PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Biomass based Cogeneration Project at Lakhimpur Kheri, Uttar Pradesh.

Version 2.0

Date 29/12/2022

First CoU Issuance Period: 6 years

Date: 07/12/2016 to 6/12/2022

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

BASIC INFORMATION	
Title of the project activity	Biomass based Cogeneration Project at Lakhimpur Kheri, Uttar Pradesh.
Scale of the project activity	Large Scale
Completion date of the PCN	29/12/2022
Project participants	First Climate (India) Private Limited (AGGREGATOR) DCM Shriram Ltd (Sugar Unit: Ajbapur) (DEVELOPER)
Host Party	India
Applied methodologies and standardized baselines	**CDM UNFCCC Methodology** ACM0006: Electricity and heat generation from biomass (Ver. 16).
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 96,187 CoUs per year]

SECTION A. Description of project activity

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

The project **Biomass based Cogeneration Project at Lakhimpur Kheri, Uttar Pradesh** is located in Village Ajbapur, Tehsil Mohammadi, District Lakhimpur Kheri, State Uttar Pradesh, Country India.

The details of the registered project are as follows:

Purpose of the project activity:

The proposed project activity is promoted by DCM Shriram Ltd (Sugar Unit: Ajabapur) (henceforth referred as DCM).

The commissioning date of the project was on 07th December 2016 and the start date of crediting period considered for this UCR project activity is same as the commissioning date. [as per UCR Program Manual Ver5].

The renewable project activity involves installation of a 26.9 MW turbine and a high efficiency boiler of 135 tonnes per hour (TPH) capacity. The installation of new equipment will allow the factory to export renewable electricity to the Uttar Pradesh electricity grid.

Plant has signed a PPA with state Dis-com to export 24.5 MW power to grid. Hence, the UCR project activity is expected to generate 116.208 GWh of electricity per annum among which 105.840 GWh will be exported to Uttar Pradesh Power Transmission Corporation Limited (UPPTCL).

At present, the industry already has existing power projects which are now exporting energy to grid and is sufficient to cater the additional electricity demand of the sugar plant. In absence of the project activity, plant could have sourced the electricity from the existing power plants by diverting energy from existing power plant, which are presently supplying renewable electricity to the grid, to meet their additional electricity demand. The diversion of electricity would lead to reduction of renewable power in the grid mix and equivalent energy would have been compensated by existing fossil fuel based power plant connected to the grid.

Hence, baseline of this project is, equivalent amount of electricity would have been generated from fossil fuel dominated power plant connected with the Indian grid. The Project activity thus reduces 96,187 t-CO2e/annum greenhouse gas emissions (GHG) by supplying green power to grid. Therefore, the UCR project activity thus proposes to reduce GHG emissions by displacing the fossil fuel dominated grid based electricity with biomass based renewable electricity.

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 CO2 on-site emissions associated with bagasse combustion.

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:**
- Improvement of air quality in the nearby region: With the avoidance of fossil fuel combustion in the proposed project activity, the exhaust gas emissions and direct localized air pollution will be substantially reduced in the neighbouring region. Air Pollution due to open dumping of biomass will be reduced.
- Employment creation: Besides providing direct employment to the local population in the operation of the boiler, the project activity also provides indirect employment to number of people in activities associated with biomass collection, processing and operation of the boiler.
- The project activity also encourages biomass related agro industries in the area to be setup. As there is no discrimination, the project activity contributes to the removal of social disparities by providing employment to all strata of the social structure throughout the lifetime of the project. The proposed project activity will increase employment amongst the rural area where biomass is available in abundance.

- **Environmental benefits:**
- Reduction of fossil fuels consumption: With the implementation of the proposed project activity, the renewable energy source will replace the fossil fuels source thus contributing to reduced GHG emissions.
- Utilization of Agricultural residues – The project activity utilizes agricultural residue, which is a carbon neutral fuel hence do not contribute to additional atmospheric CO_2 emission as compared to baseline coal.
- The project activity helps in proper utilization of agro waste, which otherwise would have been dumped openly.
- As the biomass residues have inherently low sulphur and nitrogen content, the problems of NO_X and SO_X emissions is almost nil.
- The agricultural residues are dumped providing zero economic value and causing air pollution and soil pollution.
- The project activity would ensure the agricultural residues are combusted efficiently in the boiler with proper air treatment and handling systems. Thus preventing air and soil pollution and getting economic value from the wastes.

