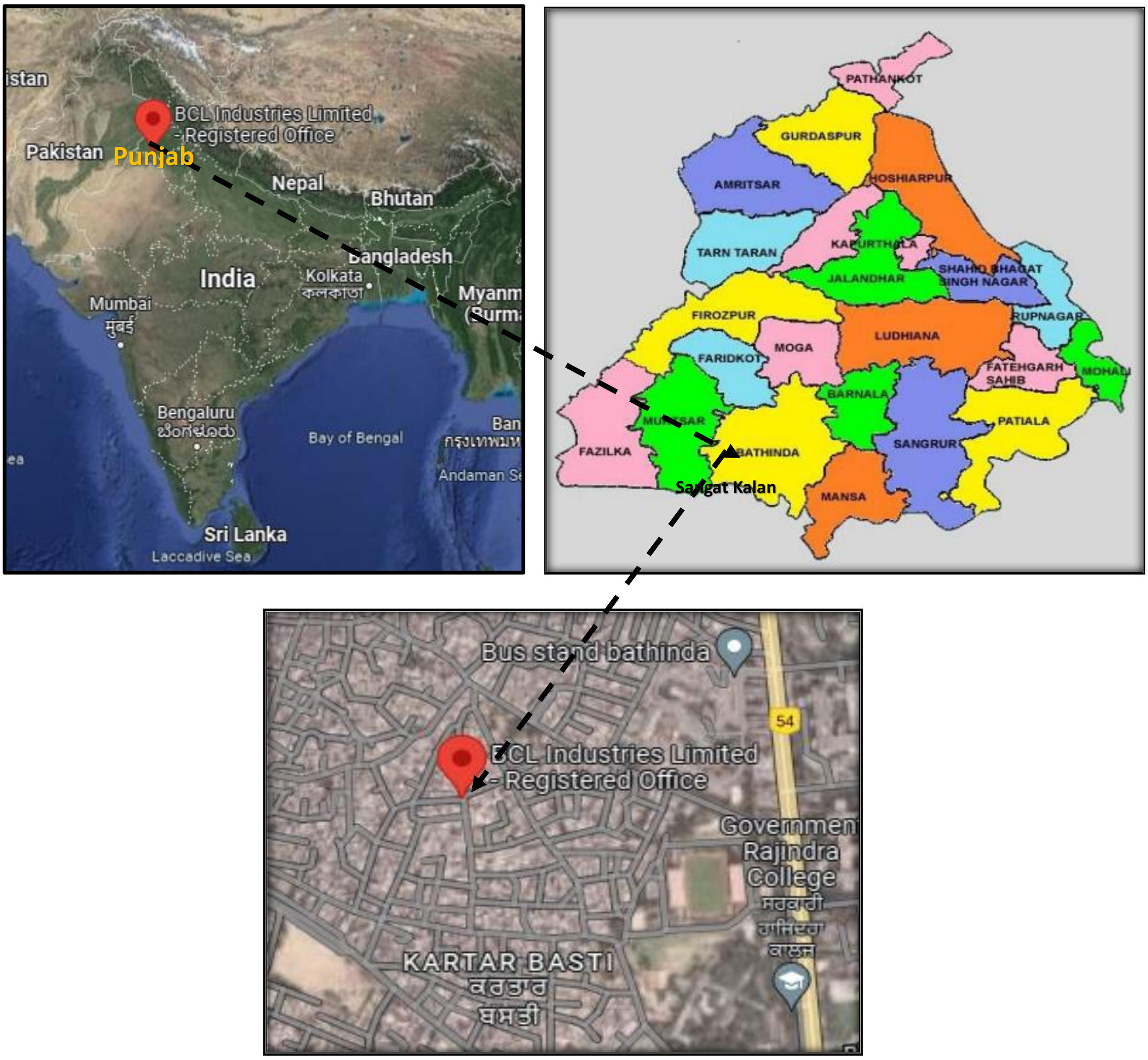
- The technology facilitating use of biomass material for cogeneration is environmentally safe.
- The success of the project will help in diffusion of knowledge about renewable energy technology to other power producers and will also promote the generation of green power in the region.

