



PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT



Title: Chilwaria Biomass Grid Supply Power Project, Bahraich, Uttar Pradesh

Version 1.0

Date of PCN: 10/12/2022

First CoU Issuance Period: 9 Years, 0 Months
Crediting Period: 01/01/2013 to 31/12/2021



PROJECT CONCEPT NOTE

BASIC INFORMATION	
Title of the project activity	Chilwaria Biomass Grid Supply Power Project, Bahraich, Uttar Pradesh
Scale of the project activity	Large Scale
Completion date of the PCN	10/12/2022
Project participants	Project Proponent: Simbhaoli Sugars Mills Limited Aggregator: M/S Gram Vikas Trust , Gujarat, UCR Seller #741215693
Host Party	India
Applied methodologies and standardized baselines	CDM UNFCCC Methodology ACM0006: Grid connected renewable electricity generation (Ver.16.0) UCR Standard for Baseline Grid Emission Factor
Sectoral scopes	01 Energy industries (Renewable/NonRenewable Sources)
Estimated total amount of average GHG emission reductions per year (Ex-Ante)	120727 CoUs (120727 tCO _{2eq})

SECTION A. Description of project activity

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

The project **Chilwaria Biomass Grid Supply Power Project, Bahraich, Uttar Pradesh** is located at Block: Chilwaria, District: Bahraich, State: Uttar Pradesh (UP), India – Pin: 271801

The details of the UCR project activity are as follows:

Purpose of the UCR project activity:

The Chilwaria Biomass Grid Supply Power Project, Bahraich, Uttar Pradesh (UCR Project Activity) involves the renewable biomass (bagasse) based electricity generation within the Chilwaria Sugar Mills Ltd (CSML), which is a unit of Simbhaoli Sugars Mills Ltd. The purpose of the project activity is to generate electricity using renewable biomass and thereby reducing GHG emissions by displacing fossil fuel dominated grid based electricity with biomass based renewable electricity. The commissioning date of this UCR project activity is the date of first commercial supply of power to the grid on **01/02/2008 (as per the PPA dated 21/03/2006)**.

Hence, the project activity is a grid-connected biomass (bagasse based) cogeneration power plant with a high pressure steam-turbine configuration. The high pressure boilers are fired by bagasse, a biomass byproduct from the sugar manufacturing process, to generate steam which in turn is fed to the steam turbine to generate power. The overall business is integrated with alcohol distillation and power generation. The power co-generation units generate biomass based power for captive consumption of the sugar plant and the sale of surplus power to the state grid.



The UCR project activity, is located within the premises of the CSML. Renewable biomass power and steam generated from the cogeneration unit is supplied to the sugar plant for captive use, with the surplus power being exported to the UP state grid (132 kV Grid SubStation Bahraich) under a long term PPA at the published rate for bagasse cogeneration.

The UCR project activity currently involves two biomass boilers of 80 TPH each (one dumping grate and one retrofitted with a traveling grate), a bleed and back-pressure turbine with rated capacity of **20 MW**, a condensing extraction and bleed-type steam turbine-driven generator set with a rated capacity of **18 MW** and an old **12MW** turbine that operated till June 2013 within the project boundary.

