PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Carbon Credit Generation Project by NSL Sugars Ltd. Aland Unit Karnataka, India

Version 1.0

Date 15/11/2024

First CoU Issuance Period: 11 years, 10 months

Date: 01/01/2013 to 31/10/2024 (inclusive of both dates)

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

BASIC INFORMATION	
Title of the project activity	Carbon Credit Generation Project by NSL Sugars Ltd. Aland Unit Karnataka, India
Scale of the project activity	Large Scale
Completion date of the PCN	15/11/2024
Project participants	NSL Sugars Limited Unit - II, Aland
Host Party	India
Applied methodologies and standardized baselines	**CDM Methodologies:** ACM0006: Electricity and heat generation from biomass, version16.0 **Standardized baseline:** Not applicable.
Sectoral scopes	Scope: 01 Energy industries (Renewable/Non-Renewable Sources)
Estimated amount of total GHG emission reductions	For Bagasse based co-generation: 83,955 CoUs per year

SECTION A. Description of project activity

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

NSL Sugars Limited (NSL), is one of the most efficient sugar companies in south India and a sugar arm of 'NSL Group'. NSL Group entered the 'sugar' business being related to agro-commercial crop business. NSL Group which has its core strength in Agri business like Seeds, Cotton & Sugar taken over the "Sahakari Sakkare Kharkane Niyamit", Aland for 30 years on LROT (Lease, Rehabilitate, Operate Transfer) basis of 1250 TCD sugar plant & took possession of the factory on 06-March-2010. The Project is owned by "M/s NSL Sugars Limited, Unit-II, Aland" and hereby called as Project Proponent.

NSL Sugars has operated plant at 1250 TCD during 2010-11 season. Simultaneously plant has been expanded to 7000 TCD with 34 MW co-generation commissioned in 2011-12 season. The plant has been working with the state of art equipment(s) for sugar to achieve 7000 TCD and 34 MW bagasse based co-gen power plant.

The current project activity included under this UCR document is located in Bhusnoor Village, Aland Taluka in the district of Gulbarga in Karnataka state. The main scope of carbon credits is due to the existing 34 MW bagasse-based co-generation unit at the Bhusnoor sugar mill which exports electricity to grid.

These scope is well recognized activity under GHG mechanisms due to the reduction of carbon emissions as compared to their respective baseline scenarios viz. displacement of grid electricity with the export power produced & supplied by NSL.

The Co-generation Unit:

The purpose of the project activity is to utilize available mill generated bagasse effectively for generation of steam and electricity for both in-house consumption and to export surplus electricity to the power grid. The project meets the captive steam and power requirement of sugar unit, co-generation (Cogen) plant auxiliaries and power requirement of the facilities. The balance power is exported to Karnataka Power Transmission Corporation Limited (KPTCL).

As per design specification, the unit has an existing co-generation unit with installed capacity of 34 MW turbine, out of which 2% of gross electricity generated is assumed to be imported electricity and 40% of gross electricity generated is assumed to be used for captive-consumption and the remaining gross electricity is exported to the grid. PLF for the plant is assumed to be 60% and the plant is operational since commissioning on 05/08/2011.

The major equipment of the project activity comprises 170 Tons Per Hour (TPH) capacity steam generator with the outlet steam parameters of 110 atm and 540°C, 34 MW capacity turbine generator set Multi stage Extraction cum Condensing (MEC) type.

The design of the plant is to operate for 340 days per annum, which includes 310 days of crushing season, and balance 30 days during off-season (plant operates on an average of 8 months in a year including the crushing season and some off-season months). The plant is designed with all other auxiliary plant systems like bagasse/biomass handling system with storage and processing arrangements, ash handling system, water treatment plant, cooling water system and cooling tower, De-Mineralized (DM) water plant, compressed air system and balance of plant including high pressure piping etc. for its successful operation. The provision of extraction cum condensing machine allows the possibility of operating the plant during the off-season with the saved bagasse and procured surplus biomass residues

NSL Sugars Limited, Unit-II, Aland, project activity has implemented the steps which are well recognized activities under GHG mechanisms due to the reduction of carbon emissions as compared to the baseline scenarios viz. displacement of grid electricity with the export power produced & supplied from the co-generation unit. Thus, NSL Sugars project activity helps to contribute to emission reductions as well as SDG targets creating a sustainable pathway.

Photographs showing the project site

Scope of Capacity Expansion[1]:
As per the current operational status, the NSL Bhusnoor unit has planned capacity expansion to include one 120 KLPD of distillery unit in future.

[1] If any expansion is done by PP in future as projected it will be reported and accounted in the respective monitoring periods.

NOTIFICATION FROM UCR FOR SUGAR PROJECTS:

UCR has released a notification to clarify the project and credit type to be allowed under UCR specific to biofuel production and also clarifies the scope of power generation from biomass waste. This notification is highlighted below for better understanding:

Date of implementation: 03/08/2022

Based on the UCR stakeholder/auditor feedback and policy review of the guidelines on the national ethanol policy, which is positive for the sugar and agricultural processing industries (the Indian government has advanced the 20% ethanol blending in petrol by five years to 2025 and has plans to divert surplus sugar and broken rice for the production of ethanol), the following new updates have been incorporated within the UCR CoU Standard to establish stability in the voluntary carbon market and also provide clarification to the numerous requests for project registration involving sugar and rice industries that are expanding their facilities and foraying into ethanol production at scale.

While currently, 60% of maize produced in the country is used as poultry feed, 20% for human consumption and 20% for the industry, the new ethanol policy is likely to make ethanol production super profitable and also help green the transport sector at speed and scale. Effective immediately, the following new UCR guidelines have been proposed and implemented:

- ✓ Project activities using biomass derived as a by-product from their manufacturing process within the project boundary (e.g. bagasse from sugar mills, husk from rice mills etc), can only claim CoUs under the UCR carbon program for the quantity of biomass based renewable power (electricity) exported to the regional/local grid.