A.3. Location of project activity >>

Country: INDIA
District: Bathinda
Village: Machhana Sang
Tehsil: Sangat
State: Punjab
Code: 151001

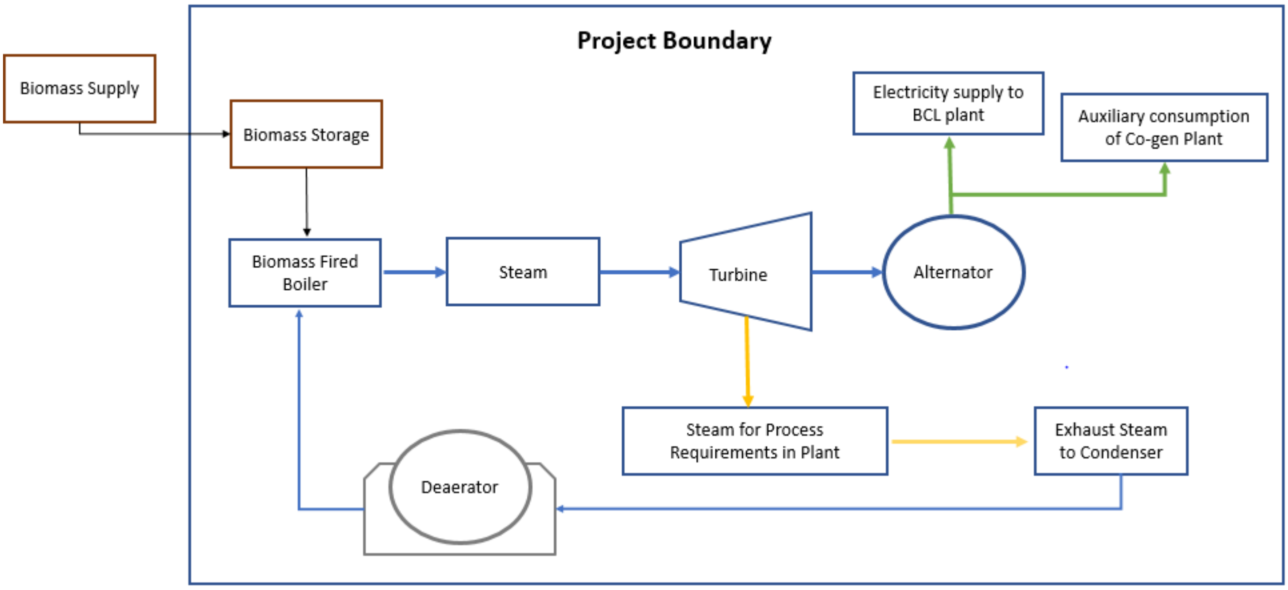
The project site is well connected by district and village roads to the nearest town. The geographic co-ordinates of the project locations are:
Latitude: 30.0728
Longitude: 74.8719

Google map showing location of the project activity:



A.4. Technologies/measures >>

Process flow chart:



Distillation process demands both electrical and thermal energy to run the process. To meet the demand, plant has installed a biomass fired co-generation system at its facility.

- The plant has put up a 35 TPH husk fired boiler which can generate superheated steam at a pressure of 67 kg/cm2 and a temperature of 490 ^{O}C.
- The installed boiler is a bi-drum AFBC multi-fuel boiler.
- Superheated steam directly enters the back pressure turbine of capacity 4.4 MW.
- After the turbine, steam is extracted for process use at a pressure of 3.5 kg/cm2.

To operate the plant, proponent could have use coal as a fuel, which is very common across the industry sector. Rice husk is considered as renewable biomass and surplus in the region of Punjab. Owing to some operational barriers, plant has decided to operate the co-gen system with rice husk to reduce the carbon emission caused by fossil fuels.