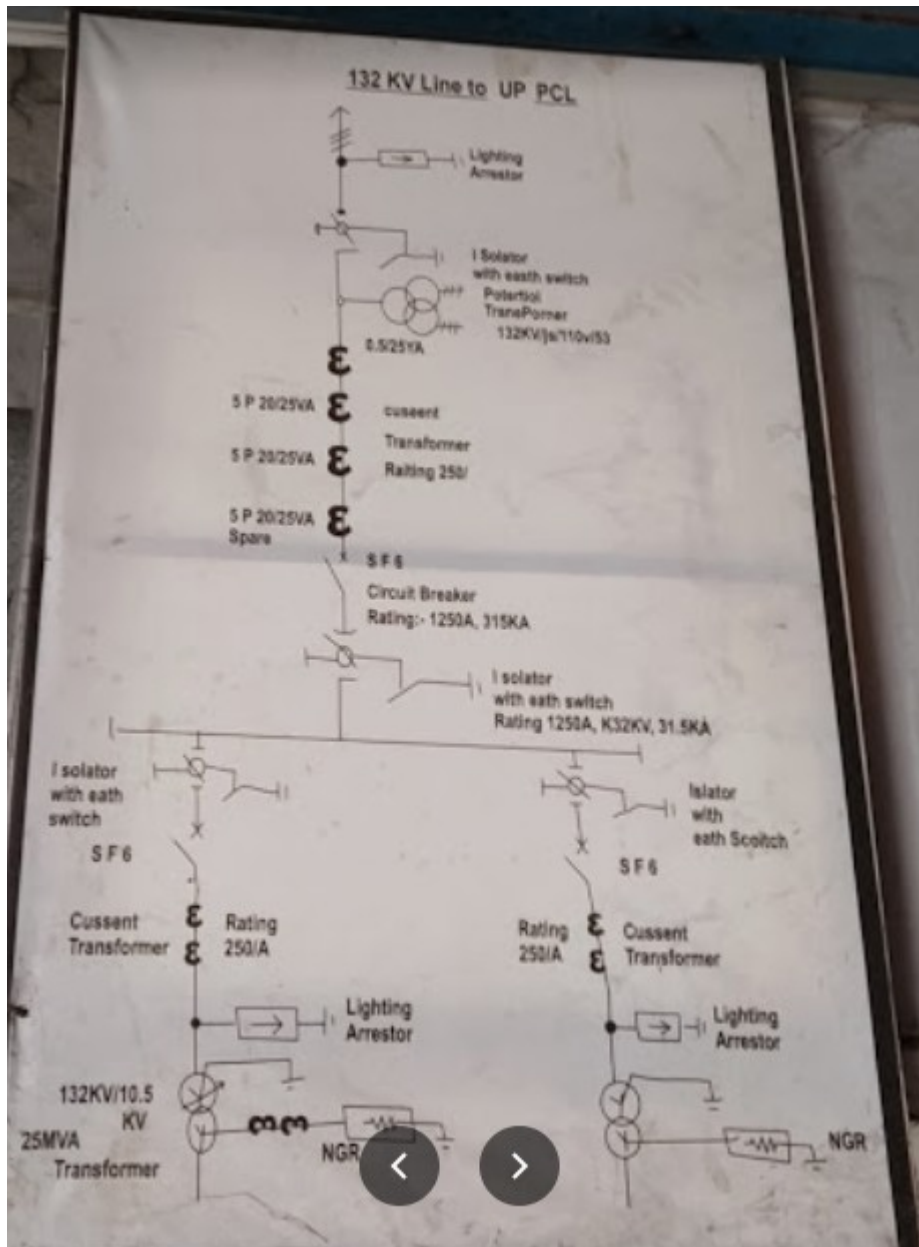
Hence the total installed capacity during the first crediting period is **50MW** for the period 2013-2021. The start date of the UCR project activity is the date of commercial power supply to the state grid on **01/02/2008**





Prior to the UCR project activity, the biomass was used for captive steam and power requirement of the CSML plant.

The pre-project activity scenario consisted of captive power generation without grid supply. The project activity has been able to operate throughout the year and export renewable power to the Uttar Pradesh Power Corporation Limited (UPPCL) grid. The export of electricity hence reduces GHG emissions by replacing the fossil fuel dominated grid based electricity with a renewable source of electricity. The high pressure boilers are fired by bagasse, a byproduct from the sugar manufacturing process to generate steam, which in turn powers all the steam turbines to generate electricity. The power generated from the turbines is utilised for captive consumption and the surplus power is exported to the grid. Power is generated both in the sugar season and off-season at 11 kV and stepped-up on-site to 132 kV before being transmitted to the nearby UPPCL sub-station located at Bahraich.



The UCR project activity is the construction and operation of a power plant/unit that uses renewable energy sources and supplies renewable electricity to the grid. The UCR project activity is thus the displacement of electricity that would be provided to the grid by more-GHG-intensive means and provides long-term benefits to the mitigation of climate change. The UCR project activity qualifies under the environmental additional positive list of pre-approved project types under the UCR carbon incentive model for issuance of voluntary carbon credits.

Assured supply of biomass fuel and other barriers to the UCR project activity

One of the major constraints associated with the project activity is the availability of sugarcane and there is often a diversion of cane from sugar mill to khandsaris and ghur manufactures when sugar prices are high (typically periods of low availability of cane). These manufacturers offer higher price as they operate in unorganised sector and have no quality assurance plans. These diversions put a further constraint on cane availability and hence bagasse which again may impact the viability of the project activity. The uncertainty in weather conditions also plays an important role in determining the cane availability in the region. There is a continuous weather related risk for cane under rain fed cultivation conditions.

Along with that, there are often chances of diversion of cane by farmers to other sugar mills in the nearby areas. The uncontrolled growth of sugar mills in UP, has lead to competition among the sugar mills for the natural resource utilisation i.e. agriculture farm produce, and leading to farmer option for getting varying prices among the sugar mills in the region. This diversion is an also important constraint faced by the project promoters and can significantly influence the cane crushing capacity and in turn the power generation capacity of the sugar mill.

