PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: TEIL Biomass Grid Supply Power Project, Khatauli, Uttar Pradesh

Version 1.0

Date of PCN: 22/09/2022

First CoU Issuance Period: 04 Years, 09 Months
Monitoring Period: 19/03/2017 to 31/12/2021
Crediting Period: 19/03/2017 to 31/12/2021

PROJECT CONCEPT NOTE

BASIC INFORMATION	
Title of the project activity	TEIL Biomass Grid Supply Power Project, Khatauli, Uttar Pradesh
Scale of the project activity	Large Scale
Completion date of the PCN	22/09/2022
Project participants	**Project Proponent:** Triveni Engineering and Industries Ltd (TEIL) **Aggregator:** Carbon Equalizers, KATNI UCR ID : 660687753
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	107940 CoUs (107940 tCO_{2eq})
Estimated total amount of average GHG emission reductions for the entire monitoring period (2017-2021)	539700 CoUs (539700 tCO_{2eq})

SECTION A. Description of project activity

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

The project **TEIL Biomass Grid Supply Power Project, Khatauli, Uttar Pradesh** is located at Village: Sheikhpura, City: Khatauli, District: Muzaffarnagar, State: Uttar Pradesh (UP), Country India (Pin: 251201).

The details of the UCR project activity are as follows:

Purpose of the UCR project activity:
The purpose of the project activity is to generate electricity using renewable biomass and thereby reduce GHG emissions by displacing the fossil fuel dominated grid based electricity with biomass based renewable electricity. The commissioining date or start date of this UCR project activity is **19/10/2005 (**although the power synchronization to the 132 KV substation was on 18/10/2005).

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 project plant exports power to the Uttar Pradesh Power Corporation Limited (UPPCL), in absence of the project activity, UPPCL would have withdrawn electricity from northern regional grid.

The project activity involves the renewable biomass (bagasse) based electricity generation within the Triveni Engineering & Industries Ltd (TEIL) plant located at City: Khatauli, State: Uttar Pradesh. This UCR project activity involves the installation of two **23 MW** turbo generators along with two high pressure (86 kg/cm^2) 120 TPH capacity boilers commissioned in **19/10/2005 and 17/12/2006.** The total installed capacity is hence **46 MW** The UPPCL electrical substation of 132 kV, for power export, is only 5 km from the site. The project activity supplies approximately **119934 MW** of renewable power to the grid each year.

The project activity uses bagasse as fuel for cogeneration power unit, which is a renewable bio-mass fuel and does not add any net carbon-dioxide to the atmosphere because of the carbon recycling during growth of sugar cane. Therefore, the project activity leads to zero CO_2 on-site emissions associated with bagasse combustion.

The project activity also induces environmental and sustainable development benefits. The project activity has introduced efficient high pressure cogeneration technology to the Indian sugar industry; reducing power shortages in the state of Uttar Pradesh (UP) India; and fostering sustainable economic growth through promoting energy self-sufficiency and resource conservation in India's sugarcane industry. The policy to grow in a sustainable manner with a commitment towards the environment has been adopted by TEIL. The technology used in the project activity is highly replicable as the country's sugar mills produce large quantities of bagasse that could be efficiently utilized to generate power.

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 Khatauli.

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 TEIL has focused on continuing to work closely with the thousands of farmers who rely on TEIL for their sustenance and livelihoods. TEIL 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 TEIL 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>>

Host party regulations require TEIL to obtain environmental clearance in the form of "No objection Certificate" from State Pollution Control Board, which in this case is Uttar Pradesh Pollution Control Board. The Environmental Management Plan had been prepared and submitted to the pollution control board for approval. An Environmental Impact Assessment had been conducted for the project activity to understand if there are any significant environmental impacts and the study indicates that the impacts are not significant. The project activity is set up adjacent to existing sugar mill, in a common premise. The land prior to the project activity was barren with not much vegetation. No cutting of trees was involved and there was no deforestation required.

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 TEIL has focused on continuing to work closely with the thousands of farmers who rely on TEIL for their sustenance and livelihoods. TEIL 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 (NOx and SOx) 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.