As the project is a co-gen system, conventional Rankin cycle is considered. Equipment required for the project are as follows:

- Boiler
- Back pressure turbine
- Alternator
- Boiler and Turbine Auxiliaries
- Cooling water system
- Air pollution controlling system
- BOP

Technical details of boiler and turbine is tabulated below:

<u>Boiler:</u>

Parameter	Unit	Details
Type of boiler	-	AFBC Bi-Drum
Boiler rated capacity	TPH	35
Steam Pressure	kg/cm2	67
Steam Temperature	Deg. C	490 +/- 5
Feed water Temperature	Deg. C	121
Fuel Type	-	Rice Husk

<u>Turbine:</u>

Parameter	Unit	Details
Type of turbine	-	Multistage, impulse, nozzle governed back pressure type
Inlet steam pressure	kg/cm2	66
Inlet steam temperature	Deg. C	490
Inlet steam quantity	TPH	35
Back pressure	kg/cm2	3.4
Back pressure steam quantity	TPH	26

<u>Alternator</u>:

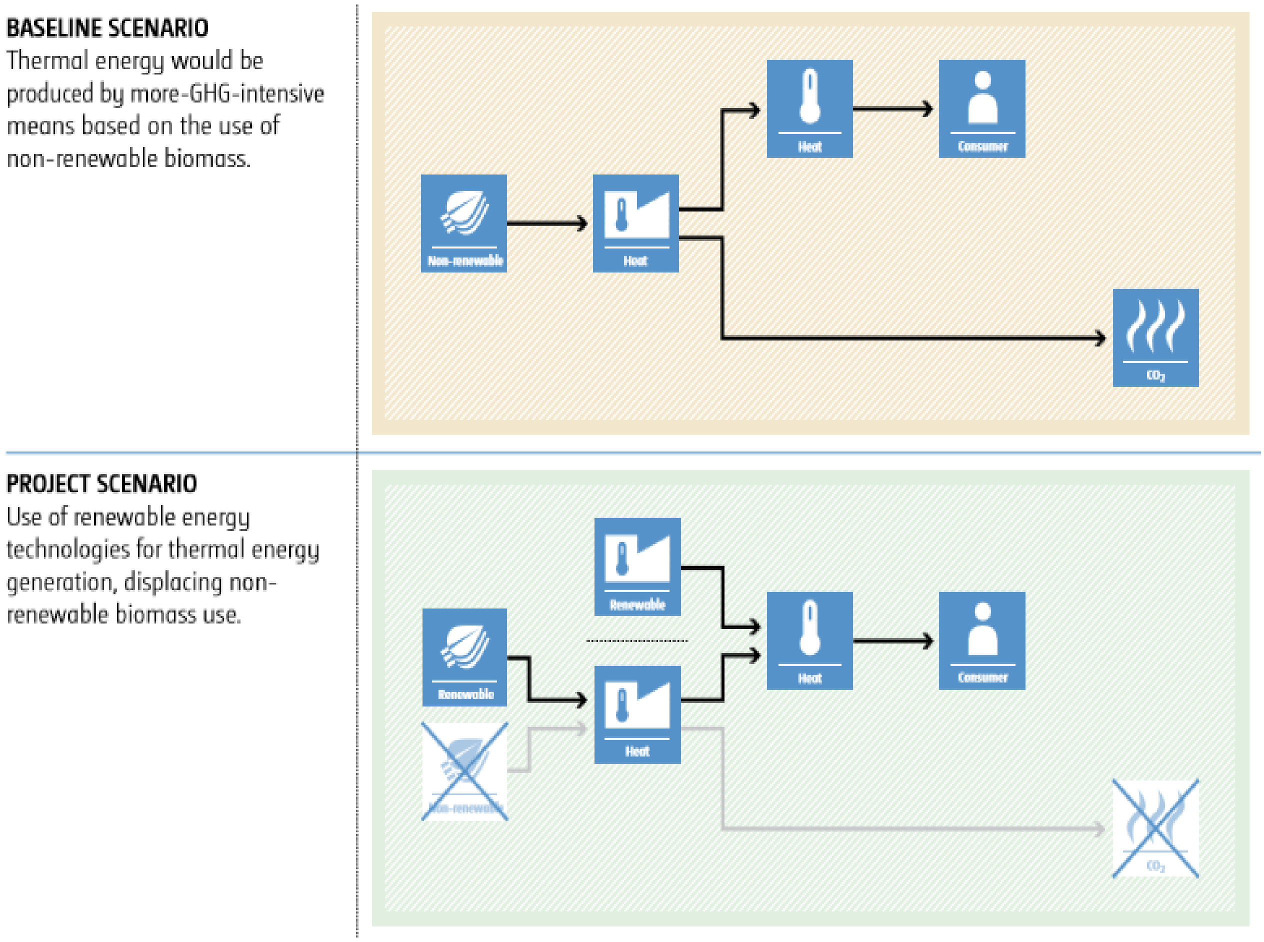
Parameter	Unit	Details
Type	-	4 pole synchronous generator
Rated Capacity	kW	5000
Rated power factor	-	0.8
Voltage	V	11000
Frequency	Hz	50