The operation of bagasse based power plants for captive steam and electricity generation is common amongst the sugar industry. It is therefore fair to say that these options are consistent with the applicable laws and regulations as demonstrated by existing practices. There is no policy in India that mandates the generation of electricity **for grid supply from bagasse**, hence this is a voluntary project activity. The policy frameworks for bagasse based grid electricity supply are governed by the state electricity regulatory commissions which detail the terms of power purchase agreements for such investments.

The Indian sugarcane harvesting has been affected amid the COVID-19 pandemic situation prevailing in the country, and CSML has focused on continuing to work closely with the thousands of farmers who rely on CSML for their sustenance and livelihoods. CSML has further stepped up efforts towards better cane development and farm management, through adoption of techniques such as intercropping, conservation of energy and water resources through drip irrigation, waste-water management, and rain-water harvesting.

Recently, Uttar Pradesh Electricity Regulatory Commission (UPERC) has notified the updated UPERC (Captive and Renewable Energy Generating Plants) Regulations, 2019 to supersede the earlier Regulations of 2014. Under the new regulations, the tariff of bagasse-based power generation and supply to UPPCL has been reduced by nearly Rs 2 per Kwh (unit) which has affected the financials of SPPL substantially, and hence earning CoUs (carbon offset units or credits) under the UCR program will help in ensuring financial stability for such biomass based grid supply green project activities.

A.2 Do No Harm or Negative Impact test of the project activity>>

The project activity is included in the Positive List of Approved Project Types under the UCR CoU Standard.

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

- **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.

- The Indian sugarcane harvesting has been affected amid the COVID pandemic situation prevailing in the country, and CSML has focused on continuing to work closely with the thousands of farmers who rely on CSML for their sustenance and livelihoods. CSML has further stepped up efforts towards better cane development and farm management, through adoption of techniques such as intercropping, conservation of energy and water resources through drip irrigation, waste-water management, and rain-water harvesting.

- 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 power 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.

- **Environmental benefits:**

- The project activity is a renewable energy project, which utilizes biomass as a fuel for grid power 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 power, it has positively contributed towards the reduction in (demand) use of finite natural resources like coal and oil, minimizing depletion and in turn increasing its availability to other important purposes. Therefore, this project activity helps to environment sustainability by reducing GHG emission in the atmosphere.
- Avoids global and local environmental pollution, leading to reduction of GHG emissions.
- Enabling regional grid to divert the electricity displaced by the project activity to the nearby needy areas.

- Indirect capacity building by providing a case example to other sugar mills in the region for switching to high capacity cogeneration configuration, for exporting electricity to grid.

- In addition to the reduction in carbon dioxide (CO₂) emissions the project implementation will result in reduction of other harmful gases (NO_x and SO_x) that arise from the combustion of coal used in power generation. The project activity also leads to reduce ash generation since the ash content in bagasse is lower than that of Indian coal.

- **Economic benefits:**

- The project activity creates employment opportunities during the project stage and operation and maintenance of the boiler and turbines.
- 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 various other benefits due to the project activity ensure that the project is contributing to the sustainable development of the region by bringing in green technologies and processes to a backward region. The technology is indigenous and by implementing such projects the country is showcasing its GHG mitigation actions in its efforts to combat climate change.