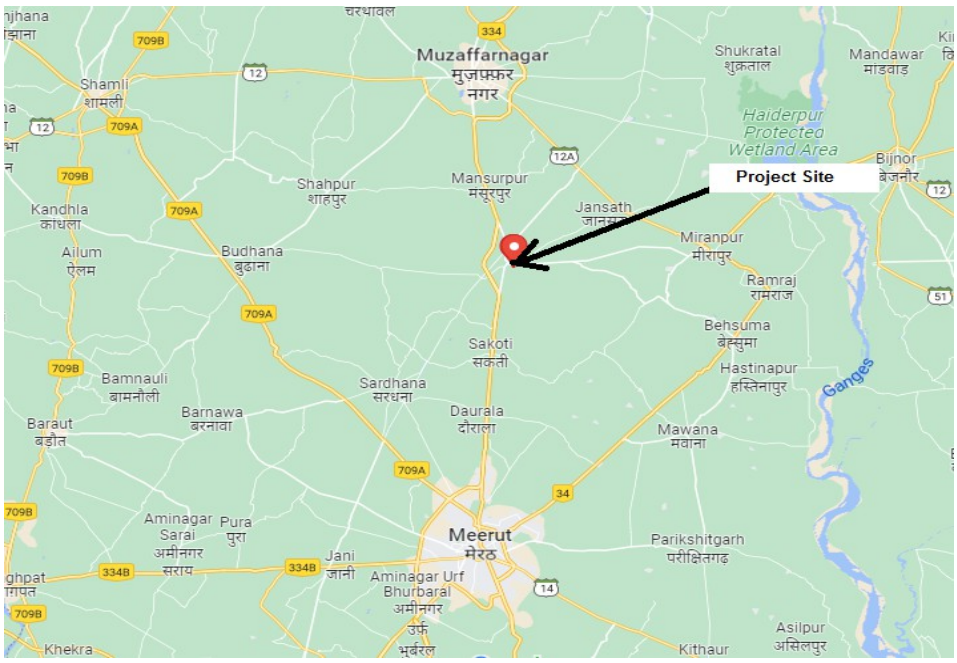
- **Economic benefits:**
- The project activity creates employment opportunities during the project stage and operation and maintenance of the boiler and turbines.
- The project activity helps in conservation of fast depleting natural resources like coal and

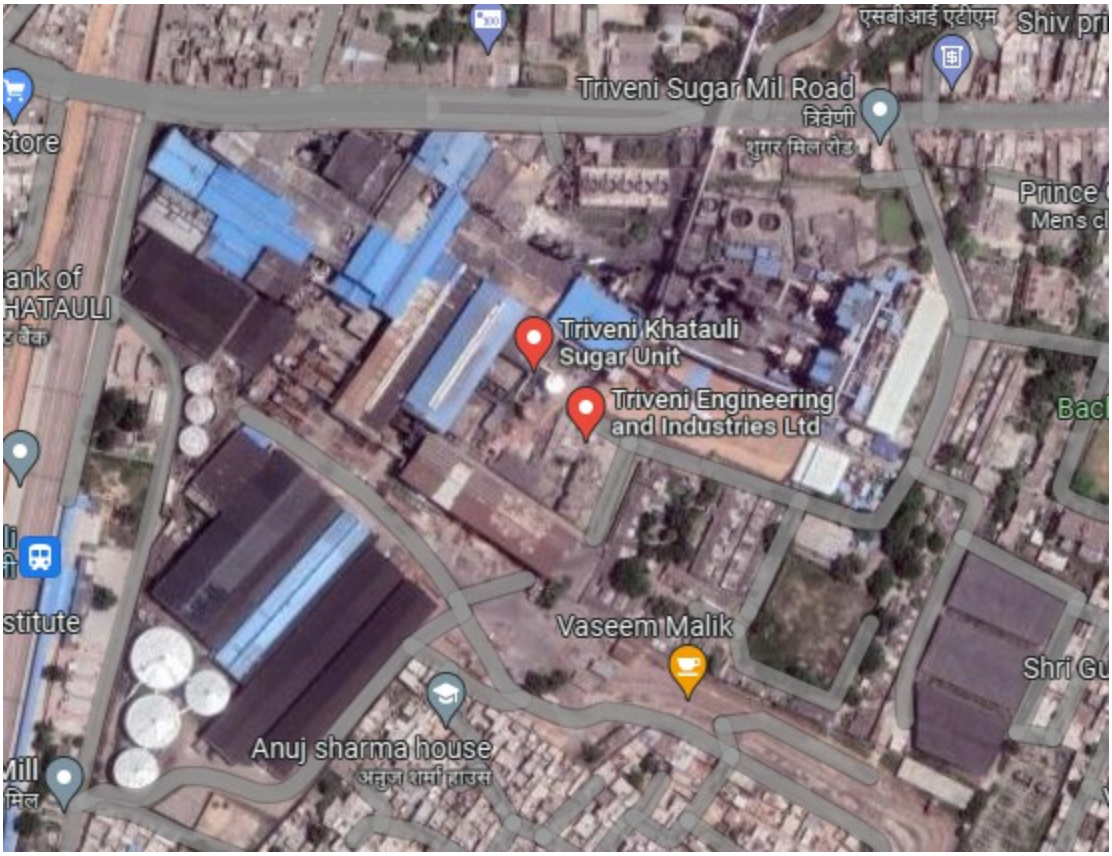
oil thereby contributing to the economic well being of country as a whole.