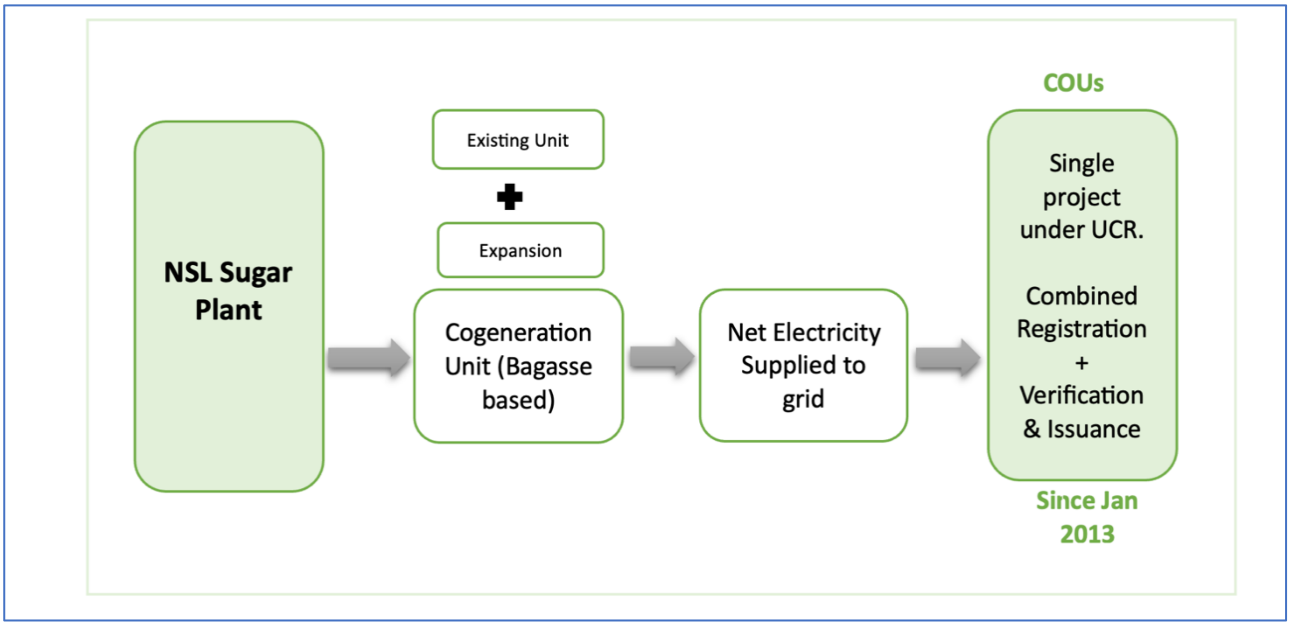
- ✓ Project activities using biomass derived as a by-product from the manufacturing process (e.g. bagasse from sugar mills, husk from rice mills etc), within the project boundary, can continue to claim CoUs for the quantity of surplus renewable electricity exported to the grid and for their biofuel production plant for production of (blended) biofuel that is used as fuel in existing stationary installations (e.g. diesel generators) and/or in vehicles (UNFCCC CDM ACM 0017).

This new update does not affect project activities using methane capture from wastewater/spent-wash activities (e.g. biogas for captive steam/power from spent-wash in sugar mills, etc) within the project boundary.

This new update does not affect project activities that are importing biomass from

The current project activities follow only one condition and hence intending to claim CoUs for the net exported power from the co-gen unit.

The project activity representation is depicted with the flow diagram below:



In line with the provision of UCR, the COUs can be claimed retroactively since 01/01/2013 or date of commissioning of the project activities, whichever is later. Since the project activity was commissioned prior to 2013 (and after 2002, which defines the eligibility clause) hence COUs shall be claimed and accounted from 01/01/2013.

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:

- Project activity had contributed to employment generation in the local and surrounding areas for both skilled and unskilled people for technical operations as well as the maintenance of the plant and equipment.
- It has created a steady income and improved skills in the jobs for the workers at the facility.
- The project activity is also contributing to the national energy security by reducing the consumption of fossil fuels.
- The technology used in the project is proven and safe for power generation.
- The technological advancement and will help in capacity building.

Environmental benefits:

- The project has a renewable energy component that uses bagasse as a fuel for power generation and heat. It is a voluntary process and not mandated by any environmental laws of India. As the power generation and heat requirement is done by use of renewable biomass, project activity positively contributes to reduction in use of finite natural resources like coal, gas and oil which would have otherwise been used for equivalent power production. Therefore, this project activity helps in creating environment sustainability by reduction of GHG emission in the atmosphere.
- Avoids global and local environmental pollution, leading to reduction of GHG emissions.
- The bagasse generated in sugar mills in the region are generally in excess and hence get disposed in unplanned ways including dumping into nearby land or rivers. This will be reduced.

Economic benefits:

- The project activity creates employment opportunities during the project stage and operation and maintenance of the Cogen power plant.
- The project activity results in saving the coal and allowing it to be diverted to other needy section of the economy.
- The project activity creates employment opportunities during the project stage and operation and maintenance of the boiler, turbines.
- The increase in demand of bagasse exerted by the project has led to have an effect on its price and generates additional revenue for the sugarcane farmers.
- The biomass-based power generating plant facilitates the availability of continuous and sustained power to the local industries and agricultural farmers located in remote areas, thereby avoiding the load shedding and low frequency of power.
- The implementation of the project activity has helped to uplift and create a sustainable growth in the local and surrounding regions.
- The use of this technology encourages its efficient development and thereby reducing GHG emissions.

Sustainable Development Goals (SDG) Attributes:
Linkage of the project activities with SDGs:

Biomass power project in Bhusnoor, Aland sugar plant can be directly linked with the contribution to several Sustainable Development Goals (SDGs) outlined by the United Nations.

Below are some of the key SDGs and their specific targets that can be addressed by the project:

SDG 1: No Poverty and its associated targets, particularly

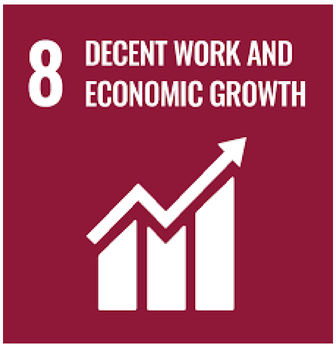
Target 1.1: Eradicate extreme poverty for all people everywhere.

Job Creation: Biomass power project involved a significant labour force for the cultivation of sugarcane, the operation of processing facilities, and distribution. These are job opportunities, particularly in rural areas where the sugar plants are located. By providing employment, these projects can help lift people out of extreme poverty.

Local Economic Development: The establishment of biomass power project stimulated local economic development by attracting investments, creating supply chains, and fostering entrepreneurship, all of which can contribute to poverty reduction.

SDG 7: Affordable and Clean Energy
Target 7.1: Ensure universal access to affordable, reliable, and modern energy services.
Target 7.2: Increase the share of renewable energy in the global energy mix.
Biomass power project can help achieve these targets by providing clean and affordable energy while reducing reliance on fossil fuels.

SDG 8: Decent Work and Economic Growth



Target 8.4: Improve resource efficiency in consumption and production.
Target 8.5: Achieve full and productive employment and decent work for all.
Biomass power projects created jobs in both energy production and agriculture, ensures regular training and growth for the resources, thus contributing to economic growth.