- **Economic benefits:**
- Reduction of dependence from fossil fuels: The project activity will reduce the Production facility's dependence on fossil fuel. This will reduce the overall dependence of the whole region from the imports and availability of fossil fuels and will allow other industries to use energy resources which will allow their development.
- Project activity acts as a nucleus for other economic activities such as setting up of shops, hotels etc. in and around the area contributing to the economic development around the project activity site.
- Results in increased business opportunities for local contractors and suppliers during the various phases.

- **Technological well-being:**
- The method adopted for cogeneration is controlled direct combustion, which is an

environmentally sound technology. This is adopted replacing the practice of open dumping of fuel, which is environmentally unsafe. Prolonged exposure to such gases could lead to health problems.

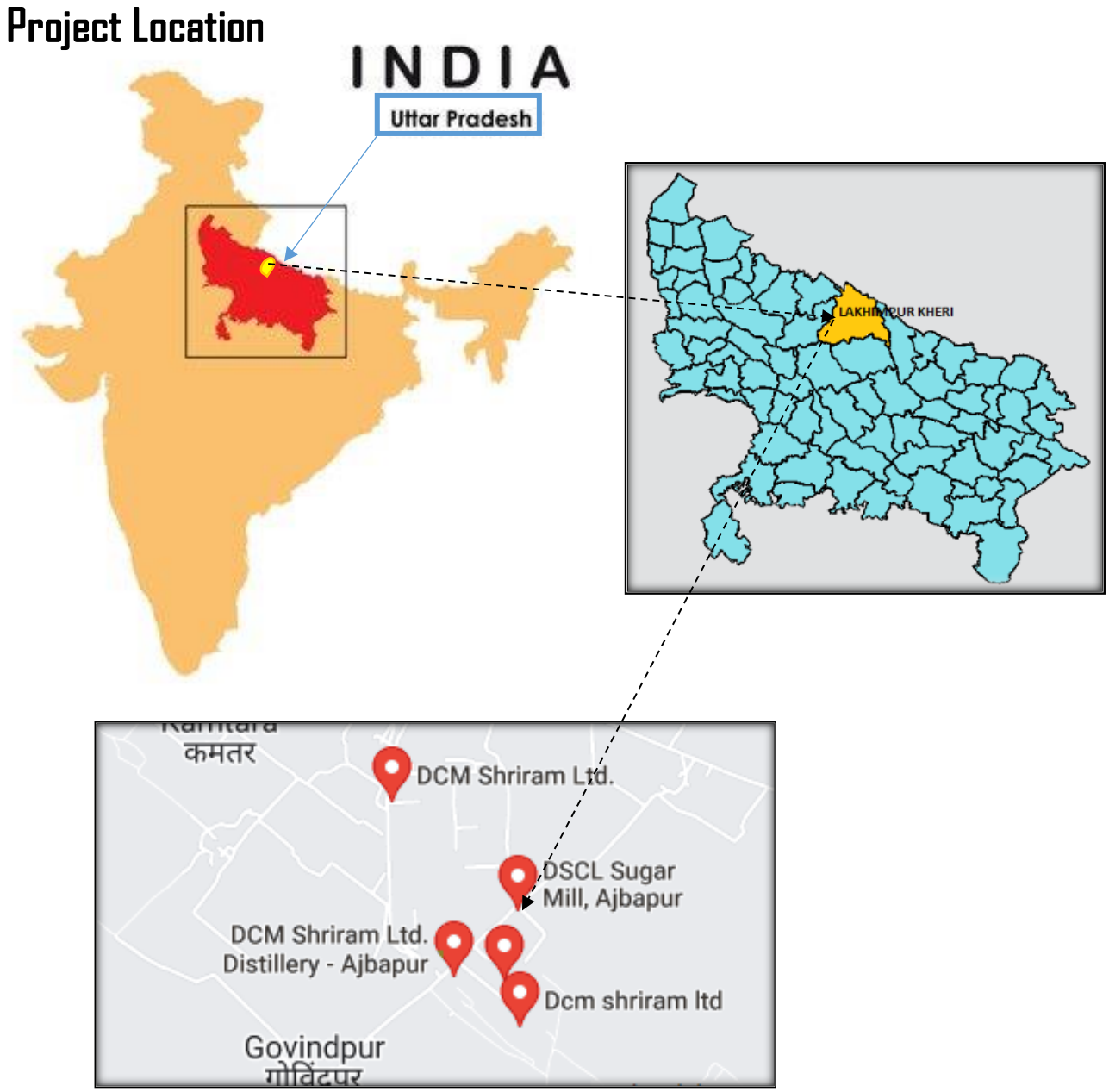
- The technology being adopted is a good example of application of established technologies developed within the country for power generation, thus positively contributing to the technological well-being.