A.5. Parties and project participants >>

Party (Host)	Participants
India	**First Climate (India) Pvt. 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 **BCL Industries Limited (Developer)** Address: Village Sangat Kalan, Dabwali Road, Bathinda 151001, Punjab, 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 4.4 MW Rice Husk based Cogeneration Project at Sangat Kalan, Punjab 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- AMS-I.C. Version-22.0 Thermal energy production with or without electricity

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

The project activity is a biomass based co-generation system set to cater the electricity and steam demand of the plant. It replaced the baseline technology fossil fuel fired traditional co-generation system that used non-renewable fuel or more carbon intensive fuel sources i.e. Coal

This project will result in avoidance of GHG emissions associated with generation of equivalent amount of energy from a coal based captive co-generation plant. Moreover, the proposed project activity will also utilize the biomass which is a renewable source of energy and thus will prevent depletion of non-renewable natural resources like coal.

Here, the project activity is to install one 35 TPH rice husk fired boiler and a turbo-alternator set to cater the electricity and steam demand of the plant.

Applicability of AMS – I.C.	Project Status
1. Biomass-based cogeneration and trigeneration systems are included in this category.	**Applicable and fulfilled** The project involves biomass (renewable) based cogeneration of thermal and electrical energy for captive usage, thereby displacing fossil fuel-based cogeneration for the purpose.
2. 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.
3. 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.

<table>
<tr><td>4. In the case of new facilities (Greenfield projects) and project activities involving capacity additions the relevant requirements 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>Applicable and Fulfilled

This 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>5. The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal1 (see paragraph 9 for the applicable limits for cogeneration and trigeneration project activities).</td><td>Applicable and Fulfilled

This is a cogeneration project and the rated thermal energy generation capacity of the boiler is 29.62 MW_{th} which is less than 45 MWth as shown in the following table: -

<table>
<tr><td>Boiler Capacity</td><td>35 TPH = 9.72 kg/sec</td></tr>
<tr><td>Enthalpy of steam @67 kg/cm2 and 490 Deg. C</td><td>3391.0 kJ/kg = 3.391 MJ/kg</td></tr>
<tr><td>Enthalpy of feed water @121 Deg. C</td><td>508.04 kJ/kg = 0.508 MJ/kg</td></tr>
<tr><td>Total thermal generation capacity of the project</td><td>29.62 MW_{th}</td></tr>
</table></td></tr>
<tr><td>6. 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 (see paragraph 9 for the applicable limits for cogeneration project activities).</td><td>Not Applicable

This project activity is solely renewable biomass-based co-generation project. Plant would not use any fossil fuel in its entire operating period.</td></tr>
<tr><td>7. 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</td><td>Applicable and Fulfilled

This is a cogeneration project, i.e., plant would extract electrical as well as thermal energy from the project activity. Total energy generation capacity of the boiler is 29.62 MW thermal which is well below the methodological capacity limit of 45 MW thermal.</td></tr>
</table>

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); (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.	
8. 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	**Not Applicable** This project activity is solely renewable biomass based greenfield co-generation project. Not addition or expansion is not applicable for this project. Compliance with the stipulated capacity limits have been demonstrated in above paragraphs.

limits specified in the paragraphs 7 to 9, and shall be physically distinct from the existing units.	
9. 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 use of solid biomass fuel such as briquette, but biomass (renewable) residue rice husk, obtained from nearby rice mills and hence this criterion is not applicable.
10. 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** As mentioned against criterion 9 above, the project activity does not involve use of any processed solid biomass fuel, but biomass (renewable) residue rice husk obtained directly from nearby rice mills and therefore no separate solid biomass fuel production process or emissions thereof are associated. Hence this criterion is not applicable.
11. 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 supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	**Not Applicable** The electricity and steam produced by the project activity shall be used for in-house consumption and is not delivered to another facility or facilities within the project boundary.
12. 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	**Not Applicable** The project activity does not involve use of biogas as fuel and hence this criterion is not applicable.