A.3. Location of project activity >>

Block: Chilwaria

Road: Gonda Road,

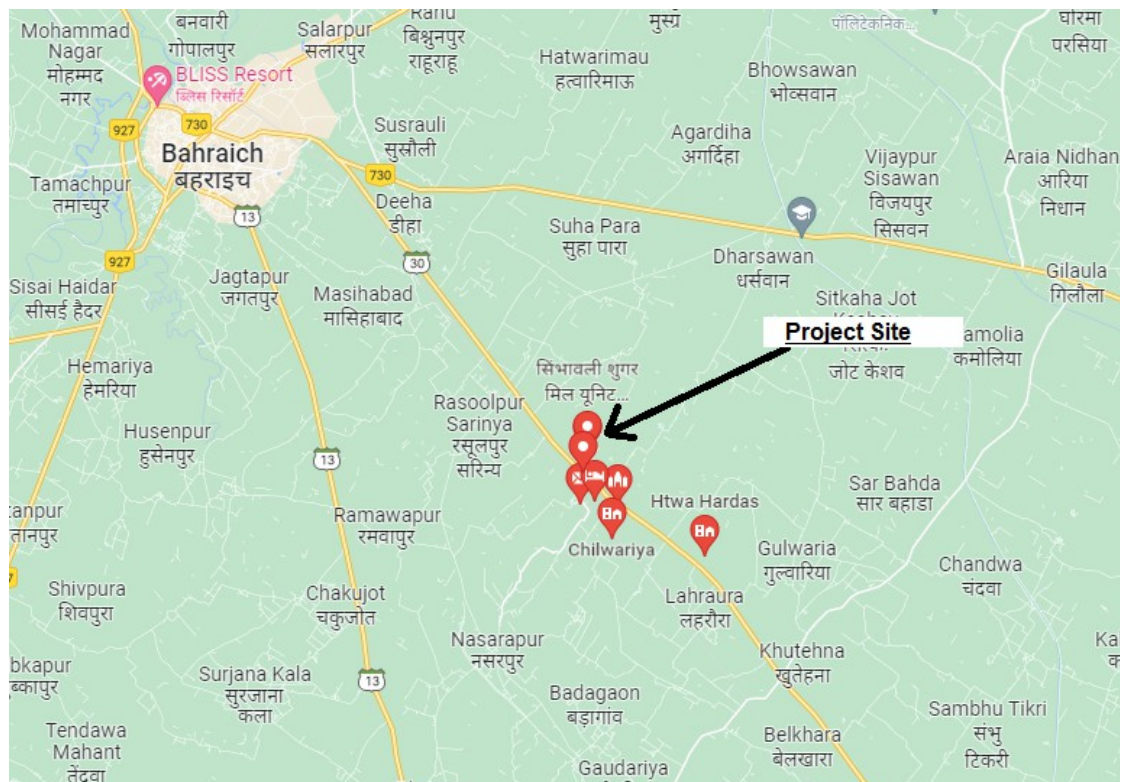
District: Bahraich,

State: Uttar Pradesh,

Country India

Latitude: 27° 30' 40.644" N

Longitude: 81° 41' 11.94" E





A.4. Technologies/measures >>

The UCR project activity is a grid-connected bagasse based cogeneration power plant with a highpressure steam-turbine configuration. The UCR project activity is the electricity generation capacity and the installation of facilities for allowing the export of electricity to the regional grid.

Boiler Details		
Date of Commissioning	2006	2008
Capacity (TPH)	80	80
Output Temp (°C)	510	510
Output Pressure (kg/cm ²)	87	87
Feed Water Temp (°C)	110	110

Turbine Details			
Date of Commissioning	2007	2008	2014
Capacity (MW)	12	20	18
Inlet Stem Temp (°C)	410	510	510
Inlet Steam Pressure (kg/cm ²)	45	87	87

The high pressure boilers are fired by bagasse, a byproduct from the sugar manufacturing process to generate steam, which in turn powers the steam turbine to generate power. The technology of biomass residue based high steam pressure power generation itself is known and in use in India. The use of high pressure system allows for increased efficiency levels for electricity generation. Power is generated and supplied in the sugar season and off-season at 11 kV and stepped-up on-site to 132 kV before being transmitted to the nearby UPPCL sub-station located at Simbhaoli.

A.5. Parties and project participants >>

Project activity does not involve any public funding from Annex I Party, which leads to the diversion of the official development assistance.

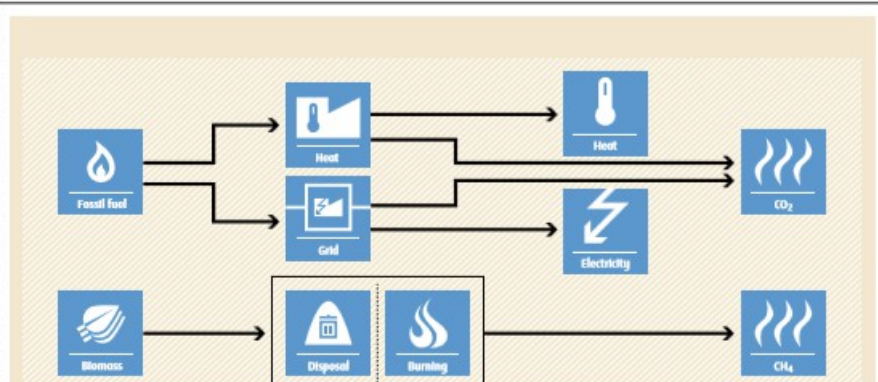
Party (Host)	Participants/Aggregator
India	<u>Project Proponent</u> : Simbhaoli Sugar Mills Limited <u>Aggregator</u> : M/S Gram Vikas Trust , Gujarat, UCR Member #741215693 Email:gytbiogas@gmail.com