A.3. Location of project activity >>

Country: India
District: Lakhimpur Kheri
Village: Ajbapur Village
Tehsil: Mohammadi
State: Uttar Pradesh
Code: 241405

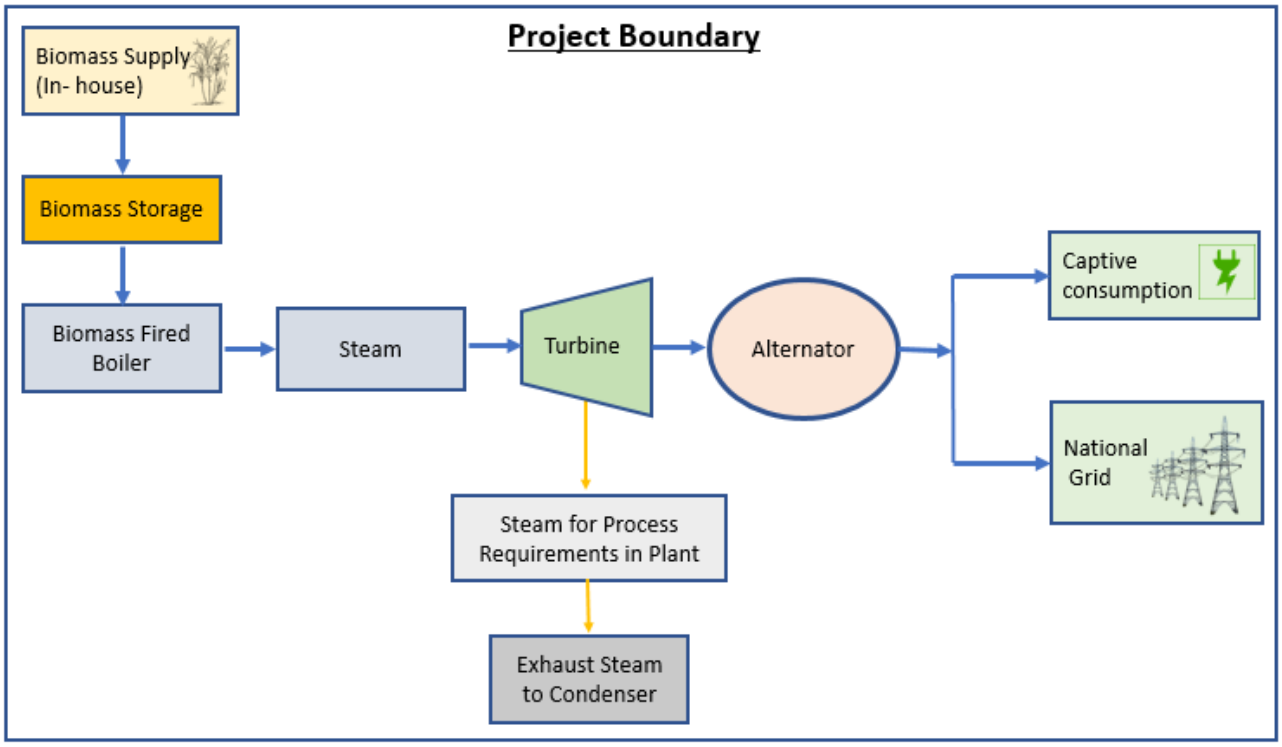
The project site is well connected by district and village roads to the nearest town. The geographic co-ordinates of the project location are:
Latitude: 27°46'47.37" N to 27°47'20.53"N
Longitude: 80°11'46.64" E to 80°12'13.74" E