SDG 11: Sustainable Cities and Communities

Target 11.6: Reduced the adverse per capita environmental impact of project areas and cities.
Biomass power can be integrated into urban energy systems, reducing the environmental impact of cities.

SDG 12: Responsible Consumption and Production

Target 12.2: Achieve sustainable management and efficient use of natural resources.
Target 12.5: Substantially reduce waste generation through prevention, reduction, recycling, and reuse.
Biomass power generation can utilize agricultural waste and residues, promoting efficient resource use.

SDG 13: Climate Action

Target 13.1: Strengthen resilience and adaptive capacity to climate-related disasters.
Target 13.2: Integrate climate change measures into national policies, strategies, and planning.

SDG 15: Life on Land

Target 15.1: Ensure conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems.

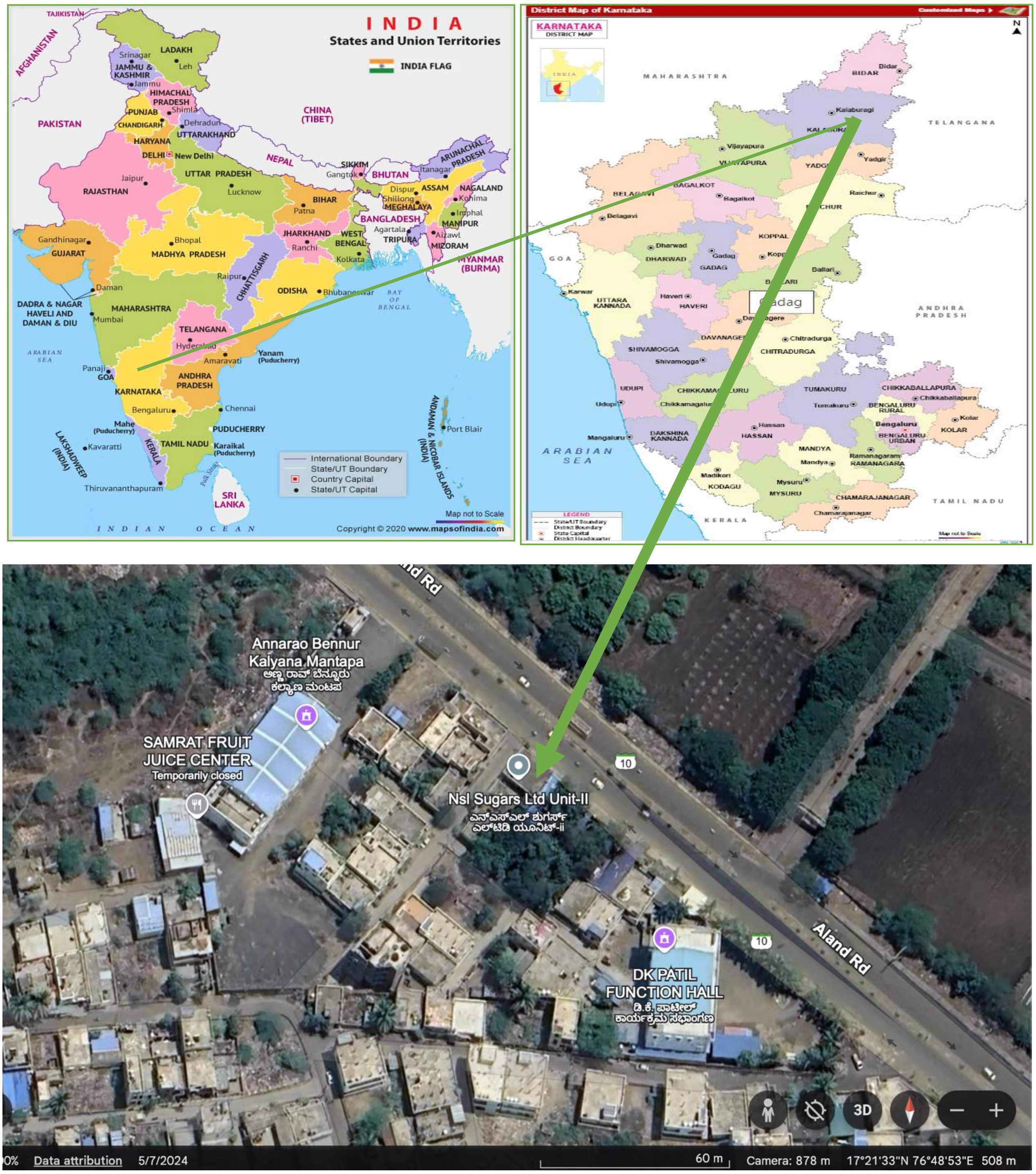
Sustainable biomass sourcing and land management practices in sugarcane cultivation can contribute to the preservation of terrestrial ecosystems. Under the current project activity, the main feedstock is sugarcane which is a dedicated plantation followed by land activities such water management, mulching, etc. Similarly, the utilization bagasse for power generation ensures zero biomass residues going back to the fields. Thus, overall there is an ecosystem conservation across the cycle.

By aligning with these SDGs and their respective targets, biomass power project in sugar plants can play a significant role in promoting sustainable development, mitigating climate change, and improving the well-being of communities involved in these activities.

During the course of verification process, these SDGs can be further explained either with
(i) more project linked data/info/linkages etc. or
(ii) (ii) based on more explanatory notes that relevant in the contents of the project activity.

A.3. Location of project activity >>

Country : India
District : Gulbarga
Village : Bhusnoor
Tehsil : Aland
State : Karnataka
Pin Code : 571425
Latitude : $17^{0}21'32''$ N
Longitude : $76^{0}48'51''$ E



Maps Showing the exact project location

A.4. Technologies/measures >>

The project activity involves 1 x 170 TPH boiler with high pressure and temperature configuration (110 atm and 540 °C), 1 x 18 MW back pressure and 1 x 8 MW Double extraction cum condensing Turbine Generator set. The cogeneration cycle for the plant is designed as regenerative cycle with high pressure feed water heater and one low-pressure feed water heater. The plant is generating more than three to four times power as compared to the power generated by the sugar mill of same capacity having conventional low pressure and temperature steam configuration with back pressure turbines. Although very few bagasse/biomass based cogeneration power plants are designed with above mentioned high pressure and temperature parameters, the technology is well proven worldwide.

