Universal Carbon Registry

PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Carbon Credit Generation Project by NSL Sugars Ltd. at Koppa, Karnataka.
Version 01.0, Date: 05/09/2023

First CoU Issuance Period: 10 years, 00 months
Date: 01/01/2013 to 31/12/2022

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

BASIC INFORMATION	
Title of the project activity	Carbon Credit Generation Project by NSL Sugars Ltd. at Koppa, Karnataka.
Scale of the project activity	Large Scale
Completion date of the PCN	05/09/2023
Project participants	NSL Sugars Ltd.
Host Party	India
Applied methodologies and standardized baselines	**CDM Methodologies:** 1) ACM0006: Electricity and heat generation from biomass, version16.0 2) ACM0017: Large-scale Consolidated Methodology: Production of biofuel, version 04.0 **Standardized baseline:** Not applicable.
Sectoral scopes	Scopes specific to ACM0006: 01 Energy industries (Renewable/Non-Renewable Sources) Scopes specific to ACM0017: 01, 05, 07 and 15
Estimated amount of total GHG emission reductions	For Scope -1 (Bagasse based co-generation) : 82,143 CoUs per year For Scope -1 (Bioethanol for blended biofuel) : 51,397 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), formerly known as SCM Sugars Ltd, 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.

The current project activity included under this UCR document is a combination of two scopes included under the Koppa Sugar unit of NSL Sugars Ltd. Which is located in Koppa Village, Maddur Taluka in the district of Mandya in Karnataka state. The main scopes are:

> **Scope 1:** generation of carbon credits due to an existing 26 MW bagasse-based co-generation unit at the Koppa sugar mill.
>
> **Scope 2:** generation of carbon credits due to production and applicability of bioethanol produced in the Koppa unit which is supplied to OMCs for blending with petrol or equivalent services.

Both these scopes are well recognized activities 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 from the co-generation unit and displacement of petrol with a share of blending of bioethanol 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 NSL Koppa unit has an existing co-generation unit with installed capacity of 26 MW, out of which 1.8 MW is for auxiliary consumption, 5.2 MW is captive-consumption and the rest 19 MW is exported to the grid. The project is operational since June 2004. The Project is owned by M/s NSL Sugars Ltd. hereby to be called as Project Proponent.

The major equipment of the project activity comprises 110 Tons Per Hour (TPH) capacity steam generator with the outlet steam parameters of 87 kg/cm2 and 515oC, 26 MW capacity turbine generator set of Double Extraction cum Condensing (DEC) type and electrical evacuation package for power export to KPTCL grid. Plant operates for 340 days per annum, which includes 310 days of crushing season, and balance 30 days during off-season. 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.

The Bioethanol Unit:

The purpose of bioethanol plant is to produce ethanol for blending with regular fuel as substitute. Bioethanol fuel is mainly produced by the sugar fermentation process, although it can also be manufactured by the chemical process of reacting ethylene with steam. Ethanol can be produced from biomass by the hydrolysis and sugar fermentation processes. Biomass wastes contain a complex mixture of carbohydrate polymers from the plant cell walls known as cellulose, hemi cellulose and lignin. In order to produce sugars from the biomass, the biomass is pre-treated with acids or enzymes in order to reduce the size of the feedstock and to open up the plant structure. Thus, bioethanol from sugar plan is the output of series process that goes through Fermentation, Distillation and Molecular Sieve Dehydration (MSDH) process.

The project activity (i.e. Bioethanol production unit at Koppa) was commissioned in October 2007 and bioethanol is being produced for producing blended biofuel by OMCs to whom NSL has supply contracts. This blended biofuel is finally used as fuel in existing stationary installations (e.g. diesel generators) and/or in vehicles within India. The project activity is hence a renewable energy project activity that displaces more-GHG-intensive fossil fuel for combustion in vehicles and stationary installations.

The key features of the bioethanol project scope are as follows:

Existing installed capacity	: 60 KLPD
Purpose	: To supply for biofuel blending by Oil Marketing Companies (OMCs)
Blending types	: B10 and B20.
The energy values	: 44.22 MJ/kg with a blend of 10%(E10)
The targeted blending	: Current-12-13%, however, as per central government order to be achieved 25% blending by year of 2025.

Scope of Capacity Expansion:

As per the current operational status, the NSL Koppa unit has planned capacity expansion and due to which both the co-gen unit and the bioethanol production unit will undergo some capacity addition. Hence, this project includes this provision of capacity expansion in near future, the proposed details are as follows:

Project Scope	Current Capacity	Project Expansion	Expected Timeline
Bagasse based Co-generation, net power export to the grid	26 MW	Addition of 35 TPH boiler and 3 MW turbine unit	Year 2023
Bioethanol production, for supply to OMCs for blended biofuel	60 KLPD	Addition of 100 KLPD unit	Year 2023

Thus, NSL Sugars Limited (NSL), a sugar arm of ‘NSL’ group owns this entire project activity. The current project activity included under this UCR program is a combination of two scopes (power & bioethanol) included under the Koppa Sugar unit of NSL Sugars Ltd. Which is located in Koppa Village, in Mandya district of Karnataka. The project scopes contribute to emission reductions as well as SDG targets creating a sustainable pathway.

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.