The representative location map is included below:



A.4. Technologies/measures >>

Process flow chart:



The project activity involves generation of renewable electrical energy from the combustion of renewable biomass i.e. bagasse, to generate process steam and electricity for captive consumption and grid supply. The technology employed is a biomass-based cogeneration system, generating steam and electricity. Thus, the technology to be used in this project is indigenous and is environmentally safe & sound. Emission reductions will be claimed from electricity exported to grid only.

Details of the technical concept is as below:

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

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

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

Technical details of boiler, turbine and alternator are tabulated below:

Boiler:

Parameter	**Unit**	**Details**
Type of boiler	-	CFB Boiler
Boiler rated capacity	TPH	135
Steam Pressure	kg/cm2	105
Steam Temperature	Deg. C	535
Feed water Temperature	Deg. C	105
Fuel Type	-	Bagasse

Turbine:

Parameter	**Unit**	**Details**
Inlet steam pressure	kg/cm2	105
Inlet steam temperature	Deg. C	535
Inlet steam quantity	TPH	135
Extraction pressure	kg/cm2	2.4
Extraction steam quantity	TPH	98

Alternator:

Parameter	**Unit**	**Details**
Type	-	4 pole synchronous generator
Rated Capacity	MW	26.9
Rated power factor	-	0.8
Generation voltage	V	11000
Frequency	Hz	50

A.5. Parties and project participants >>

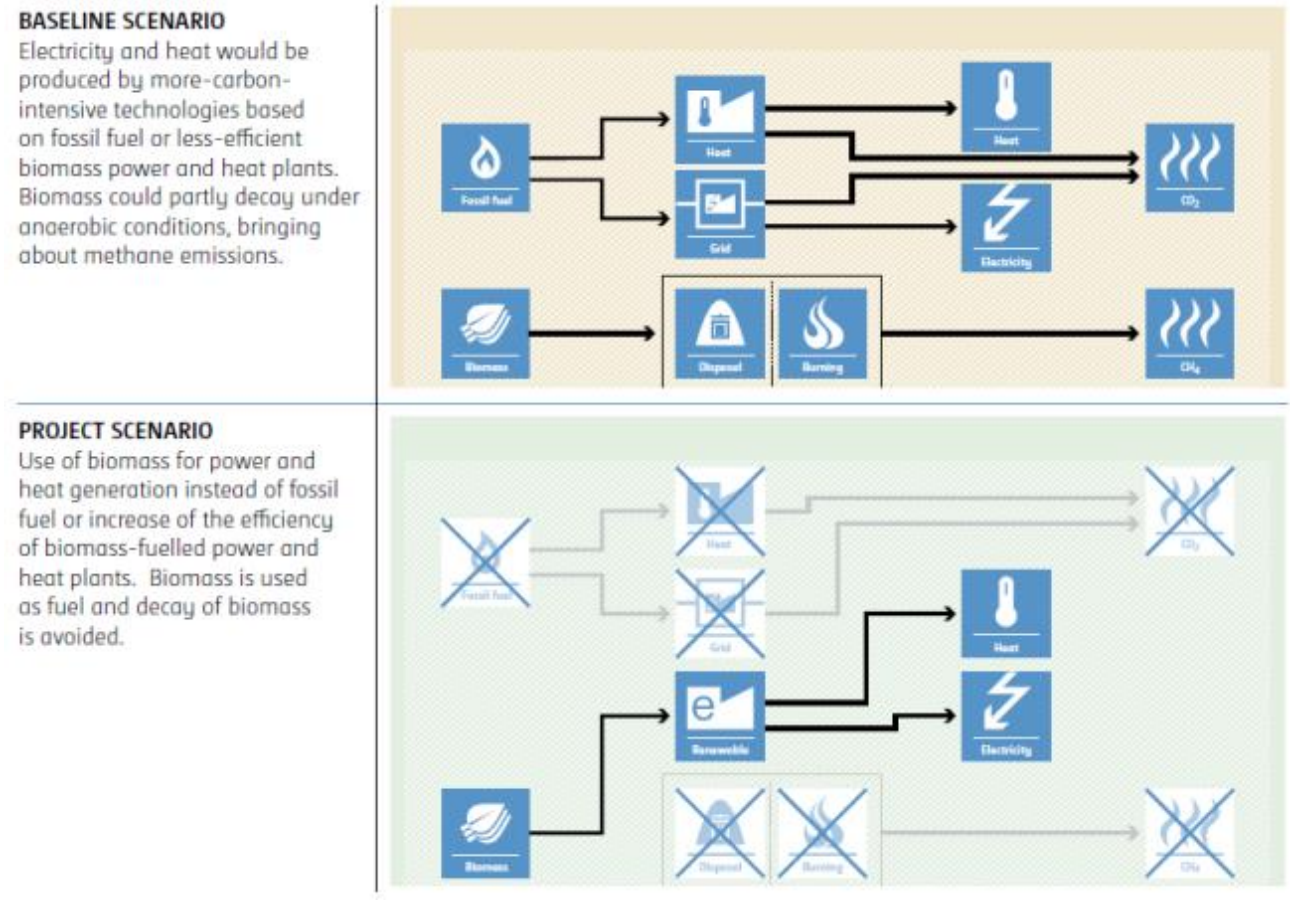
Party (Host)	Participants
India	**First Climate (India) Pvt. Limited (AGGREGATOR)** Contact person: Partha P Chaudhuri Mobile: +91 9831012824 Address: 903 ERGO Tower, Plot No. A1-4, Block EP & GP, Sector V, Salt Lake, Kolkata 700 091 **DCM Shriram Ltd (Sugar Unit Ajbapur) (DEVELOPER)** Address: Ajbapur Village, PO Mullapur, Distt.-Lakhimpur Kheri, Uttar Pradesh, 261505, India.