Some of the salient features of the project equipment can be found in the below mentioned table:

Boiler Specifications	**Values**
Heating surface	5678 sq.m.
Boiler working pressure	110 atm.
Steam capacity	170 TPH
Steam Temperature	540 °C ± 5 °C
Boiler Make	M/s ISGEC
Type	Single Drum, Water Tube Type

Steam Turbine Specification	**Values**
Make	M/S Siemens Ltd.
Model	SST300VE50AL
Type of machine	Multi stage Extraction Cum condensing
No. of stages	Multi stage
Output rating	34000 kW
Turbine speed	6838 rpm
Steam pressure	110 atm
Feed water temperature	218.59 °C

A.5. Parties and project participants >>

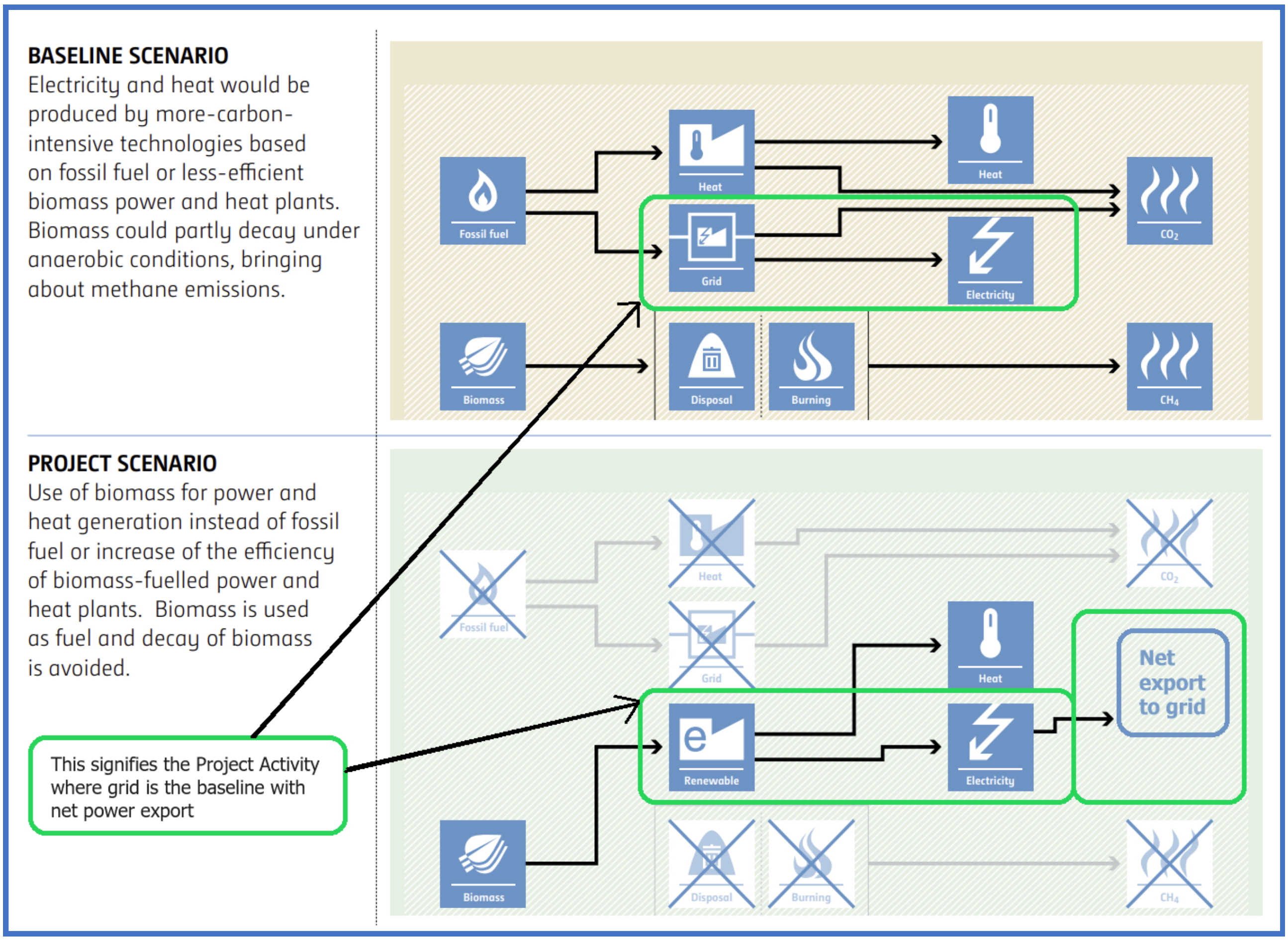
Party (Host)	Participants
India	Project Owner: M/s NSL Sugars Limited, Unit-II, Aland Address: Bhusnoor, Aland Taluka, Gulbarga District, Karnataka-571425, India.

Since project owner is also the representor in UCR for this project, hence no representative or separate participants are applicable.

A.6. Baseline Emissions>>

Scope 1:

The baseline and project scenario for the project activity is shown below as per methodological guidance:



The proposed project activity uses bagasse as fuel for cogeneration unit. The bagasse is a renewable biomass fuel, thus does not add any carbon dioxide to the atmosphere because of the carbon recycling during the growth of sugar cane. Therefore, the project activity will lead to zero CO2 on-site emissions associated with bagasse combustion.

On an average 8 months in a year including the crushing season and some off season months is considered for the project activity[2]. Without the project activity, the required amount of electricity would have been supplied to the grid by the fossil fuel dominated grid mix and which would have led to continuous CO2 emissions. With the use of biomass fuel, there will be GHG reductions as it would avoid equivalent amount of GHG emissions.

[2] Actual generation months will be monitored for each monitoring period to calculate the gross electricity generation from the project activity.

A.7. Debundling>>

This project is not a de-bundled component of a larger project activity. There is no registered large-scale UCR project activity but not any other small-scale project activity with the following conditions:

- by the same project participant;-
- in the same project category and technology/measure;
- whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The Bhusnoor Unit is a stand-alone plant with no other adjacent facilities nearby.

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, Version 16.0.

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

Standardized Baseline **:** Not applicable.
The Methodological applicability **:** The methodological applicability has been demonstrated below:

ACM0006 is applicable to the project activity as per the below applicable conditions:

Applicability Criteria & Project Conditions are demonstrated below:

1. **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 palletisation, are allowed.

The project activity uses 100% bagasse in the power plant. No fossil fuel co-firing occurs in this project activity. The biomass utilized under the project is bagasse, which is supplied continuously during season and thereafter without storing for more than a year. Also, the bagasse is directly used as fuel without any pre-processing.
Therefore, criteria a, b, c, d, e is applicable.

2. 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.
- **b.** collecting and cleaning contaminated new sources of biomass residues that could otherwise not be
- **c.** used for energy purposes); or
- **d.** Equipment for preparation and feeding of biomass.

The project is a new greenfield project and thus these criteria are not applicable.

3. 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;

b. 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 criterion is not applicable.

4. 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 bagasse produced as a waste of the sugar mill is being used for the generation of steam and hence this criterion is also not applicable.