A.6. Baseline Emissions>>

ACM0006 Electricity and heat generation from biomass

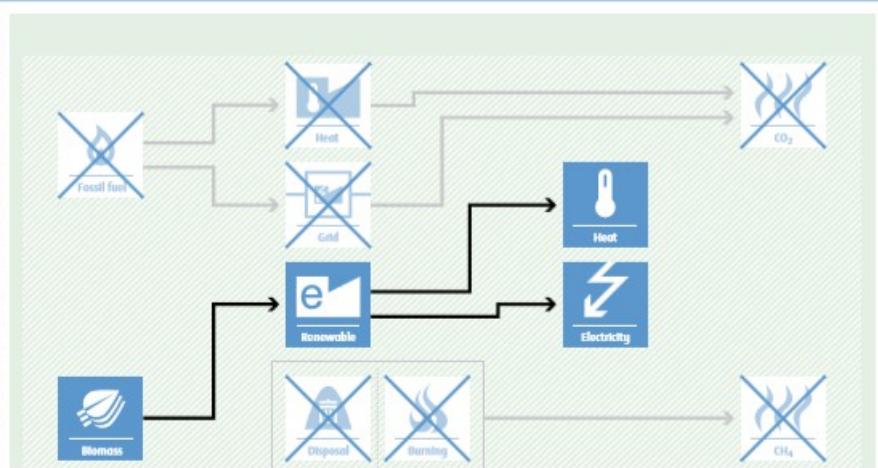
BASELINE SCENARIO

Electricity and heat would be produced by more-carbon-intensive technologies based on fossil fuel or less-efficient biomass power and heat plants. Biomass could partly decay under anaerobic conditions, bringing about methane emissions.



PROJECT SCENARIO

Use of biomass for power and heat generation instead of fossil fuel or increase of the efficiency of biomass-fuelled power and heat plants. Biomass is used as fuel and decay of biomass is avoided.



The approved baseline methodology has been referred from the indicative simplified baseline and monitoring methodologies for selected large scale UNFCCC CDM project activities that involve generation of power and heat in thermal power plants, including cogeneration plants using biomass.

Typical activities under ACM 0006 are new plants, capacity expansions, energy efficiency improvements or fuel switch projects.

The applicable methodology and simplified modalities and procedures for small scale CDM project activities is “*the baseline scenario is displacement of more-GHG-intensive electricity generation in grid.*”

Emission coefficient of fuel used in the baseline scenario

The CO₂ emission factor for grid connected power generation in year y calculated using UCR Standard emission factor is 0.9 tCO₂/MWh for the period 2013-2021.

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 (Large Scale)

UCR Positive List Environmental Additionality

CATEGORY- *ACM0006 Large-scale Consolidated Methodology*

Electricity and heat generation from biomass, Version 16.0

This methodology is applicable to project activities that operate biomass (co-)fired power and-heat plants. The project activity includes the installation of new plants at a site where currently power or heat generation occurs. The new plant replaces or is operated next to existing plants (capacity expansion projects). Project types included under this methodology are co-generation of power and heat using biomass. Typical activities include capacity expansions, as is the the current UCR project activity.

UCR CoU Standard is used to determine the baseline grid emission factor for the 2013-2021 period.

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

The project activity is a power generation project using a biomass (bagasse) and displaces CO₂ emissions from electricity generation in power plants that are displaced due to the project activity. Since the project activity utilises biomass (bagasse) for the generation of power and supplies it to the local grid, it displaces fossil fuel (coal), and hence it meets the primary applicability criteria of the UCR and UNFCCC CDM methodology project eligibility parameters. The project is also included in the positive list of approved types of activities of the UCR CoU Standard.

The project activity is a power-and-heat plant that encompasses cogeneration plants, i.e. power-and-heat plant in which at least one heat engine simultaneously generates both process heat and power. The total installed capacity of project activity is 50MW which is acceptable as per the applied large scale methodology.

The installation of a new biomass residue fired power generation unit, which replaces or is operated next to existing power generation capacity fired with either fossil fuels or the same type of biomass residue as in the project plant (power capacity expansion projects) is also included in this methodology.

For the purposes of this methodology, heat does not include waste heat, i.e. heat that is transferred to the environment without utilization, for example, heat in flue gas, heat transferred to cooling towers or any other heat losses.

The biomass used by the project plant is not stored for more than one year. The biomass used by the project plant is not processed chemically or biologically (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemicaldegradation, etc.) prior to combustion.

The Project Activity uses biomass residues from a production process (e.g. production of sugar), and the implementation of the project does not result in an increase of the processing capacity of (the industrial facility generating the residues) raw input (e.g. sugar) or in other substantial changes (e.g. product change) in this process

The project activity unit does not co-fire fossil fuel and/or does not exceed the limit of 25% co-firing fossil fuel criteria as per the UCR Protocol for such projects.
Biomass generated power is used for direct grid supply and for meeting the captive needs at the facility. The project activity involves the grid-connected bagasse based electricity generation capacity involving the installation of facilities for allowing the export of electricity to the regional grid
Biomass is not sourced from dedicated plantations. The existing installed turbo-generators are fired by bagasse, a byproduct of the sugarcane processing and a biomass residue
Bagasse is burnt in boilers as generated from the sugar mill and does not require any specific technology for its preparation before combustion. No fuel preparation equipment has been installed at site for preparation of bagasse. Hence no significant energy quantities are required to prepare the biomass residues for fuel combustion.
The project activity also does not include any GHG emissions related to the decomposition or burning of biomass. The baseline heat emissions for the project activity are not included in the project boundary nor does it claim for emission reductions from heat.