- 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 >>

Country: India
Village: Sheikhpura,
City: Khatauli,
District: Muzaffarnagar
State: Uttar Pradesh (UP),
Pin: 251201
Latitude: 29^0 16’ N
Longitude: 77^o 42' E





A.4. Technologies/measures >>

The UCR project activity is a grid-connected bagasse based cogeneration power plant with a high pressure 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.

The project activity has commissioned two (2) boilers with nominal capacity of 120 tons per hour (TPH) and outlet steam configuration of 87 kg/cm^2, 515 ^{o}C and two turbo generators with rating of **23 MW each (total 46 MW)**. The cogeneration cycle for the plant is designed as an energy efficient regenerative cycle. This plant gives around 7 % more power output than the most of the cogeneration plants designed with boiler outlet steam parameters of 67 kg/cm^2 and 485 ^{o}C and 23 % more than normal configuration in India of 45 kg/cm^2 and 390 ^{o}C with back pressure turbine.

The plant is designed with all other auxiliary plant systems like

- Bagasse handling system with storage and processing arrangements,
- High pressure feed water heaters,
- Ash handling system,
- Water treatment plant,
- Compressed air system,
- Air conditioning system,
- Main steam, medium pressure and low pressure steam systems,

- Fire protection system,
- water system which include raw water system, circulating water system, condensate system, De-Mineralised water system and service with potable water system and
- The electrical system for its successful operation.

The power is generated at 11 kV level. The internal consumption requirements for auxiliaries and equipment of the sugar plant and the cogeneration plant are met by stepping down voltage level to 415V. The exportable power is stepped upto 132 kV and paralleled with the UPPCL grid at the substation in Khatauli. The project was commissioned on 18/10/2005 and this can be verified from the minutes of meetings (MoM) held on 18/10/2005 between UPPCL and PP. The MoM states that the energy is recieved on UPPCL 132 KV substation on 18/10/2005 and the MoM are signed by the UPPCL Executive Enginner and TEIL management.

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.