5. The methodology is only applicable if the baseline scenario, as identified per the "Selection of the baseline scenario and demonstration of additionality" section hereunder, is:

a. For power generation: scenarios P2 to P7, or a combination of any of those scenarios; and

b. For heat generation: scenarios H2 to H7, or a combination of any of those scenarios;

c. If some of the heat generated by the CDM project activity is converted to mechanical power through steam turbines, for mechanical power generation: scenarios M2 to M5:

- **i.** In cases M2 and M3, if the steam turbine(s) are used for mechanical power in the project, the turbine(s) used in the baseline shall be at least as efficient as the steam turbine(s) used for mechanical power in the project;
- **ii.** In cases M4 and M5, steam turbine(s) generating mechanical power to be used for the same purpose as in the baseline are not allowed;

d. For the use of biomass residues: scenarios B1 to B5, or a combination of any of those scenarios;

e. For the use of biogas: scenarios BG1 to BG3, or a combination of any of those scenarios.

> As per the UCR list of eligible projects and methodologies found in the UCR Program Manual Ver. 4, this criterion is not applicable.

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

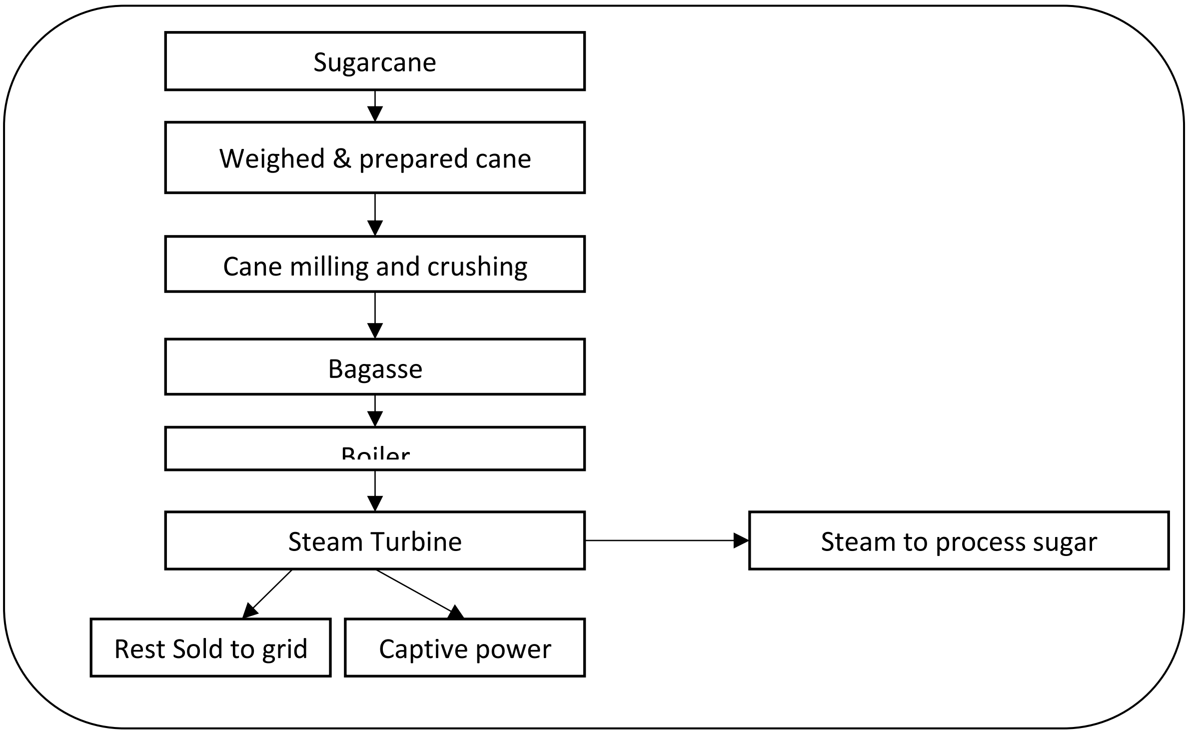
The project activity does not incur any double accounting of emission reductions as the project is not registered in any other registry other than UCR .

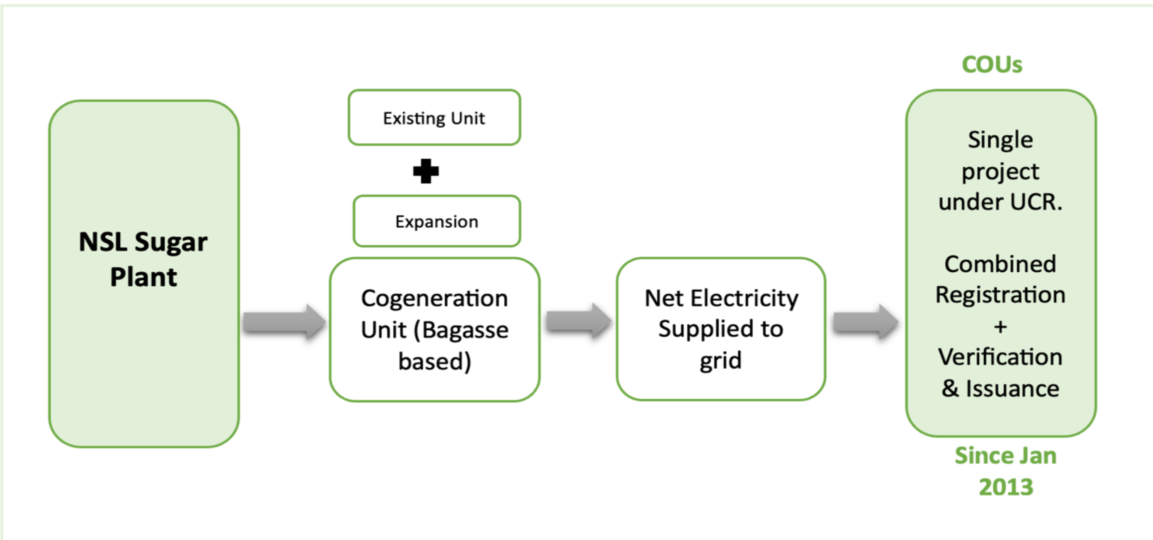
Under UCR registration is being considered with crediting period only from 01/01/2013. Thus, there is no double accounting of emission reductions.

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

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

- All plants generating power/and/or heat located at the project site, whether fired with biomass, fossil fuels or a combination of both
- All power plants connected physically to the electricity system(grid) that the project plant is connected to
- The means of transportation of biomass to the project site
- If the feedstock is biomass residues, the site where the biomass residues would have left for decay or dumped.