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

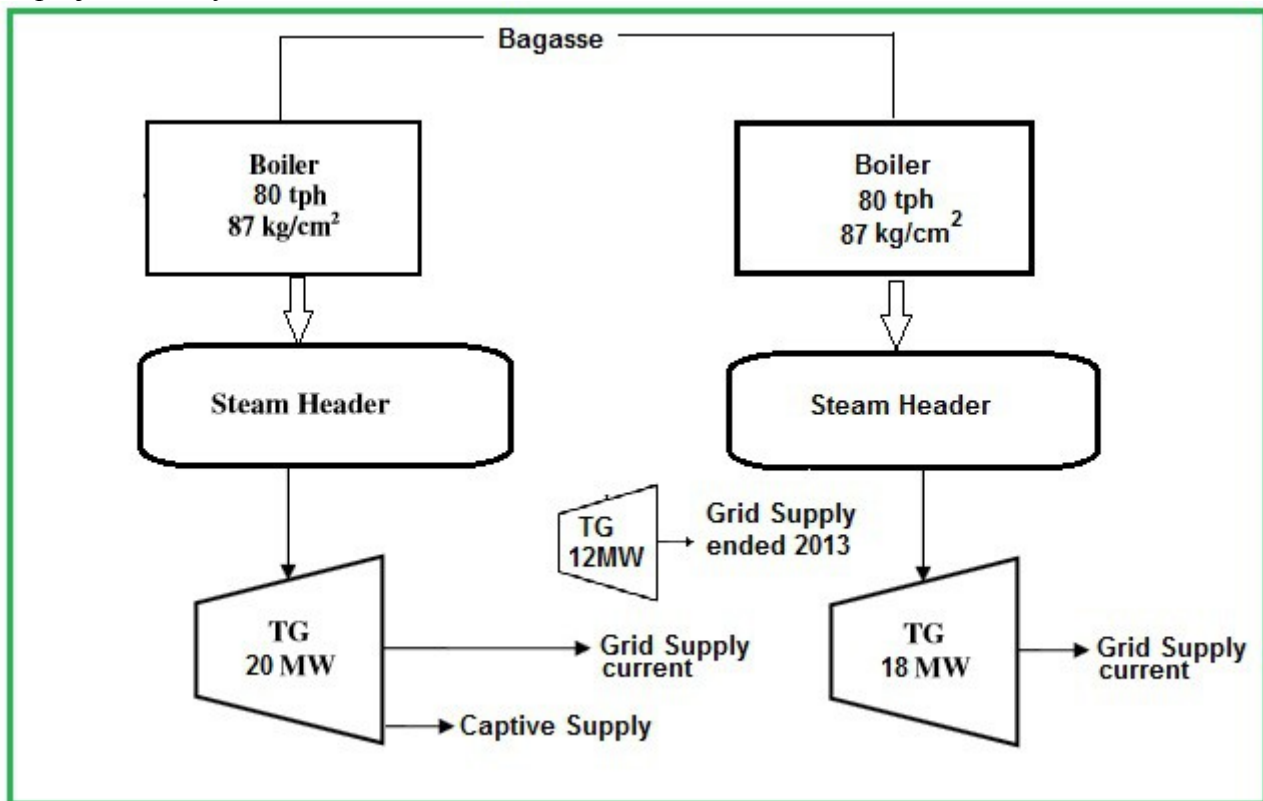
The biomass boilers and turbines are constructed by the project proponent within the project boundary. The biomass boilers, turbines and meters have unique IDs, which is visible on the units. The Monitoring Report has the details of the same and will be provided to the UCR verifier during the verification process.

The UCR project activity has never been issued voluntary carbon credits for the current 2013-2021 vintage years and there is no double counting of the credits. Additionally, the same has been stated in the undertaking provided in the Double Counting Avoidance Assurance Document (DAA) by CSML which will be provided to the verification agency during the audit.

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

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

(a) the project power plant and all power plants connected physically to the electricity system that the project activity is connected to.