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.	
13. If project equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP).	**Not Applicable** The project activity does not use such equipment’s which contains refrigerants. Hence this criterion is not applicable.
14. 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 from traditional open-ended methods to mechanized	**Not Applicable** The project activity does not use charcoal for its operation. Hence this criterion is not applicable.

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.	
15. In cases where the project activity utilizes biomass, sourced from dedicated plantations, applicability conditions prescribed in the tool "Project emissions from cultivation of biomass" shall apply.	**Not Applicable** The biomass that would be used for this project would come from its own rice mill operation. Hence this criterion is not applicable.

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

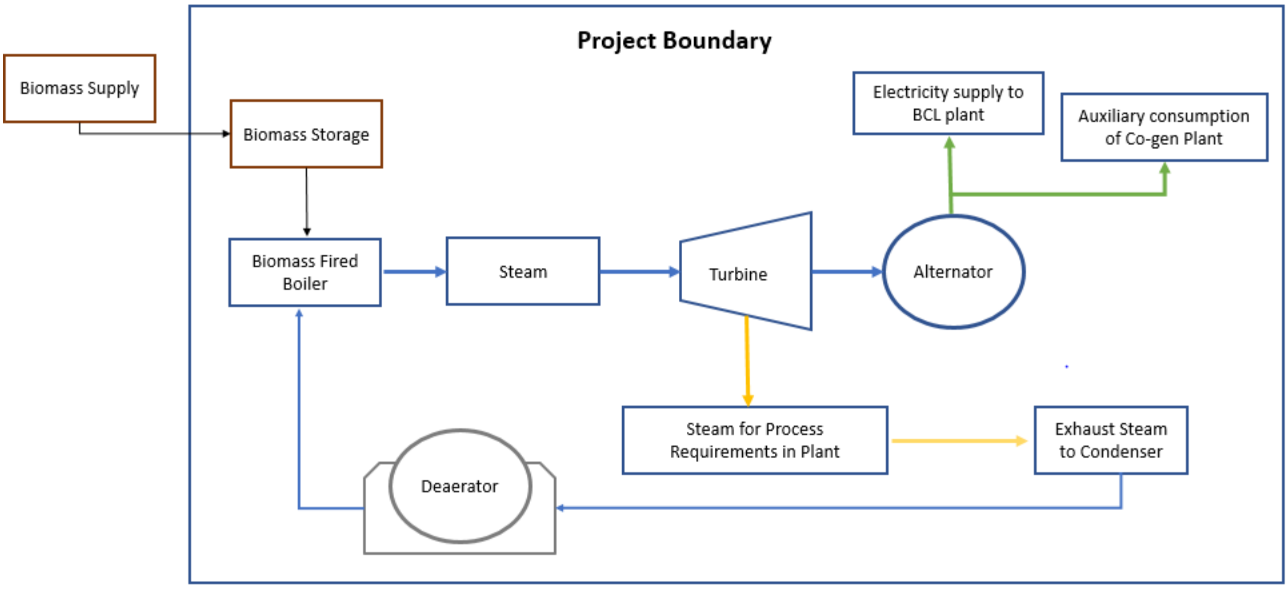
There is no double accounting of emission reductions in the project activity due to the following reasons:
• Project is uniquely identifiable based on its location coordinates,
• Project has dedicated commissioning certificate and connection point,
• Project is associated with energy meters which are dedicated to the consumption point for project developer.

The Monitoring Report has the details of the end user's name and location i.e., BCL Industries Limited located at Sangat Kalan Village, Dabwali Road, Bathinda 151001, Punjab, India.

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

In line with this methodology, the project boundary encompasses the industrial facility of BCL, equipment installed for the operation of cogeneration plant, the biomass storage facility, the facility (distillery) consuming the energy (electrical and thermal) generated by the project activity plant; Plant would use the rice husk as a renewable fuel of the boiler. Quantity of the biomass purchased from outside by the plant activity would be used as fuel for project boiler.