A representative diagram of the overall project activity is given below

The inclusion and exclusion of GHG Source from the project boundary is demonstrated in the table below:

EXAMPLE	Source	GHG	Included?	Justification/Explanation
Baseline Activity	Emissions from fossil fuel in Grid baseline power generation	CO_2	Yes	It is the major source of emission
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
	Emissions from uncontrolled burning or decay of biomass residue	CO_2	No	Excluded for simplification. This is conservative
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
Project Activity	Emissions from onsite fossil fuel consumption	CO_2	Yes	There is no fossil fuel, however electricity is consumed at the project site due to the project activity. Hence, import grid electricity is considered for project emissions.
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
	Emissions from off-site transportation of biomass	CO_2	No	Though it is an important emission source, but the input biomass is bagasse which is available within the sugar mill, hence off-site transportation is not applicable.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from combustion of biomass for electricity and heat	CO_2	No	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	This emission is not included as CH_4 emissions from uncontrolled burning or decay of biomass residue in the baseline scenario is not included.
		N_2O	No	Excluded for simplification. This emission source is assumed to be

				very small.
	Emissions from wastewater from the treatment of biomass	CO_2	No	As per methodology, it is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	As per methodology, this emission source shall be included in cases where the waste-water is treated (partly) under anaerobic conditions. However, there is a proper waste-water treatment.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small. in cases biomass from dedicated plantation is used. Hence, excluded
	Emission from Cultivation of land to produce biomass feedstock	CO_2	No	As per methodology, this emission source shall be included in cases biomass from dedicated plantation is used. However, as already demonstrated under the methodology eligibility section, though the origin of feedstock is sugarcane which is a dedicated plantation however the input biomass feedstock in the co-generation unit is only bagasse, which is a waste biomass comes under 'renewable biomass' category
		CH_4	No	As per methodology, this emission source shall be included in cases biomass from dedicated plantation is used. Hence, excluded
		N_2O	No	As per methodology, this emission source shall be included in cases biomass from dedicated plantation is used. Hence, excluded

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

In absence of the project activity equivalent energy would have been generated and supplied to the grid by the power plants connected to the grid which are dominated by fossil fuel fired power generation unit.

Emission reductions are calculated as follows:

$ER_y = BE_y – PE_y - LE_y$

Where,
ER_y = Emissions reductions in year y (tCO_2)
BE_y = Baseline emissions in year y (tCO_2)
PE_y = Project emissions in year y (tCO_2)
LE_y = Leakage emissions in year y (tCO_2)

In many cases, it may be difficult to clearly determine the precise mix of power generation in the grid and power or heat generation with biomass residues or fossil fuels that would have occurred in the absence of the CDM project activity. For this reason, this methodology adopts a conservative approach based on the following assumptions and taking into account any technical and operational constraints:

a) Biomass residues, if available in the baseline scenario, would be used in the baseline as a priority for the generation of power and heat over the use of any fossil fuels;

b) When different types of biomass result in different levels of heat generation efficiency, the allocation of biomass shall be guided to maximize the heat generation efficiency of the set of heat generators;

c) If different types of fossil fuels can technically be used in the heat generators, the type of fossil fuel used should be guided by the principle that fossil fuels would be used so as to maximize the heat generation efficiency of the set of heat generators;

d) Where heat can technically be generated in more than one heat generator, it should be assumed that it is generated from the most efficient to the less efficient heat generators to the maximum extent possible, taking into account any technical and operational constraints, including co-firing and the partial use of the heat generator in the previous steps;

e) The heat provided by heat generators is used first in heat engines which operate in cogeneration mode, then in thermal applications to satisfy the heat demand, and after that in heat engines which operate for the generation of power only;

f) Where heat can technically be used in more than one engine type, it should be allocated from the most efficient to the less efficient heat engines to the maximum extent possible;

g) Where heat can technically be used in more than one cogeneration heat engine type, it should be assumed that it is allocated so as to maximize the cogeneration of process heat.

The methodology provides detailed equations with all possible combinations for baseline scenarios and corresponding emissions reduction calculations are prescribed. The example is sited below:

Baseline emissions are calculated as follows:

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

BEy = Baseline emissions in year y (tCO_2)

$EL_{BL,GR,y}$= Baseline electricity sourced from the grid in year y (MWh)

$EF_{EG,GR,y}$ = Grid emission factor in year y (tCO_2/MWh)

$FF_{BL,HG,y,f}$ = Baseline fossil fuel demand for process heat in year y (GJ)

$EF_{FF,y,f}$ = CO_2 emission factor for fossil fuel type f in year y (tCO_2/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)

$EF_{EG,FF,y}$ = CO_2 emission factor for electricity generation at the project site or off-site plants in the baseline in year y (tCO2/MWh)

$BE_{BR,y}$ =Baseline emissions due to disposal of biomass residues in year y (t CO_{2e})

f = Fossil fuel type

However, for this project activity scope a simplified approach has been considered where net electricity export from the project is considered for ER estimation. This because of the following rationale:

Rational 1:
The project activity uses bagasse for its captive thermal and electrical energy which is a common practice across the sugar mills. The fuel used for the project activity is entirely carbon neutral biomass residue. In absence of the project activity, plant would not have exported green power to grid and consequently other thermal power plants which are dominated by fossil fuels would generate electricity and supply equivalent energy to grid. Hence the emission reduction can only be calculated for the replacement of equivalent grid-mix energy, which would be exported to grid by this project activity, with renewable electricity.

Rational 2:
As per UCR guideline, released on 03/08/2022, it was prescribed that:

Project activities using biomass derived as a by-product from their manufacturing process within the project boundary (e.g. bagasse from sugar mills, husk from rice mills etc), can only claim CoUs under the UCR carbon program for the quantity of biomass based renewable power (electricity) exported to the regional/local grid.

Thus, considering the methodological provision as well as the above two rationale applicable to the current project scenario, the baseline calculation has been prescribed as follows:

The equation to calculate baseline reduces to:

$BEy = EL_{BL,GR,y} \times EF_{EG,GR,y}$ **……………………………………….Final Eq 1**

Where,

BE_y = Baseline emissions in year y (t CO_2)
$EL_{BL,GR,y}$ = Baseline electricity sourced from the grid in year y (MWh)
= Net electricity produced from the co-gen unit that has been supplied to grid (MWh)
$EF_{EG,GR,y}$ = Grid emission factor in year y (t CO_2/MWh)

Determine $EG_{BL,GR,y}$ for the current project activity:

As mentioned above, the parameter $\mathbf{EG_{BL,GR,y}}$ is "the amount of electricity that would be sourced from the grid in the baseline" which is now redefined for the current project activity considering that it was implemented as a green-field project at the time of commissioning and hence only the captive consumption or the in-house load is the total on-site and off-site power that would have been sourced from the grid; hence the net export power available to the grid is additional. Hence, this is in line with the provision of CoUs claim allowed by UCR for Sugar industry.