Leakage Emissions (LE_y)

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

Hence LE_y = 0

	Source	GHG	Included?	Justification/Explanation
Baseline	GHG Emissions from fossil fuel in Grid Baseline Power Generation	CO ₂	Included	Major source of GHG emissions
		CH ₄	Excluded	Excluded for simplification. This is conservative
		N ₂ O	Excluded	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residue	CO ₂	Excluded	Excluded for simplification. This is conservative
		CH ₄	Excluded	Excluded for simplification. This is conservative
		N ₂ O	Excluded	Excluded for simplification. This is conservative
Project Activity	Emissions from Biomass Project Activity	CO ₂	Excluded	No fossil fuel / electricity is consumed at the project site due to the project activity. No biomass residue from off-site will be used for the project activity.
	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)			Excluded for simplification. This is conservative
	Off-site transportation of biomass residue	CH ₄	Excluded	No fossil fuel / electricity is consumed at the project site due to the project activity. No biomass residue from off-site will be used for the project activity
	Combustion of biomass residue for electricity and / or heat generation			Excluded for simplification. This is conservative
	Storage of biomass residue	N ₂ O	Excluded	Excluded for simplification. This is conservative

Project Emissions (PEy)

The project emissions (PEy) under the methodology may include

- CO₂ emissions from transportation of biomass residue to the project site,
- CO₂ emissions from on-site consumption of fossil fuels due to project activity,
- CO₂ emissions from electricity consumption at the project site that is attributable to the project activity and
- CH₄ emissions from combustion of biomass.

where

$PE_{T,y}$ = are the CO₂ emissions during the year y due to transport of the biomass to the project plant in tons of CO₂,

$PEFF_{CO_2,y}$ = are the CO₂ emissions during the year y due to fossil fuels co-fired by the generation facility in tons of CO₂,

$PE_{EC,y}$ = are the CO₂ emissions during the year y due to electricity consumption at the project site that is attributable to the project activity in tons of CO₂,

GWP_{CH_4} = is the Global Warming Potential for methane valid for the relevant commitment period and,

$PE_{Biomass,CH_4,y}$ = are the CH₄ emissions from the combustion of biomass during the year y.

The proposed project activity does not have any CO₂ emissions due to off-site transportation of biomass, or from fossil fuel co-firing and from electricity consumption at site. The project activity also doesn't include the CH₄ emissions from the combustion of biomass.

Hence,

$$PE_{T,y} = 0,$$

$$PEFF_{CO_2,y} = 0,$$

$$PE_{EC,y} = 0 \text{ and,}$$

$$PE_{Biomass,CH_4,y} = 0.$$

Therefore, $PE_y = 0$.

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.

The baseline emissions due to displacement of electricity are determined by net quantity of electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh times the CO₂ emission factor for the electricity displaced due to the project activity during the year y in tons CO₂/MWh

Given that steam and electric power generation for internal consumption is part of the present project activity, emission reductions are only claimed from on-site incremental power generation that is injected to the grid. Therefore, the baseline scenario is the emission of GHG from the present electricity generation mix of the UPPCL grid in the northern region.

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:

$$ER_y = BE_y - (PE_y + LE_y)$$

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

As mentioned in the methodology the baseline emissions are calculated as follows:

$$BE_y = EG_{pj,y} * EF_{grid,y}$$

Where:

$EG_{grid,y}$ = Quantity of net electricity generation that is fed into the local grid as a result of the implementation of the project activity in year y (MWh)

$EF_{grid,y}$ = The CO₂ emission factor for grid connected power generation in year y calculated using UCR Standard emission factor (0.9 tCO₂/MWh).

PE_y = Project activity emissions = 0

LE_y = Leakage emissions = 0

For this methodology, it is assumed that transmission and distribution losses in the electricity grid are not influenced significantly by the project activity and are therefore not accounted for.

Estimated yearly $ER_y = 120727$ CoUs/yr

B.6. Prior History>>

The project has received no public funding. The project activity was not registered under any other GHG or voluntary carbon program or been issued carbon offsets or credits for the current crediting period.

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

There is no change in the start date of crediting period (01/01/2013-01/01/2021).

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 UCR Issuance Period: 9 years, 0 months

UCR Crediting Period: 01/01/2013 to 31/12/2021

UCR Monitoring Period: 01/01/2013 to 31/12/2021

B.8. Monitoring plan>>

The monitoring of electricity data revolves around the power generation from the turbine generators and the auxiliary consumption of the power plant. All auxiliary units at the power plant is metered and there are also main meters attached to each turbine generator to determine their total generation.

All meters are ABT compatible special energy meters, complete with Meter Reading Instruments(MRI) which have the ability to measure and download real time power exported and imported by the project activity. The meters are installed and maintained by the State Electricity Board (UPPCL). One set of export/import meters is termed as “Bill Meter” and the other is “Check Meter”.

The total amount of bagasse generated by the sugar plant can be calculated from the amount of cane crushed in the season (monitored variable), which is obtained from the RT8C records. Therefore, bagasse can be calculated using the formula:

$$\text{Bagasse} = \text{Cane} + \text{Added water} - \text{Juice}$$

This quantity will be cross-checked using an annual energy balance using the monitored steam values. The total heat generated as well as the heat generated by the project activity is monitored using the temperature and pressure values and calculating the enthalpies of the steam generated and the feed water.