Project boundary of this project is illustrated below:



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

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		GHG	Included?	Justification/Explanation
Baseline	Coal fired co-generation for thermal energy and electrical energy generation	CO_2	Included	Main Emission Source
		CH_4	Excluded	Minor Emission Source
		N_2O	Excluded	Minor Emission Source
Project Activity	Biomass based Co-generation for thermal energy and electrical energy generation	CO_2	Excluded	As the renewable biomass is carbon neutral fuel, no CO_2 emitted from this project
		CH_4	Excluded	Project activity does not emit CH4. As the biomass is exported from outside the plant premises and is consumed directly by the project boiler so the chances of CH4 emission due to the decomposition of biomass is nil
		N_2O	Excluded	Project activity does not emit N_2O.

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
a) 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 Punjab is on higher side. Further, the state grid has shortage in power supply and power quality during peak hours get deteriorated. Thus, depending on grid-based electricity supply for operation of the plant is not a feasible option. Further, separate generation of thermal energy and purchase of grid electricity is a costlier option considering that cogeneration system is more efficient than independent heat only mode of energy generation. Hence, this scenario is not considered as a plausible baseline alternative.

b) 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.
c) A combination of (a) and (b);	Since, option (a) and (b) has been eliminated, thus, this option is also not considered.
d) 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
e) 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.
f) 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.
g) Electricity and thermal energy are produced in a biomass fired cogeneration or trigeneration unit (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);	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 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
h) 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
i) 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.
j) 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 Punjab, thermal energy generation using 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:*"

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

Where,

$BE_{cogen,CO2,y}$ = Baseline emissions from electricity and thermal energy displaced by the project activity during the year y; tCO_{2e}

$EG_{PJ,thermal,y}$ = The net quantity of thermal energy supplied by the project activity during the year y; TJ

$EG_{PJ,electrical,y}$ = The amount of electricity supplied by the project activity during the year y; GWh

$\eta_{BL,cogen}$ = The total efficiency (including both thermal and electrical) of the cogeneration plant using fossil fuel determined in accordance with paragraphs 28 and 29 of the methodology.

$EF_{FF,CO2}$ = The 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, alternatively, IPCC default emission factors are used (tCO2/TJ)

Now, since the project activity plant is a Greenfield plant, therefore guidance for efficiency calculation is followed as given in paragraph 41 of 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, documented efficiency specification for new steam turbines and steam generators provided by manufacturers for each type of such equipment, with specifications nearly equivalent to baseline units that would have been utilized in the absence of the project activity, within in the region have been procured. Thereafter, the total annual average efficiency of the cogeneration plant using fossil fuel has been calculated as the product of the highest efficiency value for the steam turbine(s) and the highest efficiency value of the steam generator, among those given in the obtained specifications.

Project Emission:

As per paragraph 67 and 68 of the methodology,

67. CO2 emissions from on-site combustion of fossil fuels ($PE_{FF,y}$) shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion."

68. CO2 emissions from electricity consumption ($PE_{EC,y}$) shall be calculated using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption."

The project activity however does not envisage using any fossil fuel during the crediting period. Hence, for ex-ante estimations project emissions due to consumption of fossil fuel has been considered 0.

The project activity does not use any electricity component from outside the project boundary; hence there will be no emissions from use of any electricity in the project scenario.

Leakage Emission:

As per the paragraph 77 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 78 of AMS – I.C. version 22,

"*In cases where the collection, processing and transportation of biomass residues is outside the project boundary and due to the implementation of the project activity biomass residues are transported over a distance of 200 kilometres CO2 emissions from the collection, processing and transportation of biomass residues to the project site shall be taken into account as leakage using with the latest version of tool "Project and leakage emissions from transportation of freight*."

In the project scenario, the rice husk being used as fuel is purchased by the project activity and transported from the nearby areas. Round trip distance for transportation of biomass is less than 200 km.

As per the paragraph 22 of Tool 22 Methodological tool: Leakage in biomass small-scale project activities Version 04.0

"In some cases, the biomass used in the project activity could be used for other purposes in the absence of the project. For example, biomass residues from existing forests could have been used as fuel wood or agricultural biomass residues could have been used as fertilizers or for energy generation. Competing uses for biomass are not relevant, where the biomass is generated as part of the project activity (new forests or cultivations)."