A.6. Baseline Emissions>>

The baseline scenario identified at the PCN stage of the project activity is:

The proposed project activity uses bagasse as fuel for cogeneration unit. The bagasse being a renewable biomass fuel does not add any net carbon-dioxide to the atmosphere because of the carbon recycling during growth of sugar cane. Therefore, the project activity will lead to zero CO_2 on-site emissions associated with bagasse combustion. The crushing season of 180 days is envisaged for project activity operation. Without the project activity, the energy load equivalent to electricity supplied to grid would have been taken-up by grid mix and emission of CO_2 would have occurred due to combustion of conventional fossil fuels. Considering the export of clean electricity to the fossil fuel dominated grid by the project activity there will be continuous GHG reductions, as it would avoid equivalent GHG emissions.

Flow showing baseline scenario:



A.7. Debundling>>

This 26.9 MW Biomass based Cogeneration Project 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- ACM0006: Electricity and heat generation from biomass (Ver. 16)

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

This methodology is applicable to project activities that operate biomass (co-)fired power-and-heat plants. The cogen plant can be considered as per the below applicability:

Applicability Criteria	Project Condition
The methodology is applicable under the following conditions: (a) Biomass used by the project plant is limited to biomass residues, biogas, RDF2 and/or biomass from dedicated plantations; (b) Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired does not exceed 80% of the total fuel fired on energy basis. (c) For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), 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, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process; (d) The biomass used by the project plant is not stored for more than one year; (e) The biomass used by the project plant is not processed chemically or biologically (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemical-degradation, etc.) prior to combustion. Drying and mechanical processing, such as shredding and pelletisation, are allowed.	The project activity would use bagasse and other type of renewable biomass without any chemical, physical and biological processing. Biomass would not be stored in the project boundary more than one years. Project would not use any fossil fuel for co-firing. Hence the criteria points (a), (c), (b), (d) and (e) are applicable.