The management of the plant has designated one person to be responsible for the collation of data as per the monitoring methodology. The designated person collects all data to be monitored as mentioned in this project concept note document (PCN) and reports to the head of the plant. The overall project management responsibility remains with the Plant Head. The electricity generation from turbines and auxiliary consumption is recorded continuously on an hourly basis by the operators in the shift. At the end of the day this data is collated by the engineer in charge and signed off by the power plant manager. The steam data is also manually recorded on an hourly basis from the meters. The data is recorded in logbooks by the operators and the engineer in charge collates the data from these log books and stores them electronically. This data is used by engineer in charge to prepare a monthly report and send it to Plant Head for verification. The monthly reports become a part of the Management Information System (MIS) and are reviewed by the management during the quarterly review meeting.

The monthly reports can be made available during the verification of the project activity, to estimate the monthly emission reductions, which are also, included in the MIS. The monitoring personnel are familiar with the process of monitoring and documentation. They have been maintaining and reviewing the factory records pertaining to the sugar manufacturing.

All the meters are checked and calibrated each year by an independent agency and they are maintained as per the instructions provided by their suppliers. Hence there are no uncertainties or adjustments associated with data to be monitored. An internal audit team, comprising of personnel from the factory but from a department other than utility, reviews the daily reports, monthly reports, procedure for data recording and maintenance reports of the meters. This team checks whether all records are being maintained as per the details provided in the PCN. The audit team also enlists the modifications/corrective actions required, if any, in more accurate monitoring and reporting. All the data and reports will be kept at the offices of the sugar mill until 2 years after the end of the crediting period or the last issuance of CoUs for the project activity, whichever occurs later.

Emergency preparedness plans have been laid out to meet with situations leading to unintended emissions. These emergency situations have been identified as:

1. Fire in the fuel yard
2. Fuel spoilage due to water. These emergency situations haven been taken care by putting up a fire safety system and a water drainage system in the fuel yard. CSML-Simbhaoli is ISO 9001, ISO 14001 and HACCP certified company. The proposed project activity has also taken under the ISO on operation. The monitoring process is also been covered under

the ISO.

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

Data/Parameter	Date of commissioning of biomass boilers
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 project eligibility

Data/Parameter	NCV_k
Data unit	GJ/t
Description	Net Calorific Value of Biomass Residue Type <i>K</i>
Source of data Value(s) applied	Measurements will be carried out by reputed labs and reported in dry biomass basis.
Measurement methods and procedures	On site and in labs
Monitoring frequency	Every 6 months
Purpose of data	Quality control

Data/Parameter	$Q_{\text{biomass, yr}}$
Data unit	MT/yr
Description	The quantity of bagasse used to generate steam in the boilers each year
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

Data/Parameter	EG_{project plant, y}
Data unit	MWh
Description	Net quantity of electricity generated in the project plant during the year y
Source	CSML factory records
Measurement methods and procedures	This value will be determined annually from the records maintained at the factory. All auxiliary units at the power plant are metered and there is also a main meters attached to each turbine generator to determine their total generation.
Monitoring frequency	The hourly recordings of data is to be taken from energy meters located at the project activity site. This data is to be recorded hourly by the shift attendant and entered into logbooks on site. This hourly data is to be signed off at the end of every shift by an engineer in charge of the shift and again at the end of each day and signed off by the power plant manager. The energy meters are calibrated annually by an independent third party
QA/QC	The parameter is monitored and logged in log sheets.

Data/Parameter	EF_{grid,y}
Data unit	Grid Emission Factor
Description	tCO ₂ /MW _h
Source of data Value(s) applied	UCR CoU Standard Default for Indian grid 0.9 tCO ₂ /MW _h for the period 2013-2021
Measurement methods and procedures	NA
Monitoring frequency	NA
QA/QC	The parameter is conservative.
Purpose of data	To estimate baseline emissions

Data/Parameter	EG_{grid,y}
Data unit	MWh
Description	Net quantity of electricity supplied to the grid
Source of data Value(s) applied	JMR and/or Monthly Meter Readings
Measurement methods and procedures	Type: Calculated Data type: Monitored This parameter may be checked with the necessary invoices or JMR (issued by the state grid) each month.
Monitoring frequency	Daily
QA/QC	The parameter is monitored by on site energy meters that are calibrated annually. The hourly recordings of data is to be taken from energy meters located at the project activity site. This data is to be recorded hourly by the shift attendant and entered into logbooks on site. This hourly data is to be signed off at the end of every shift by an engineer in charge of the shift and again at the end of each day and signed off by the power plant manager. The energy meters are calibrated annually by an independent third party.
Purpose of data	To estimate baseline emissions