Thus, the final equation is reduced to as follows:

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

Here, $EL_{BL,GR,y} = EL_{BL,net,exp}$ **……………………………………….Final Eq 2**

where, $EL_{BL,net,exp}$ is the net-export units attributed to CoU calculation, which is estimated assuming that the amount of electricity generated on-site using the bagasse based co-gen unit (limited by the installed capacity of the project) after adjusting all the captive load available in the baseline scenario (on-site and off-site); whereas any import power shall be separately accounted for project emission as prescribed in below sections.

Thus, the overall calculation is simplified as well as the most conservative, defined as follows:

$EL_{BL,net,exp} = \mathbf{EL_{co\text{-}gen,project}} - \mathbf{EL_{cap,n}}$ **……………………………………….Final Eq 3**

Where:
$EL_{co\text{-}gen,\ project}$ = Total electricity produced by the co-gen unit in year y (MWh)
$EL_{cap,n}$ = Total captive loads (starting from consumption point 1 to n), in year y (MWh)

Note: These captive loads shall be properly defined during the monitoring period under the UCR MR. The values shall be sourced from the plant records and to be calculated manually as per above equation to arrive at the $EL_{BL,net,exp}$.

Determine the emission factor of grid electricity generation ($EF_{EG,GR,y}$)

A "grid emission factor" refers to a CO_2emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO_2/MWh for the 2014-2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Also, latest CEA database version 19.0 recommends the combined emission factor as 0.91 tCO_2/MWh which is higher than the UCR recommended emission factor hence following the conservative approach UCR default emission factor has been considered to calculate the emission reduction under conservative approach.

Thus, $\mathbf{EF_{EG,GR,y} = 0.9\ tCO_2eq}$/MWh.

Project & Leakage Emissions:

The project emission consideration can be referred from the para 101 of the applied methodology:

$$PE_y = PE_{Biomas,y} + PE_{FF,y} + PE_{GR1,y} + PE_{GR2,y} + PE_{CBR,y} + PE_{BG2,y}$$

Here, the project activity has considered the following considerations:

$\mathbf{PE_{CBR,y} = 0.}$

As per para 108, if project proponents chose to include emissions due to uncontrolled burning or decay of biomass residues in the calculation of baseline emissions, then emissions from the combustion of this category of biomass residues have also to be included in the project scenario. Otherwise, this emission source may be excluded.

$\mathbf{PE_{BG2,y} = 0.}$

The project activity does not include biogas.

$\mathbf{PE_{FF,y} = 0.}$

The project activity does not include any fossil fuel.

$\mathbf{PE_{GR2,y} = 0.}$

The project activity does not include emission reduction in electricity generation at the project site.

$\mathbf{PE_{GR1,y} = YES.}$

As per para 106, if electricity is imported from the grid to the project site during year y, corresponding emissions should be accounted for as project emissions, as follows:

$$PE_{GR1,y} = EF_{EG,GR,y} \times EL_{PJ,imp,y}$$

Where:

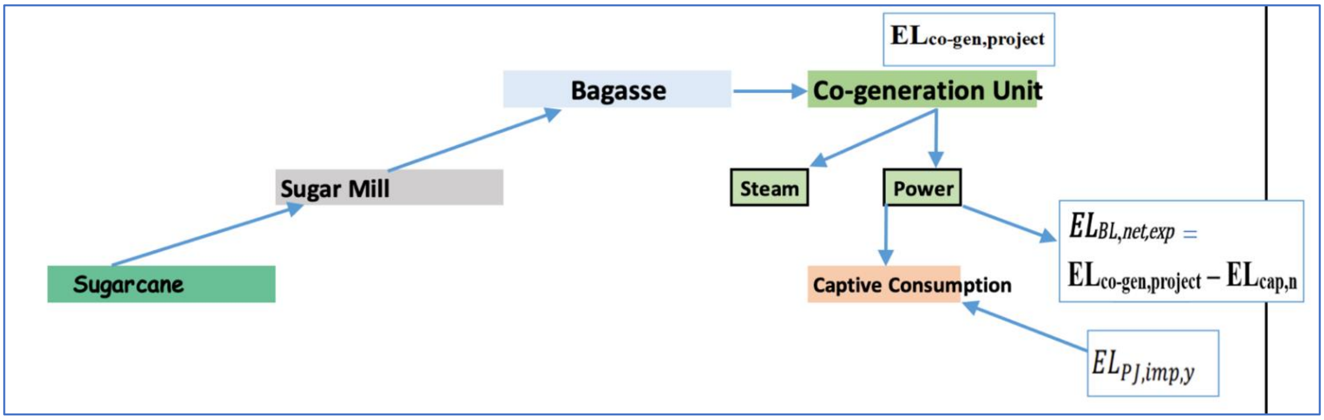
$PE_{GR1,y}$	=	Emissions during the year *y* due to grid electricity imports to the project site (t CO_2)
$EL_{PJ,imp,y}$	=	Project electricity imports from the grid in year *y* (MWh)
$EF_{EG,GR,y}$	=	Grid emission factor in year *y* (t CO_2/MWh)

Leakage emissions: For the current project activity, leakage emission is considered as zero as power generation is based on bagasse which is available from the same sugar factory. Hence both availability and transportation related concerns are eliminated.

LE_y = 0.

Adjustment Factor: As per UCR Guideline dated 04/10/2023 on default PE's for biomass projects via update (source: https://medium.com/@UniversalCarbonRegistry/biomass-based-power-thermal-energy-project-transport-emissions-related-default-parameters-6dea0e40c938), the **"Net-to-gross adjustment of 10%"** has been applied as per UCR guidance for biomass projects.

A representative diagram is included below to demonstrate the baseline emission consideration as per the above justifications:



C. Estimated Emission Reductions:
The primary equation for net emission reduction calculation is:
$ER_y = BE_y – PE_y - LE_y$

Here,

LE_y = 0

PE_y = Emissions specific to import electricity, to be calculated on actuals.

BEy = Baseline emissions reductions, to be referred from the Final Eq (1) and to be calculated using the parameters and sub-parameters under the Final Eq 2 & 3.

Applying the defined equations (i.e. Final Eq 1, 2 & 3), an ex-ante estimation for an year under the project activity has been performed as follows (Refer ER Sheet for further calculation references):

$EL_{BL,GR,y}$ = $EL_{BL,net,exp}$
= $EL_{co\text{-}gen,project} - EL_{cap,n}$ = 178,704 MWh – 71,481 MWh **= 107,222 MWh**[3]

Hence, BEy = $EL_{BL,GR,y} \times EF_{EG,GR,y}$ = 107,222 MWh x 0.9 tCO_2e/MWh **= 96,500 tCO_2e**

PE_y = $EF_{EG,GR,y} \times EL_{PJ,imp,y}$ = 3,574 MWh X 0.9 tCO_2e/MWh. **= 3,216 tCO_2e**

ERy = 96,500 - 3,216 = 93,283 tCO_2e

Final ERy after applying adjustment factor:
Final ERy = 93,283 – 10% = 83,955 tCO_2e

B.6. Prior History>>
The project activity has not applied to any other GHG program for generation or issuance of carbon offsets or credits for the said crediting period.