In the case of fuel switch project activities, the use of biomass or the increase in the use of biomass as compared to the baseline scenario is technically not possible at the project site without a capital investment in: (a) The retrofit or replacement of existing heat generators/boilers; or (b) The installation of new heat generators/boilers; or (c) A new dedicated supply chain of biomass established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); or Equipment for preparation and feeding of biomass.	This is not a fuel switch project activity. Hence, this criterion is not applicable.
If biogas is used for power and heat generation, the biogas must be generated by anaerobic digestion of wastewater, and: (a) If the wastewater generation source is registered as a CDM project activity, the details of the wastewater project shall be included in the PDD, and emission reductions from biogas energy generation are claimed using this methodology; If the wastewater source is not a CDM project, the amount of biogas does not exceed 50% of the total fuel fired on energy basis.	There is no production of biogas and hence this criteria is not applicable.
In the case biomass from dedicated plantations is used, the "TOOL16: Project and leakage emissions from biomass" shall apply to determine the relevant project and leakage emissions from cultivation of biomass and from the utilization of biomass residues.	The dedicated plantation is not applicable to the project and there are no leakage emissions from the utilization of biomass residues as the plant uses its own waste as fuel. Hence the given clause is not applicable to the Project so concerned

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 has dedicated commissioning certificate and connection point,
- Project has obtained dedicated consent to establish certificate from relevant authorities.

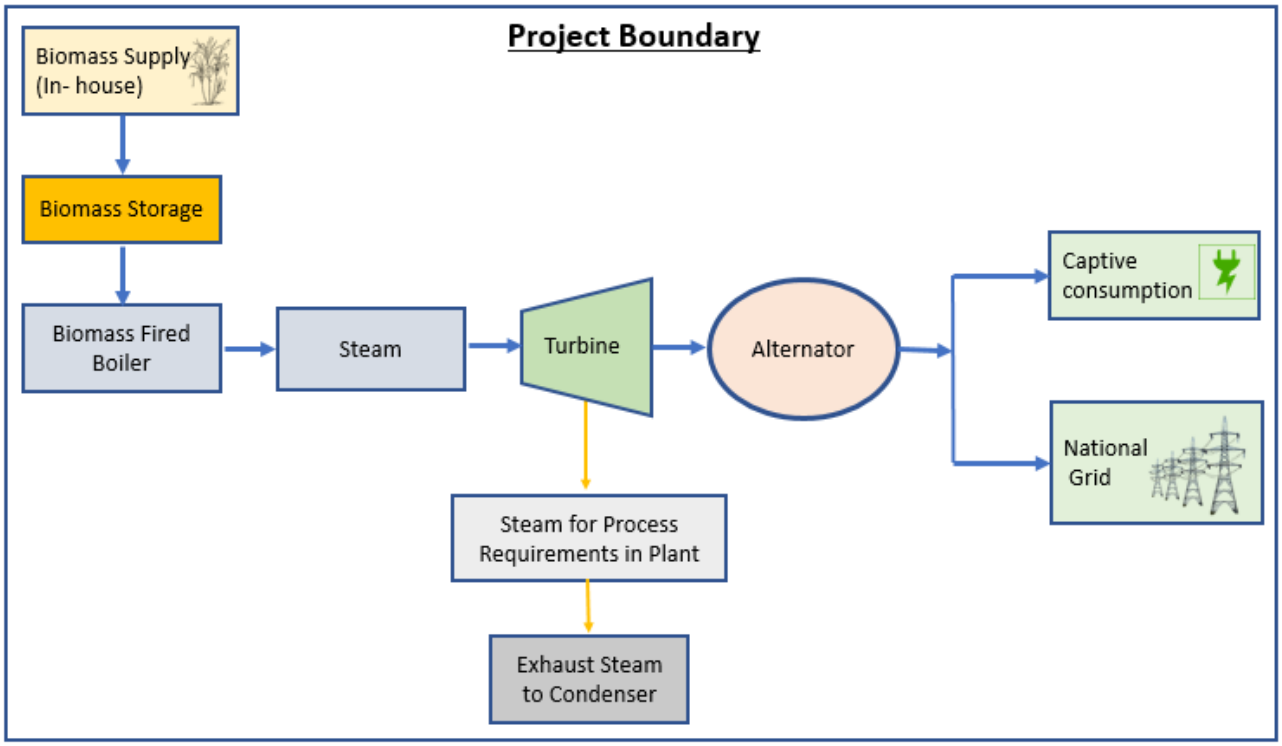
The Monitoring Report has the details of the end user's name and location i.e DCM Shriram Ltd Sugar Unit Ajbapur located at Ajbapur Village, PO Mullapur, Distt.-Lakhimpur Kheri, Uttar Pradesh, 261505, India.