As there is a surplus of rice husk in the Punjab belt i.e. near the project location so there is no leakage emission from competing uses of biomass

The key parameters for baseline emission calculation are presented below in a tabular format: -

Parameter	Unit	Value
Steam to turbine	Tph	35
Back pressure steam	Tph	26
Electricity generation capacity of project	MW	4.4
Coal emission factor ($EF_{FF,CO2}$) (mixed power plant)	tCO_2/TJ	96.1
Operating days	Days	346
Operating hours	Hours	24
Efficiency of boiler using coal	%	80 %
Pressure of steam at Boiler outlet	kg/cm2	67
Temperature of steam at Boiler outlet	Deg. C	490
Pressure of steam at Turbine Extraction	kg/cm2	3.4
Temperature of feed water inlet to boiler	Deg. C	121

Estimated Annual or Total baseline emission reductions (BEy)= 100086 CoUs /year (100086 tCO2eq/yr)

B.6. Prior History>>

The project activity has not applied to any other GHG program for generation or issuance of carbon offsets or credits.
Hence project will not cause double accounting of carbon credits (i.e. COUs).

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

The crediting period under UCR has been considered from the date of commissioning of the project.

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: 8 years, 4 months – 01/01/2014 to 01/04/2022

B.8. Monitoring plan>>

Following parameters being used in emission reductions determination (Fixed Ex-Ante):

Data/Parameter	**$\eta_{BL,cogen}$**
Data unit	%
Description	Co-generation efficiency of baseline project
Source of data Value(s) applied	Boiler Specification Sheet and actual calculated turbine efficiency.
Measured / Calculated/ Default	Calculated based on the boiler and turbine efficiency. Co-gen efficiency = boiler efficiency X turbine efficiency.
Value of Monitored parameter	57.59%
Measurement methods and procedures	N/A
Monitoring frequency	The value is fixed for entire crediting period
Purpose of data	To calculate baseline emission.

Data / Parameter:	**$EF_{FF,CO2,coal}$**
Data unit:	t-CO_{2e}/TJ
Description:	The CO2 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	As per Table 2.2, Chapter-2, Volume-2, IPCC 2006 guidelines
Measured / Calculated/ Default	Default
Value of Monitored parameter	96.1
Measurement procedures (if any):	N/A
Monitoring frequency:	This value is fixed for entire crediting period

Following parameters being monitored for emission reductions determination:

Data / Parameter:	**$EG_{PJ,\ electrical,\ y}$**
Data unit:	MWh/year
Description:	Amount of electricity supplied by the 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:	Monitoring procedure: Continuously with energy meters Data Type: measured Recording frequency: Daily / Monthly Consolidated Archiving method: Electronic
QA/QC procedures:	Installed energy meter would be as per national or IEC standard. Calibration would be carried out once in every three 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:	^{O}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:	Monitoring procedure: Continuously with installed thermometer Data Type: measured Recording frequency: Daily average / monthly average Archiving method: Electronic
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 procedures	N/A
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_{steam}**
Data unit	MT/Year
Description	Extracted steam supplied to process plant in the year y
Source of data	Onsite Measurement
Measurement procedures	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:	$\mathbf{P_{process}}$
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 procedure	Measurement would be done by installed pressure gauge.
Measuring 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 evaluate the enthalpy of the steam bleed.

Data / Parameter:	$\mathbf{E_{steam}}$
Data unit	kJ/kg
Description	Enthalpy of extracted steam
Data source	Steam Table
Measurement Procedure	N/A
Measuring frequency	Monitoring procedure: Continuous. Data Type: Calculated Recording frequency: Daily Average / monthly average Archiving method: Electronic
QA/QC procedures	As data would obtain from Steam Table, no need any QA/QC.
Any Comment	Data would be used to evaluate enthalpy of the steam

Data / Parameter:	$\mathbf{B_{biomass,y}}$
Data unit	Tonne/Year
Description	Quantity (dry basis) of biomass (rice husk) combusted in an year y
Data source	Onsite measurement
Measurement Procedure	Measurement would be done for each batch of purchased 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.

Measuring 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	To cross check energy generation.

Data / Parameter:	GCV_k
Data unit	Kcals/kg
Description	Gross calorific value of biomass combusted in an year y
Data source	Lab test report
Measurement Procedure	Value can be obtained by testing the biomass sample from third party lab.
Measuring/reading/ recording 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 cross check energy generation.