B.7. Changes to start date of crediting period >>
There is no change in the start date of crediting period under UCR.

This project activity is newly applied under UCR with an assigned crediting period starting from 01/01/2013, which will be considered for verification in due course. Hence, currently there is no change in start date of crediting period.

B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>
This project activity is newly applied under UCR with an assigned crediting period starting from 01/01/2013, which will be considered for verification in due course. Hence, there are no permanent changes from registered PCN monitoring plan and applied methodology. Whereas, simplified approach of the methodologies has been demonstrated under the previous section B.5.

[3] For the purpose of ex-ante estimates and values refer ER sheet and for the purpose of calculation, the PLF for plant was assumed 60% and 40% inhouse electricity consumption and 2% import was assumed. Actual values will be considered during verification process and final CoUs shall be calculated.

B.9. Monitoring period number and duration>>

First Issuance Period: 11 years, 10 months – 01/01/2013 to 31/10/2024

B.8. Monitoring plan>>

The key monitoring parameter for the project activity is mainly dependent on electricity parameters. 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 are metered and there are also main meters attached to each turbine generator to determine their total generation.

Since net export values are finally utilized for calculation of CoUs hence all electricity related values are monitored, recorded and finally made available digitally (i.e. in excel format). This consolidated excel file will be used for calculation purposes.

Thus, monitoring plan can be summarized as follows:

Data type : Monitored and recorded data
Recording process : On-site recording using energy meters
Monitoring tools : Energy meters and SCADA or equivalent systems.
Archive : To be recorded and/or archived in excel formats.
QA/QC process : The meters are calibrated on regular interval, at least once in 5 years.
Internal process : Regular trainings at plant level.
Reporting : Internal reporting by NSL team, followed by UCR reporting by concerned team / consultant.

Data and Parameters available at validation/during UCR registration (i.e. ex-ante values):

Data / Parameter	**UCR recommended emission factor ($EF_{EG,GR,y}$)**
Data unit	tCO_2 /MWh
Description	A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. *"The UCR recommends an emission factor of 0.9 tCO_2/MWh for the 2014 - 2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Emission factors for the post 2020 period is to be selected as the most conservative estimate between the national electricity/power authority published data set and UCR default of 0.9 tCO2/MWh"*. Hence, 0.9 tCO2/MWh is used since latest CEA database version 19.0 recommends the combined emission factor as 0.91 tCO2/MWh which is higher than the UCR recommended emission factor hence following the conservative approach UCR default emission factor has been considered to calculate the emission reduction under conservative approach.
Source of data	https://a23e347601d72166dcd6-16da518ed3035d35cf0439f1cdf449c9.ssl.cf2.rackcdn.com//Documents/UCRStandardNov2021updatedVer2_301121081557551620.pdf
Value applied	0.9
Measurement methods and procedures	-
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For the calculation of Emission Factor of the grid

Data and Parameters to be monitored (ex-post monitoring values):

Data / Parameter	$EL_{BL,GR,y}$
Data unit	MWh
Description	Net electricity produced from the co-gen unit that has been supplied to grid in year y
Source of data	NSL records
Measurement procedures (if any):	Here, $EL_{BL,GR,y} = EL_{BL,net,exp}$ Where, $EL_{BL,net,exp}$ is the net-export units attributed to CoU calculation, which is estimated assuming that the amount of electricity generated on-site using the bagasse based co-gen unit (limited by the installed capacity of the project) after adjusting all the captive load available in the baseline scenario (on-site and off-site); whereas any import power shall be separately accounted for project emission as prescribed in below sections as per applied methodology. Thus, the overall calculation is simplified as well as the most conservative, defined as follows: $EL_{BL,net,exp} = \mathbf{EL}_{\mathbf{co\text{-}gen,project}} - \mathbf{EL}_{\mathbf{cap,n}}$ Where: $EL_{\text{co-gen, project}}$ = Total electricity produced by the co-gen unit in year y (MWh) $EL_{cap,n}$ = Total captive loads (sum of all the consumption points at the plant), in year y (MWh) **Note:** These captive loads shall be properly defined during the monitoring period under the UCR MR. The values shall be sourced from the plant records and to be calculated manually as per above equation to arrive at the $EL_{BL,net,exp}$.
Monitoring Frequency:	Monthly records
QA/QC procedures:	Calibration of the energy meters will be carried out once in five 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 electricity authority. The energy meter details shall be provided and QA/QC requirements shall be addressed during monitoring & verification process.
Any comment:	All the data will be archived till a period of two years from the end of the crediting period.

Data / Parameter	$EL_{co\text{-}gen,project}$
Data unit	MWh
Description	Total electricity produced by the co-gen unit in year y
Source of data	NSL records
Measurement procedures (if any):	Direct recording at plant level
Monitoring Frequency:	Monthly records
QA/QC procedures applied:	Calibration of the energy meters[4] will be carried out once in five 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 electricity authority. The energy meter details shall be provided and QA/QC requirements shall be addressed during monitoring & verification process.
Any comment:	All the data will be archived till a period of two years from the end of the crediting period.

Data / Parameter	$EL_{cap,n}$
Data unit	MWh
Description	Total captive loads (sum of all the consumption points at the plant), in year y
Source of data	NSL records
Measurement procedures (if any):	Direct recording at plant level
Monitoring Frequency:	Monthly records
QA/QC procedures applied:	Calibration of the energy meters[5] will be carried out once in five 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 electricity authority. The energy meter details shall be provided and QA/QC requirements shall be addressed during monitoring & verification process.
Any comment:	All the data will be archived till a period of two years from the end of the crediting period.

Additional Parameters	Only for reporting purposes (not mandatory)

1) The total amount of bagasse generated by the sugar plant and consumed in the power generation unit is available based on plant records in tonnes.

2) Total amount of steam produced from the co-gen unit, also details of steam going to process and power generation, etc.

[4] The details of energy meters for $EL_{co\text{-}gen,project}$ will be provided during the applicable monitoring periods and monthly generation records will also be referred to calculate the electricity generation in separate sheet.

[5] The details of energy meters for $EL_{cap,n}$ will be provided during the applicable monitoring periods and monthly generation records will also be referred to calculate the electricity generation in separate sheet.