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

In line with the methodology, the project boundary encompasses the industrial facility of DCM, equipment installed for the operation of cogeneration plant, the biomass storage facility, the facility (sugar unit) consuming the energy (electrical and thermal) generated by the project activity plant and its supply to the grid;

Plant would use the bagasse as renewable fuel for the boiler. Quantity of the biomass required would be generated in-house.

Project boundary of this project is illustrated below:



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

Source		Gas	Included	Justification/Explanation
Baseline	Electricity and heat generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residues	CO_2	No	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector

Source		Gas	Included	Justification/Explanation
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small
		N_2O	No	Excluded for simplification.
Project activity	On-site fossil fuel consumption	CO_2	No	Project Activity does not use fossil fuel.
		CH_4	No	Project Activity does not use fossil fuel.
		N_2O	No	Project Activity does not use fossil fuel.
	Off-site transportation of biomass	CO_2	No	Biomass is not transported to the outside of the plant premises.
		CH_4	No	Biomass is not transported to the outside of the plant premises.
		N_2O	No	Biomass is not transported to the outside of the plant premises.
	Combustion of biomass for electricity and heat	CO_2	No	It is assumed that CO2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector
		CH_4	No	Not applicable, as not considered in baseline scenario either.
		N_2O	No	Excluded for simplification. This emission source is assumed to be small
	Wastewater from the treatment of biomass	CO_2	No	Biomass does not undergo any treatment. So no wastewater is generated.
		CH_4	No	Biomass does not undergo any treatment. So no wastewater is generated.
		N_2O	No	Biomass does not undergo any treatment. So no wastewater is generated.

Source		Gas	Included	Justification/Explanation
	Cultivation of land to produce biomass feedstock	CO_2	No	Not applicable, as the biomass is not sourced from dedicated plantations.
		CH_4	No	Not applicable, as the biomass is not sourced from dedicated plantations.
		N_2O	No	Not applicable, as the biomass is not sourced from dedicated plantations.

B.5. Establishment and description of baseline scenario >>

Most plausible baseline scenario of the project is generation of power in the power grid. Considering that the Sugar mill is connected to the national grid although in the baseline situation the factory entirely covers its power demand from its own generation.
In the absence of the project activity, no electricity is exported into the grid and consequently other plants which are mainly based on fossil fuel would have generated the same power into the grid.

Emission reductions are calculated as follows:

$$ERy = BEy - PEy - LEy \quad \text{(Eq. 1)}$$

Where,
ERy = Emissions reductions in year y (t CO2)
BEy = Baseline emissions in year y (t CO2)
PEy = Project emissions in year y (t CO2)
LEy = Leakage emissions in year y (t CO2)

$$BE_y = EL_{BL,GR,y} \times EF_{EG,GR,y} + \sum FF_{BL,HG,y,f} \times EF_{FF,y,f} + EL_{BL,FF/GR,y} \times \min(EF_{EG,GR,y}, EF_{EG,FF,y}) + BE_{BR,y}$$

Where,
BE_y = Baseline Emission in year y;
$EL_{BL,GR,y}$ = Baseline electricity sourced from the grid in year y (MWh)
$EF_{EG,GR,y}$ = Grid emission factor in year y (t CO2/MWh)
$FF_{BL,HG,y,f}$ = Baseline fossil fuel demand for process heat in year y (GJ)
$EF_{FF,y,f}$ = CO2 emission factor for fossil fuel type f in year y (t CO2/GJ)
$EL_{BL,FF/GR,y}$ = Baseline uncertain electricity generation in the grid or on-site or off-site power-only units in year y (MWh)
$EF_{EG,,y}$ = CO2 emission factor for electricity generation at the project site or off-site plants in the baseline in year y (t CO2/MWh)
$BE_{BR,y}$ = Baseline emissions due to disposal of biomass residues in year y (t CO2e)

Entire project would be run with bagasse which is generated in-house and no fossil fuel is required

to run the project as plant has enough bagasse to run the project. In absence of the project activity, plant would have generated steam by firing bagasse and sourced electricity from its existing power plant which are currently exporting power to the grid. As the project exported renewable electrical energy to grid, in the absence of the project activity, no electricity is exported into the grid and consequently other plants which are mainly based on fossil fuel would have generated the same power and fed into the grid. Hence, emission reduction can only be accounted for the replacement of grid-mix energy by renewable electricity. Apart from that, baseline emission due to disposal of biomass residue is not accounted for this project.