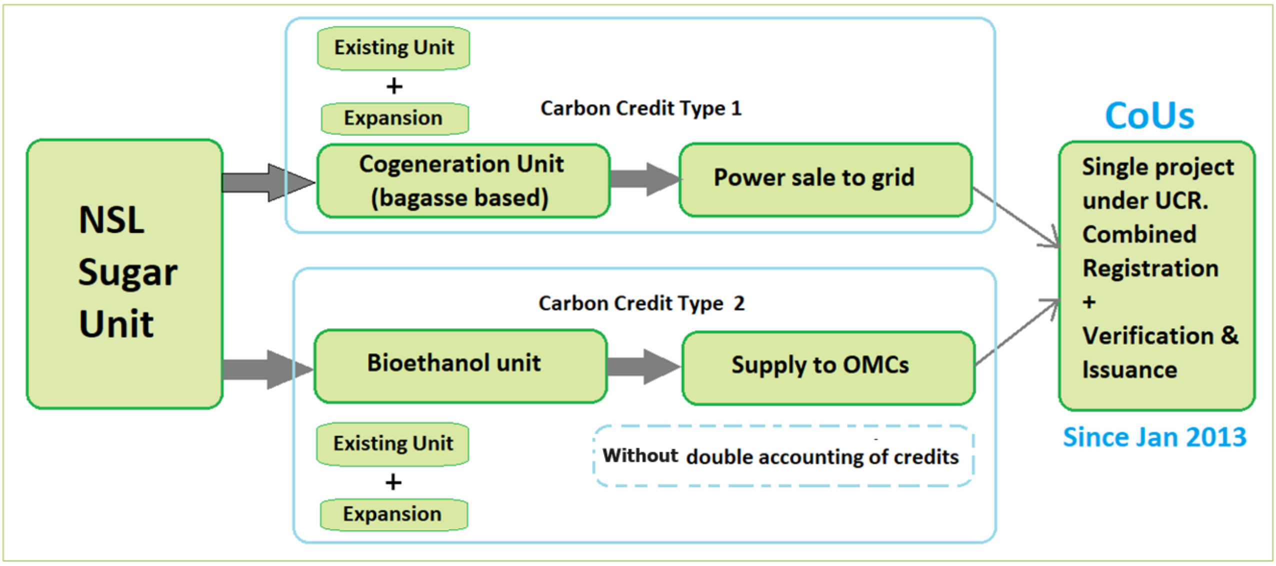
- ✓ Project activities using biomass derived as a by-product from the manufacturing process (e.g. bagasse from sugar mills, husk from rice mills etc), within the project boundary, can continue to claim CoUs for the quantity of surplus renewable electricity exported to the grid and for their biofuel production 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 locations outside the project boundary and using the same for captive heat and power generation with or without grid export. Project activities that are already registered by the UCR will not be impacted for the 2014–2021 verification/crediting period.

The current project activities follow both these conditions and hence intending to claim CoUs for the two specific project activities (i) export power from the co-gen unit and (ii) bioethanol produced for onward action as blended biofuel by OMCs.

The project activity (both the scopes) representation is depicted with the flow diagram below:



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

Status of India's bioethanol blending:

Government of India has been promoting the Ethanol Blended Petrol (EBP) Programme. The main aim is to enhance India's energy security, reduce import dependency on fuel, save foreign exchange, address environmental issues and give a boost to domestic agriculture sector, The 'National Policy on Biofuels' notified by the Government in 2018 envisaged an indicative target of 20% ethanol blending in petrol by year 2030. However, considering the encouraging performance, due to various interventions made by the Government since 2014, the target of 20% ethanol blending was advanced from 2030 to 2025-26.

As a part of sustainable initiative, a "Roadmap for Ethanol Blending in India 2020-25" was also released by the Hon'ble Prime Minister in June, 2021 which lays out a detailed pathway for achieving 20% ethanol blending. This roadmap also mentioned an intermediate milestone of 10% blending to be achieved by November, 2022. However, due to the coordinated efforts of the Public Sector Oil Marketing Companies (OMCs) the target of 10% blending under the programme has been achieved much ahead of the targeted timelines of November, 2022 wherein the Public Sector OMCs have attained an average 10% ethanol blending in petrol across the country.

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. 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 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.
- With regard to the bioethanol plant, the main purpose is Biodiesel, which is an alternative to petroleum-based fuels. Using bioethanol as a blend in fossil fuels, the project activity reduces GHG emissions. Biodiesel has zero sulfur content and offers a significant reduction in carbon monoxide and hydrocarbon emissions. Thus, implementation of the two project activities directly reduces fossil fuels consumption and renewable energy source replaces the fossil fuels source thus contributing to reduced GHG emissions.
- 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. Similar positive impact is with the bioethanol unit, both direct and indirect jobs were created.
- The project activity creates employment opportunities during the project stage and operation and maintenance of the boiler, turbines and also the utilities in the bioethanol production.
- 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.

Additional Attributes:
Positive Impacts of bioethanol project:

A Bioethanol Project can have several positive impacts on various aspects of society, the environment, and the economy. Bioethanol is a renewable and sustainable fuel derived from plant materials, and in this case primarily sugarcane and cellulosic biomass. Here are some of the positive impacts associated with the Bioethanol Project:

Reduced Greenhouse Gas Emissions: One of the most significant benefits of bioethanol is its potential to reduce greenhouse gas emissions compared to fossil fuels. Bioethanol is considered a "carbon-neutral" fuel because the carbon dioxide released during its combustion is roughly equivalent to the amount the plants absorbed during their growth.

Energy Security: Bioethanol diversifies the energy sources used for transportation, reducing dependence on fossil fuels and enhancing energy security. This is particularly important given the volatility of global oil markets.

Rural Development and Job Creation: As demonstrated in the previous section, the production of bioethanol often involves local resources and opportunities for rural economic development and job creation in these sectors, which are quite evident from the existing jobs created by the project.

Economic Growth: The bioethanol industry can stimulate economic growth by creating new industries, including farming, biofuel production, and related technologies. It also fosters research and development in biotechnology and bioenergy.

Air Quality Improvement: Bioethanol burns cleaner than traditional fossil fuels, emitting fewer pollutants and particulates that contribute to poor air quality and respiratory problems.

Technology Innovation: Research and development associated with bioethanol production can lead to technological advancements in fields such as agricultural practices, enzymatic processes, and biorefinery technologies.

Waste Reduction and responsible consumption: By utilizing agricultural residues for bioethanol production, the project contributes to waste reduction and landfill diversion. Also, such project sets up an example of responsible production & consumption.

Public Health: The reduction in air pollutants resulting from bioethanol use can lead to improved public health outcomes, particularly in urban areas with high levels of vehicular emissions.

Market Diversification: Bioethanol can provide consumers with an alternative to conventional fuel, allowing them to choose a more environmentally friendly option.