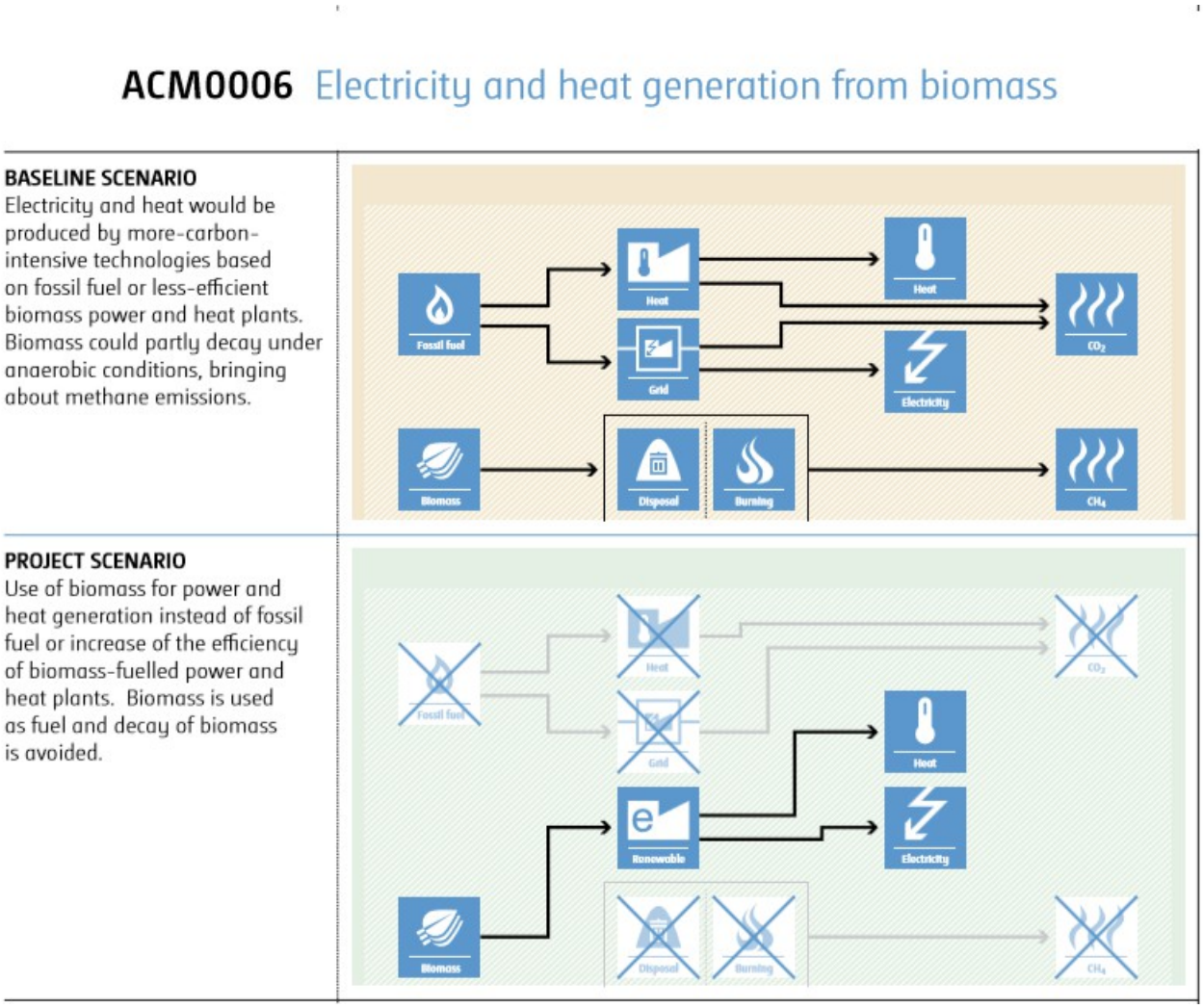
	Phase-1	**Phase-2**
Turbine		
Capacity (MW)	23	23
Steam Pressure	84 kg/cm2 (G)	84 kg/cm2 (G)
Steam temp.	510 °c	510 °c
Year of Commissioning	2005	2006
Boiler		
Capacity (Tons/hr)	120	120
Year of Commissioning	2005	2006
Steam pressure	86 kg/cm^2 (G)	86 kg/cm^2 (G)
Steam temp.	515±5 °c	515±5 °c

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	Project Owner: Triveni Engineering & Industries Ltd (TEIL) Aggregator: Carbon Equalizers, KATNI UCR ID : 660687753 Contact: Mr Vikas Chamadia Email: vikaschamadia@rediffmail.com **Mob**: 9303068600

A.6. Baseline Emissions>>



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 CO_2 emission factor for grid connected power generation in year y calculated using UCR Standard emission factor is 0.9 tCO2/MWh for the period 2017-2021.

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 in 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 methodology.
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 46MW 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 fule 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 is 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 form 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 energy 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 had been registered as a VCS project activity under the title :Bagasse based Co-generation Power Project at Khatauli (Project ID 101).

VCS Registration Date	15/07/2009
VCUs Issued (Period 1)	19/10/2005 - 31/03/2006
VCUs Issued (Period 2)	01/04/2006 - 18/03/2007

The UCR project activity had been registered as a CDM project activity under the title :Bagasse based Co-generation Power Project at Khatauli (Project ID 0826).