Hence, now the baseline emission reduces to:

$BE_y = EL_{BL,GR,y} \times EF_{EG,GR,y}$

Where,
BE_y = Baseline Emission in year y;
$EL_{BL,GR,y}$ = Baseline electricity sourced from the grid in year y (MWh)
$EF_{EG,GR,y}$ = Grid emission factor in year y (t CO2/MWh)

Plant is exporting surplus energy to grid after auxiliary and captive consumption. Hence, as per para 45 of the methodology, ($EL_{BL,y} - CAP_{EG,total,y}$) would be the quantity of electricity supplied to the grid by the project activity which is greter dan zero. So,

$EL_{BL,GR,y}$ = Net electricity exported to the grid.

Emission factor of the grid has been calculated in line with *Tool 07: Tool to calculate the emission factor for an electricity system*, based on the recent data published by the Central Electricity Authority version 17.

- The electricity import from the grid is subtracted from the baseline scenario, hence there is no separate project emissions.

$PEy = 0$ (Eq. 3)

- It is an integrated cogeneration plant. The biomass is the output of the sugar mill and which is being consumed hence there is no leakage emissions being generated.

$LEy = 0$ (Eq. 4)

Estimated Annual or Total baseline emission reductions (BEy) = 76,950 CoUs /year (76,950 tCO2eq/yr)

B.6. Prior History>>

This project developer has two CDM registered project under the same location:

1) Project ID: 0982, Crediting Period Duration: 18 May 07 - 17 May 17: This activity involved installation of two new high pressure (87kg/cm^2) and high efficiency boilers, of 60 tonnes per hour (TPH) capacity each, along with a 20MW extraction-condensing turbine.

2) Project ID: 0332, Crediting Period Duration: 01 Oct 05 - 30 Sep 15: This activity involved installation of 65 tonnes per hour (TPH) capacity with a 7.5 MW extraction-condensing turbine.

The present UCR Project Activity is commissioned on 07th December 2016 and is a stand alone project and this 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 >>

There is no change in the start date of crediting period.

B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

There are no permanent changes from registered PCN monitoring plan and applied methodology.

B.9. Monitoring period number and duration>>

First Issuance Period: 6 years – 07/12/2016 to 6/12/2022

B.8. Monitoring plan>>

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

Data/Parameter	$EF_{Grid,y}$
Data unit	tCO2 /MWh
Description	Combined Margin Grid Emission Factor
Source of data	CEA database Version 17.0
Value applied	0.9088
Measurement methods and procedures	N/A
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For estimation of baseline emission.
Additional Comment	-

Data and parameters that require to be monitored at the Project location from time to time is tabulated below:

Data / Parameter:	$EL_{BL,GR,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y (MWh)
Source of data:	Monthly Joint Meter Readings (JMRs)
Measurement procedures (if any):	Generally, the calculation is done by the Authority/Dis-com and the project proponent has no control over the authority for the calculation. Therefore, based on the joint meter reading certificates/credit notes, the project shall raise the invoice for monthly payments. EL = E(export)- E(import)
Monitoring frequency:	Data Type: Measured Monitoring equipment: ABT Energy Meters

	Frequency: Continuous monitoring and Monthly recording from Energy Meters, Archiving Policy: Paper & Electronic
Value applied:	To be applied as per actual data
QA/QC procedures:	Calibration of the Main meters will be carried out once in five (5) years as per National Standards (as per the provision of CEA, India) and faulty meters will be duly replaced immediately as per the provision of power purchase agreement. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the project participant to the grid.
Purpose of date:	The Data/Parameter is required to calculate the baseline emission.
Any comment:	All the data will be archived till a period of two years from the end of the crediting period.