It's important to note that while these positive impacts are achievable, they depend on responsible and sustainable bioethanol production practices. The current project activity is an example where all such positive impacts are involved.

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

Biomass power and the bioethanol project in Koppa sugar plants 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 Koppa project:

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 projects and bioethanol for blended fuel can help achieve these targets by providing clean and affordable energy while reducing reliance on fossil fuels.

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.
Bioethanol production from sugarcane can reduce greenhouse gas emissions and promote climate-resilient agriculture.

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. Bioethanol production can also reduce waste by utilizing sugarcane byproducts.

SDG 9: Industry, Innovation, and Infrastructure

Target 9.4: Upgrade infrastructure and retrofit industries to make them sustainable.
Bioethanol projects in sugar plants may require infrastructure upgrades and modernization, contributing to sustainable industrial development. This project also proposes expansion, hence more infrastructural development and innovations are linked.

SDG 1: No Poverty and its associated targets, particularly
Target 1.1: Eradicate extreme poverty for all people everywhere.

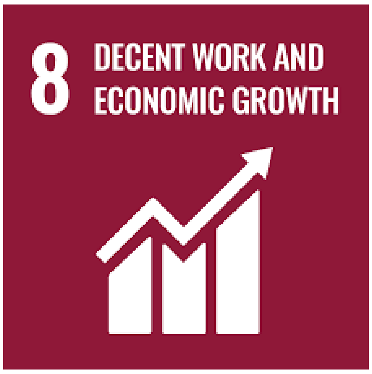
Here's how this project i.e. 'how biomass power and bioethanol projects in sugar plants can contribute':

Job Creation: Biomass power and bioethanol projects 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 plat are located. By providing employment, these projects can help lift people out of extreme poverty.

Income Generation: Farmers involved in sugarcane cultivation for bioethanol production can generate income from the sale of their crops. This additional income can be a crucial factor in reducing poverty levels, especially for small-scale farmers.

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

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 and bioethanol 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. Similarly, bioethanol going to be blended with fuel with OMCs directly contributes to urban energy system and reduced impact on city environment due to lower emissions with blended fuel.

SDG 15: Life on Land

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

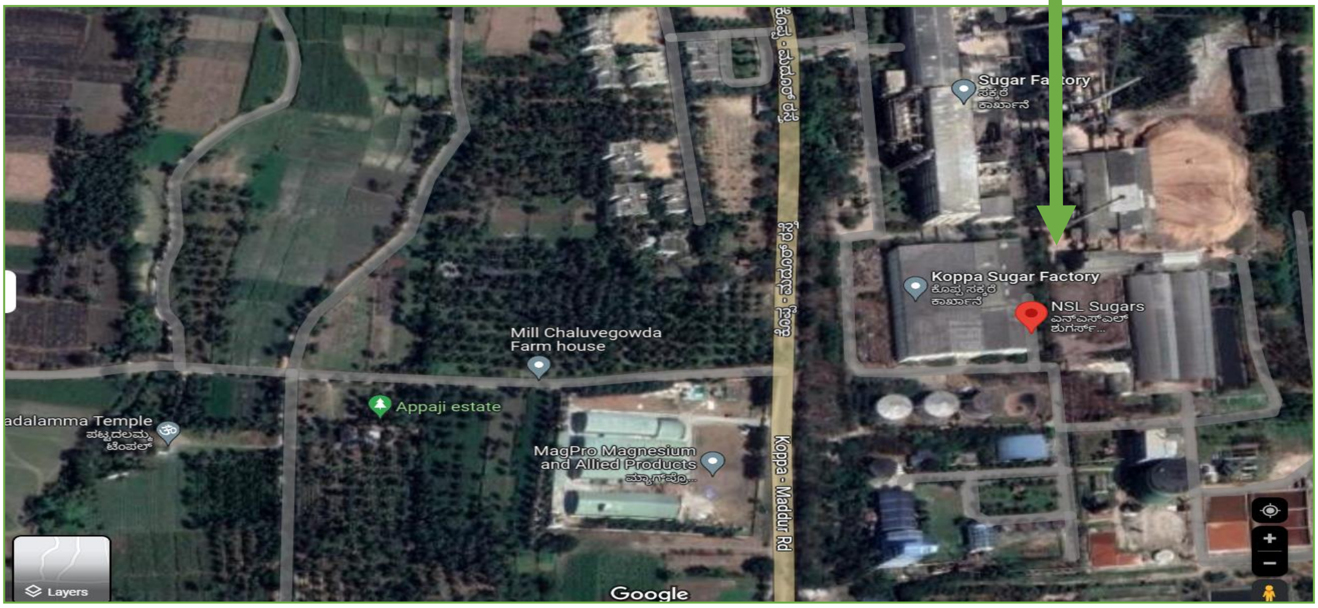
Sustainable biomass sourcing and land management practices in sugarcane cultivation can contribute to the preservation of terrestrial ecosystems. Under the current project activity, the main feedstock is sugarcane which is a dedicated plantation followed by land activities such water management, mulching,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

By aligning with these SDGs and their respective targets, biomass power and bioethanol projects 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) based on more explanatory notes that relevant in the contents of the project activity.

A.3. Location of project activity >>

Country : India
District : Mandya
Village : Koppa
Tehsil : Maddur
State : Karnataka
Pin Code : 571425
Latitude : 12.70002 N
Longitude : 76.97888 E



Project has been implemented at Koppa village, District– Mandya, Karnataka, India. It is located at latitude of 12o 42’ N and longitude of 76o 59’ E at a height of 664 meters. The project site is situated at 17 kms from Maddur town in Mandya district of the Karnataka State.