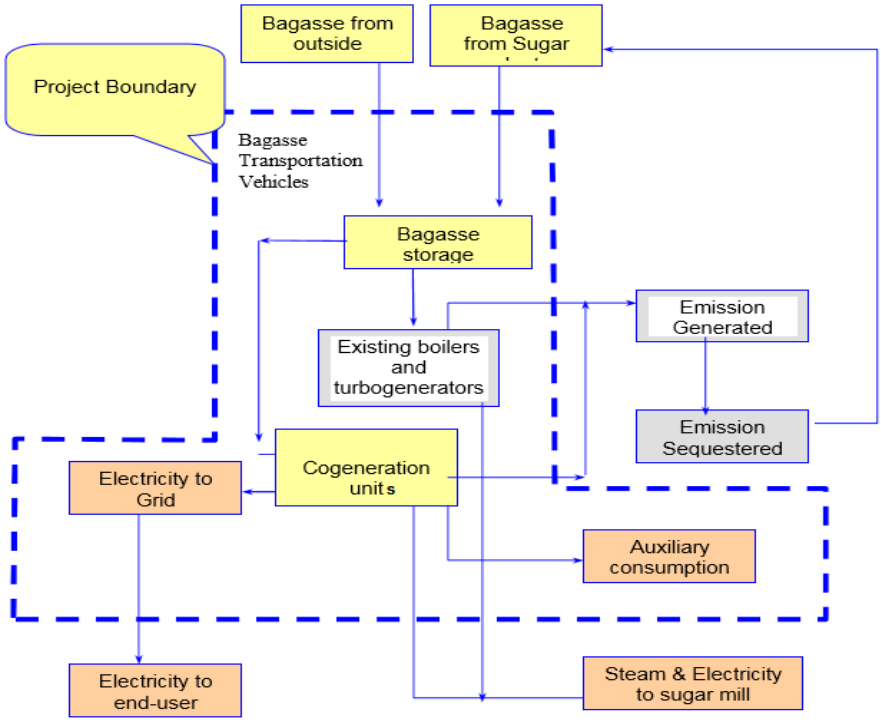
CDM Registration Date	19/03/2007
Crediting Period	19/03/2007 – 18/03/2017 (Fixed)
CERs Issued (Period 1)	59267 CERs (Period 19/03/2007 – 31/03/2008)
CERs Issued (Period 2)	50776 CERs (Period 01/04/2008-31/05/2010)
CERs Issued (Period 3)	28312 CERs (Period 01/06/2010-29/02/2012)

Hence the UCR project activity has never been issued voluntary carbon credits for the current 2017-2021 vintage years and there is no double counting of the credits envisioned. Additionally, the same has been stated in the undertaking provided in the Double Counting Avoidance Assurance Document (DAA) by TEIL.

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_2O	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_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	Emissions from Biomass Project Activity On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile) Off-site transportation of biomass residue Combustion of biomass residue for electricity and / or heat generation Storage of biomass residue	CO_2	Excluded	No fossil fuel / electricity is consumed at the project site due to the project activity. If biomass from off-site is used for the project activity, they will be accounted and would be negligible. Excluded for simplification. This is conservative
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative

Project Emissions (PEy)

The project emissions (PEy) under the methodology may include

- CO_2 emissions from transportation of biomass residue to the project site,
- CO_2 emissions from on-site consumption of fossil fuels due to project activity,
- CO_2 emissions from electricity consumption at the project site that is attributable to the project activity and
- CH_4 emissions from combustion of biomass.

where

$\mathbf{PET_y}$ = are the CO_2 emissions during the year y due to transport of the biomass to the project plant in tons of CO_2,

$PEFF_{CO2,y}$ = are the CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility in tons of CO_2,
$PE_{EC,y}$ = are the CO_2 emissions during the year y due to electricity consumption at the project site that is attributable to the project activity in tons of CO_2,
GWP_{CH4} = is the Global Warming Potential for methane valid for the relevant commitment period and,
$PE_{Biomass,CH4,y}$ = are the CH_4 emissions from the combustion of biomass during the year y.