A.4. Technologies/measures >>

Activity Type 1:

The Co-generation Unit:

The project activity involves 1 x 150 TPH boiler with high pressure and temperature configuration (87 kg/cm2 and 515 °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	87kg/cm2
Steam capacity	110 TPH
Steam Temperature	515± 5 °C
Boiler Make	Igsec John Thompson
Type	Bi-drum water tube

Steam Turbine Specification	Values
Make	BHEL
Type of machine	EHNK40/63-3
No. of stages	Impulse-1
Normal continues rating	26000 kW
Maximum continues rating	27000 kW
Turbine normal speed	5650 rpm
Turbine trip speed	6215 rpm
Type of machine	Extraction Cum condensing
Steam pressure	87 kg/cm2
Feed water temperature	160 °C

Activity Type 2:

The Bioethanol Unit:

Capacity : 60 KLPD
The raw materials : Syrup and B.Heavy Molasses
Measuring devices : (i) Hydrometer for alcohol concentration analysis, (ii)flow meter & tank calibration
Technical process : Fermentation→ Distillation → MSDH→ Ethanol

Sugar Fermentation Process:

The hydrolysis process breaks down the cellulosic part of the biomass or corn into sugar solutions that can then be fermented into ethanol. Yeast is added to the solution, which is then heated. The yeast contains an enzyme called invertase, which acts as a catalyst and helps to convert the sucrose sugars into glucose and fructose (both C6H12O6).

The chemical reaction is shown below:

$$\underset{\textbf{Sucrose}}{C12H22O11} + \underset{\textbf{Water}}{H2O} \xrightarrow[\textbf{Catalyst}]{\textbf{Invertase}} \underset{\textbf{Fructose}}{C6H12O6} + \underset{\textbf{Glucose}}{C6H12O6}$$

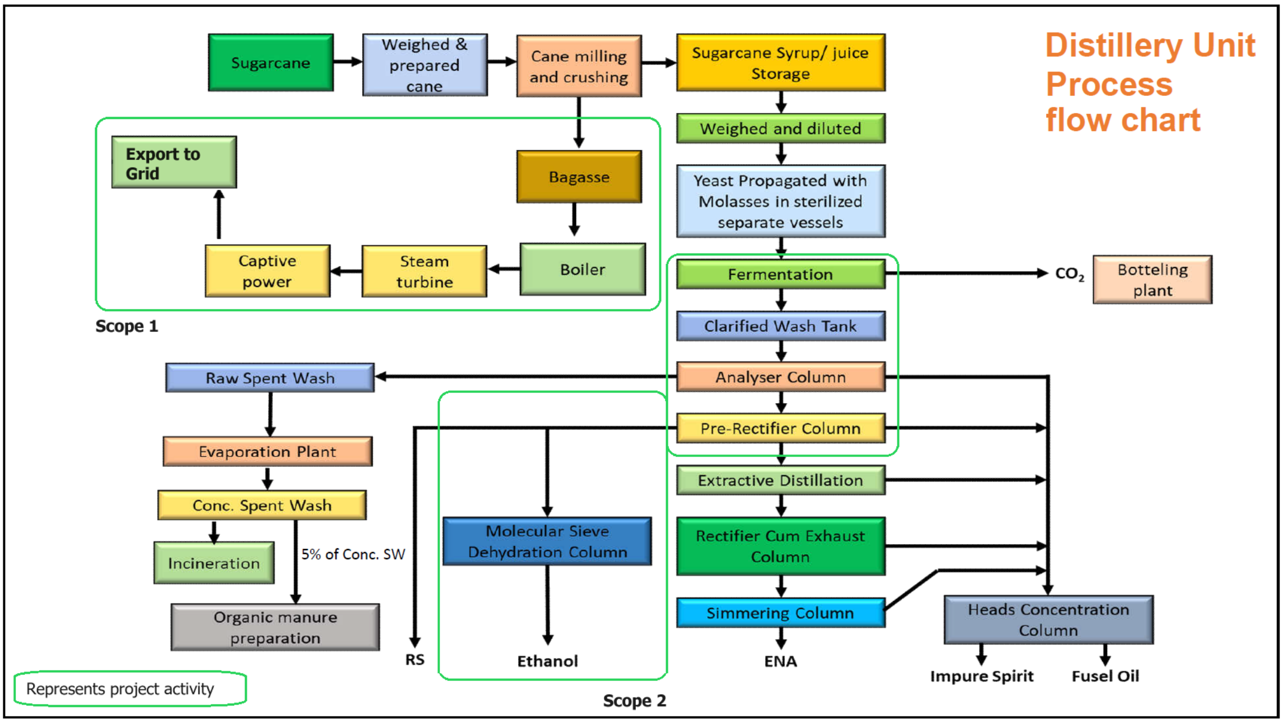
The fructose and glucose sugars then react with another enzyme called zymase, which is also contained in the yeast to produce ethanol and carbon dioxide.

The chemical reaction is shown below:

$$\underset{\textbf{Fructose / Glucose}}{C6H12O6} \xrightarrow[\textbf{Catalyst}]{\textbf{Zymase}} \underset{\textbf{Ethanol}}{2C2H5OH} + 2CO2$$

The fermentation process takes around three days to complete and is carried out at a temperature of between 250C and 300C.

The overall project activity with the two scopes (i.e. power generation and bioethanol production) a process flow diagram can be expressed as below:



A.5. Parties and project participants >>

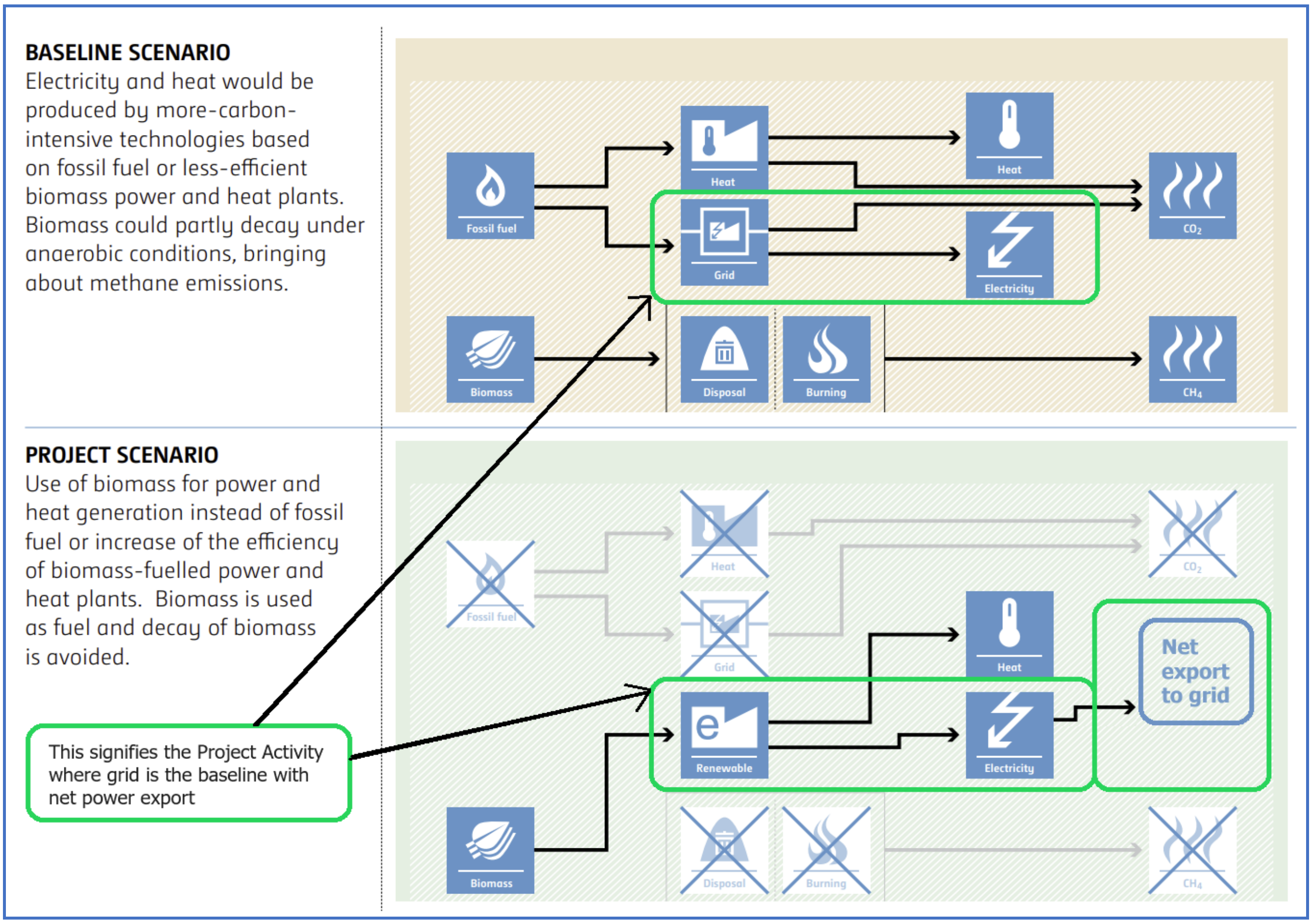
Party (Host)	Participants
India	Project Owner: M/s NSL Sugars Limited, Address: Koppa, Maddur Taluka, Mandya District, Karnataka – 571425. India.

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 Scope 1 (i.e. bagasse based co-gen power unit) is shown below as per methodological guidance:



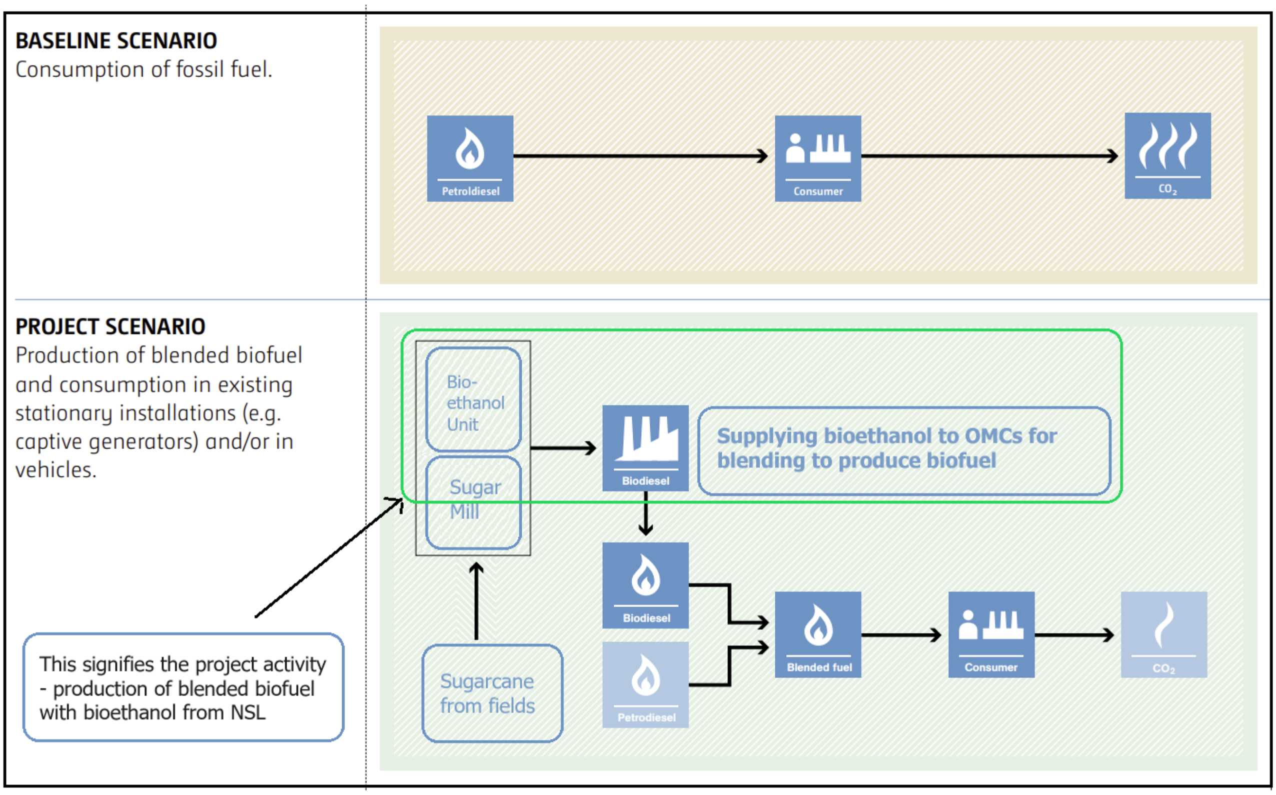
The proposed project activity uses bagasse as fuel for cogeneration unit. The bagasse is a renewable biomass fuel, thus does not add any carbon dioxide to the atmosphere because of the carbon recycling during the growth of sugar cane. Therefore, the project activity will lead to xero CO2 on-site emissions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

The crushing season of 310 days is considered for the project activity. 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.

Scope 2:

The baseline for the scope 2 (i.e. bioethanol for the purpose of blended fuel) is fossil fuel.
The Production of fossil fuels leads to emissions, which would occur in the absence of project activity. These emissions are considered in the leakage section, as the production of the fossil fuels is not included in the project boundary. Similarly, emissions associated with the production of methanol used for esterification, or chemicals used for pre-treatment and/or hydrolysis of lignocellulosic biomass are excluded from the project boundary but are accounted for as leakage.

Thus, the baseline and project scenario for Scope 2 is shown below as per methodological guidance:



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 or a request for registration by another 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.

This is applicable for both the Scopes.
The Koppa 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 >>

For Scope 1: Bagasse based co-generation power unit.

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.

For Scope 2: Bioethanol production unit for the purpose of blending biofuel

SECTORAL SCOPE	: 01, 05, 07 and 15
TYPE	: Renewable energy Displacement of more-GHG-intensive fossil fuel for combustion in vehicles and/or stationary installations
CATEGORY	: ACM0017- Large-scale Consolidated Methodology Production of biofuel, Version 04.0.

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

Standardized Baseline **:** Not applicable.

The Methodological applicability :
The methodological applicability has been demonstrated below:

For Scope 1: Bagasse based co-generation power unit.
This methodology 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
a. 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.

For Scope 2: Bioethanol production plant for the purpose of blended biofuel.

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

Applicability Criteria & Project Conditions are demonstrated below:

1. This methodology comprises project activities involving production of biofuel that is used as fuel in existing stationary installations (e.g. diesel generators) and/or in vehicles. The methodology is applicable to project activities that reduce emissions through the production of blended biofuels to be used in existing stationary installations and/or in vehicles. The biofuel is produced from one or a combination of the following feedstock:
   - a. Waste oil/fat;
   - b. Seeds or crops that are cultivated in dedicated plantations;
   - c. Biomass residues (e.g. agricultural residues, wood residues, organic wastes).

> Applicable.
> The project activity is specific to the bioethanol production for the purpose of blended biofuel production and supply to be used in vehicles and/or in existing stationary installations. Also, the blended biofuel is produced from sugar fermentation process where syrup and molasses by-product of the sugar manufacturing process. Thus, it can be considered under the category both (b) and (c), i.e. crops cultivated in dedicated plantations and biomass residue.

2. The biofuels and blended biofuels comply with national regulations and with suitable international standards.

> Yes, the bioethanol is supplied to OMCs for blending as per national standard (currently and the blended fuel 12-13% & as per central government order to be achieved 25% blending by year of 2025.

3. The project activity involves the construction and operation of a biofuel production plant.

> Not applicable.
> The project activity includes only the bioethanol plant with the purpose of supply to biofuel blending by OMCs.

4. Any by-product (e.g. glycerol) is not disposed of or left to decay. It should be either incinerated or used as raw material for industrial consumption or sold

> The project activity has only the following by-products, viz. Carbon Dioxide, Spent-wash, Bio-compost, where spent-wash is properly incinerated, and CO_2 is used in industrial consumption and also the bio-compost is used for soil application. This can be checked from the process flow chart.

5. If biomass or biofuel is used at the project plant(s) (processing, production or blending plant) as fuel (e.g. for heat or electricity generation), then at least 95% of the biomass or biofuels used in these plants should be either biomass residues from the dedicated plantations established under the project activity or biofuel generated in the project plant. The amount of biofuel used should not be included in the quantity of biofuel for which emission reductions are claimed;

> The biofuel which is blended is with bioethanol supplied by NSL from the fermentation process from the Sugar unit. Thus, the raw materials are the sugarcane which are dedicated plantation, and the syrup & amp; raw materials are the residues.

6. The (blended) biofuel is used by consumers within the host country in existing stationary installations (e.g. captive generators) and/or in vehicles;

> Yes, the bioethanol is supplied to OMCs in India for preparing blended biofuel, which are consumed within the host country of India.

7. In case of vehicles, the target consumer group (e.g. captive fleet of vehicles, gas stations, bulk consumers) and distribution system of the biofuel shall be identified and described in the CDM-PDD;

> Yes, the distribution is considered as the entire customers of the OMCs to whom NSL supplies the bioethanol for preparing blended biofuel.

8. If the (blended) biofuels are consumed in stationary facilities, the consumer and the producer of the (blended) biofuel are bound by a contract that allows the producer to monitor the consumption of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption;

> Currently not applicable.
> However, NSL will provide No-Double accounting declaration during the verification process.

9. If the (blended) biofuels are sold to an identified consumer group within the host party, the buyer and the producer of the (blended) biofuel are bound by a contract that allows the producer to monitor the sale of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption;

> Currently no applicable.
> The PP produces bioethanol and supplies to the OMCs, whereas PP does not have control on the consumer behaviour.

10. If the biofuel is blended but neither used in stationary facilities nor sold to an identified consumer group, the blender and the producer of the biofuel are bound by a contract that allows the producer to monitor the blending of biofuel to ensure that blending proportions and amounts are monitored and meet all regulatory requirements, and that states that no CERs resulting from its consumption will be claimed;

> Currently in the host country there are standard norms related to blending. Hence, the project by default meets the regulatory requirements. Also, since the end beneficiary or consumers are the vehicle operators and currently there is no carbon project registered from India with this methodology with consumers as carbon credit owner, hence this is not applicable.