The proposed project activity does not have any CO_2 emissions due to fossil fuel co-firing and from electricity consumption at site. The project activity also doesn't include the CH_4 emissions from the combustion of biomass.
Hence,
$PEFF_{CO2,y}$ = 0,
$PE_{EC,y}$ = 0 and,
$PE_{Biomass,CH4,y}$ = 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 CO_2 emission factor for the electricity displaced due to the project activity during the year y in tons CO_2/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:

$ERy = BE_y - (PE_y + LE_y)$

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 CO_2 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 and also the UCR grid emission factor results in conservative estimates of the carbon credits.

Direct off-site emissions in the project activity arise from the biomass transport. The same type of CO_2 emission occurs during transportation of coal from coal mines to thermal power plants (supplying power to state grid). However actual quantity of bagasse purchased shall be monitored and corresponding emissions due to its transportation shall be deducted from baseline for a given crediting year.

Estimated yearly MWh grid supply = 119934 MWh
Estimated yearly ERs = 107940 CoUs

B.6. Prior History>>

The project has received no public funding. The project activity was registered under the UNFCCC CDM and also the voluntary carbon market in the past. Details have been explained in the relevant section (B3) of this PCN.

The project activity has not applied to any other GHG program for generation or issuance of 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 (19/03/2017-31/12/2021).

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: 4 years, 9 months
UCR Crediting Period: 19/03/2017 to 31/12/2021
UCR Monitoring Period: 19/03/2017 to 31/12/2021

B.10. 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.

Operational records and other evidences have been documented, collected and archived in either hard-copies or electronic manners. The energy generation is metered by calibrated meters. The biomass consumption is measured by Weigh Bridge calibrated after every two year by state government organisation. Steam quantity, temperature and pressure are measured by calibrated meters. The date of calibration and next due date of calibration can be checked against the calibration certificates. All the values can be checked from the source data ie. plant records. The calorific value of biomass can be checked against the third party analysis reports.

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 in house records. Therefore, bagasse can be calculated using the formula:

Bagasse = Cane + Added water – 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. T

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

Monthly joint meter reading of main meters installed at interconnection points are taken and signed by authorised officials of TEIL and UPPCL on the first day of every month. Records of this joint meter reading are maintained by TEIL and UPPCL. Daily and monthly reports stating the net power export is prepared by the shift in-charge and verified by the plant manager. Power Purchase Agreement (PPA) with UPPCL has been signed. Reliability of energy data is maintained as per PPA. TEIL archives and preserves all the monthly invoices raised against net saleable energy and also archives the complete metering data at generation electronically. All the records are maintained at site. Uttar Pradesh Pollution Control Board (UPPCB) and Environment Department of Uttar Pradesh have prescribed standards of environmental compliance and monitor the adherence to the standards. TEIL has received the 'Consent to Operate' the plant. State's regulatory body of power is Uttar Pradesh Electricity Commission (UPERC) and they have issued consent for the installation of co-generation power plant of 46 MW capacity. As a buyer of the power, the UPPCL is a major stakeholder in the project. They hold the key to the commercial success of the project.

Data/Parameter	NCV_k
Data unit	GJ/t
Description	Net Calorific Value of Biomass Residue Type *K*
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	$Q_{biomass,yr}$
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.Quantity of biomass has been monitored. Biomass measuring device has an accuracy level of +/- 0.5% of full scale, and ranging between 0-120 TPH.

Data/Parameter	$EG_{project\ plant,\ y}$
Data unit	MWh
Description	Net quantity of electricity generated in the project plant during the year y
Source	TEIL-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	Net electricity production has been calculated by deducting auxiliary consumption from gross generation of the plant. Digital meters calibration procedures are planned. Daily productions details are kept in log books and electronic data base. Energy meters are of class 0.2 with tolerance of 0.5%. All Meters are calibrated by accredited external third party, as per standard procedures, periodically.

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 2017-2021
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	Energy meters on existing turbines are calibrated on annual basis by NABL accredited labs. Electricity generation in these units are recorded and kept in log books for verification purpose.Energy meters are of class 0.2 with tolerance of 0.5%. All Meters are calibrated by accredited external third party, as per standard procedures, periodically
Purpose of data	To estimate baseline emissions