11. In any case where the host party exports beyond the national boundary (blended) biofuels of the same type(s) as the biofuel(s) produced in the project plant, the consumption of the produced (blended) biofuel shall be monitored in order to ensure that no double counting occurs. The consumer and the producer of the (blended) biofuel shall be bound by a contract that allows the producer to monitor the consumption of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption;

Not applicable as there is no export involved.

12. In case of stationary installations, biofuels with any blending fraction between 0 and 100% can be used. In case of vehicles, the blending proportion must be appropriate to ensure that the technical performance characteristics of the blended biofuels do not differ significantly from those of fossil fuels;

Biofuel blending is considered as per prescribed national standard only and there is no expected variation on the technical performance.

13. For biodiesel, the condition in 6.d.vii above is assumed to be met if the blending proportion is up to 20 per cent by volume (B20).2 If the project participants use a blending proportion of more than 20 per cent, they shall demonstrate in the CDM-PDD that the technical performance characteristics of the blended biodiesel do not differ significantly from those of petro-diesel and comply with all local regulations;

The current blending proportion in India is less than 20 per cent.

14. Only biofuel consumed in excess of mandatory regulations is eligible for the purpose of the project activity.

The mandatory blending is not there.
In 2009, the National Policy on Biofuels was launched in India that proposed a non-mandatory target of 20% blending for both biodiesel and bioethanol by 2017.

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

The project activity does not incur any double accounting of emission reductions. Following details can be referred to for both the scopes.

The Scope-1 of this entire project activity was registered with Clean Development Mechanism (CDM) with Project ID 0865 and initial verifications were conducted under CDM till 31 March 2007, followed by an incomplete submission of monitoring period till 31 March 2010. However, there was no further verification conducted under CDM or under any other mechanism, whereas UCR registration is being considered with crediting period only from 01 Jan 2013. Thus, there is no double accounting of emission reductions.

Additionally, the Scope-2 of this project activity (i.e. bioethanol plant) is not a part of any other GHG mechanism and has never been applied under any such mechanisms. Hence, there will not be any double counting of emission reductions.

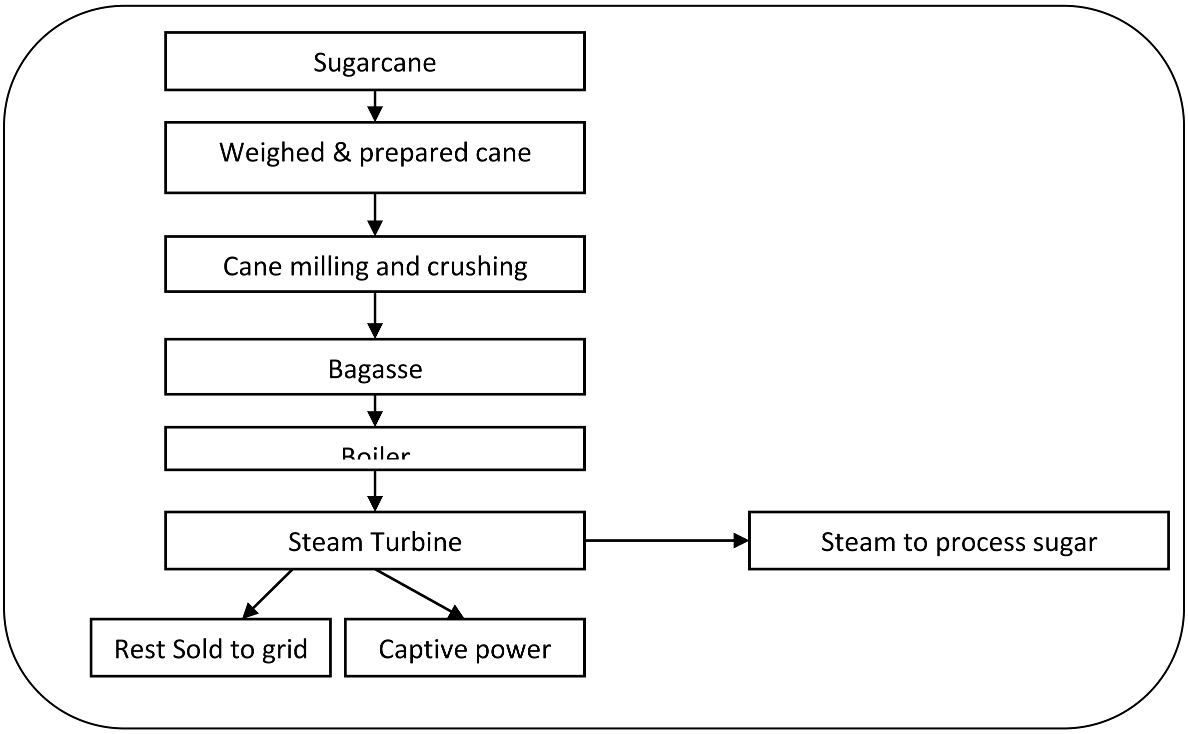
Also, as on the date of crediting period assigned under this document, the project activities are not part of any ongoing or upcoming domestic program or schemes.

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

For Scope-1: Biomass co-gen unit

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.



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

BASELINE ACTIVITY:

I. GHG emissions from fossil fuel in Grid baseline power generation

CO_2 : Yes, it's the major source of emission.
CH_4 : No, excluded for simplification.
N_2O : No, excluded for simplification. This is conservative.

II. 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:

I. On-site 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 emission source is assumed to be very small.
N_2O : No, excluded for simplification. This emission source is assumed to be very small.

II. 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.

III. 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.
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.

IV. Wastewater from the treatment of biomass

CO_2 : No.

As per methodology, it is assumed that CO2 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 facility and methane is not capture or utilized, hence not included.

N_2O : No, Excluded for simplification. This emission source is assumed to be very small.

V. 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.

For Scope-2: Bioethanol production plant for the purpose of blended biofuel

As per methodology para 16, it is prescribed that the production of fossil fuels leads to emissions, which would occur in the absence of project activity. These emissions are considered in the leakage section, as the production of the fossil fuels is not included in the project boundary. Similarly, emissions associated with the production of methanol used for esterification, or chemicals used for pre-treatment and/or hydrolysis of lignocellulosic biomass are excluded from the project boundary, but are accounted for as leakage.

Also, the methodology prescribes the spatial extent of the project boundary as inclusive of:

(a) where applicable, transportation of:

- (i) Raw materials (e.g. seeds and/or biomass residues) to the project plant(s);
- (ii) Feedstock (e.g. vegetable oil and/or waste oil/fats) to the biofuel production plant; and
- (iii) The biofuels to the site where it is blended with fossil fuels or used in stationary installations;

(b) the biofuel production plant at the project site, comprising the processing unit(s) (e.g. esterification, fermentation, hydrolysis) plus other installations on the site (e.g. storage, refining, blending, etc.)

However, this project activity is limited to the production of Bioethanol which will be finally blended with fossil fuel by the OMCs; hence the blending and further distribution and consumption by end users or their consumption behaviour/pattern etc. are not controlled by NSL. Therefore, a overall project boundary is simplified with inclusions and exclusions of GHG sources in a relevant manner.

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

BASELINE ACTIVITY:

I. Vehicles and stationary combustion installations consuming fossil fuels

CO_2	**: Yes, it's the main source of emission.**
CH_4	: No, excluded for simplification.
N_2O	: No, excluded for simplification. This is conservative.

PROJECT ACTIVITY:

I. On-site fossil fuel consumption

CO_2	: No. No fossil fuel/electricity is consumed at the project site due to the project activity.
CH_4	: No, excluded for simplification. This is conservative.
N_2O	: No, excluded for simplification. This is conservative.

II. Combustion of fossil fuel derived methanol in the biodiesel ester

CO_2 : No. Not Applicable
CH_4 : No. Not Applicable
N_2O : No. Not Applicable

III. Transportation of feedstock

CO_2 : No.
Not included under the project boundary.
CH_4 : Not included.
N_2O : Not included.

IV. Transportation of biofuel to blending facility

CO_2 : No.
Not included under the project boundary.
CH_4 : Not included.
N_2O : Not included.

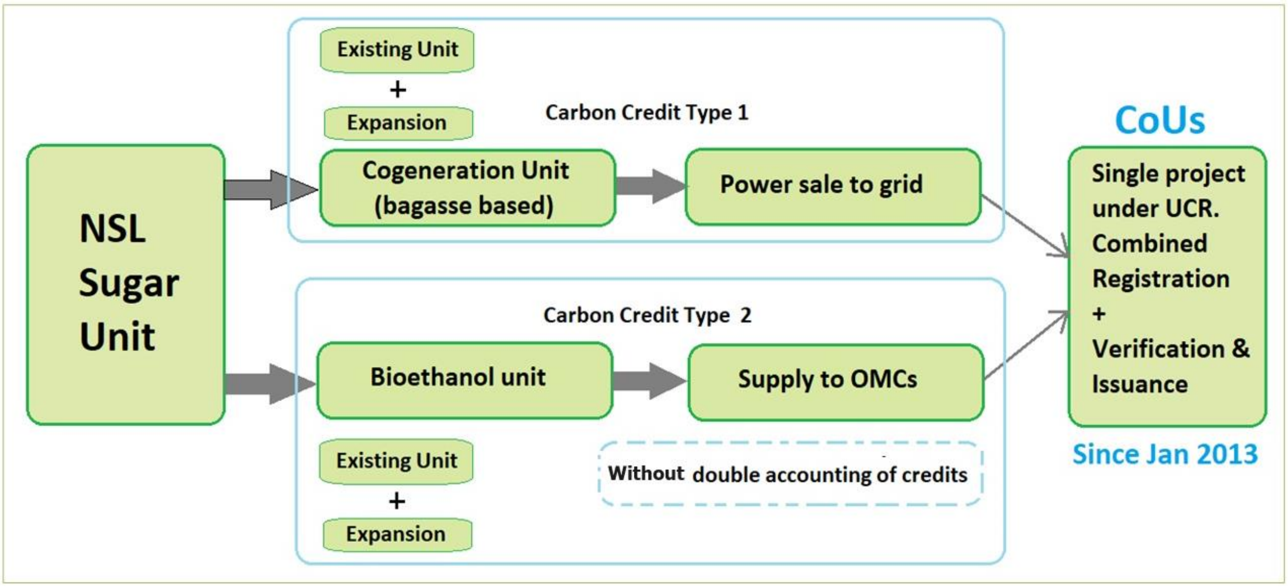
V. Anaerobic wastewater treatment in feedstock production.

CO_2 : No.
CH_4 : Not included.
There is a proper waste-water treatment facility and methane is not captured or utilized, hence not included.
N_2O : Not included.

VI. Cultivation of biomass in a dedicated plantation.

CO_2 : No applicable.
CH_4 : No applicable.
N_2O : No applicable.

A representative diagram of the overall project activity is given below:



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

A. For Scope-1: Biomass co-gen unit:

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:

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

BEy = Baseline emissions in year y (t CO_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 (t CO_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 (t CO_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 (t CO2/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 (i.e. Scope 1 defined under this project), 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 **$EG_{BL,GR,y}$** 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:

$EL_{BL,net,exp} = EL_{co\text{-}gen,project} - EL_{cap,n}$ **……………………………………….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 CO2emission factor (tCO2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO2/MWh for the 2014-2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Also, for the vintage 2021-22, the combined margin emission factor calculated from CEA database in India results into higher emission than the default value. Hence, the same emission factor has been considered to calculate the emission reduction under conservative approach.

Thus, **$EF_{EG,GR,y}$ = 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:

$PE_{CBR,y}$ = 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.

$PE_{BG2,y}$ = 0.

The project activity does not include biogas.

$PE_{FF,y}$ = 0.

The project activity does not include any fossil fuel.

$PE_{GR2,y}$ = 0.

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

$PE_{GR1,y}$ = 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:

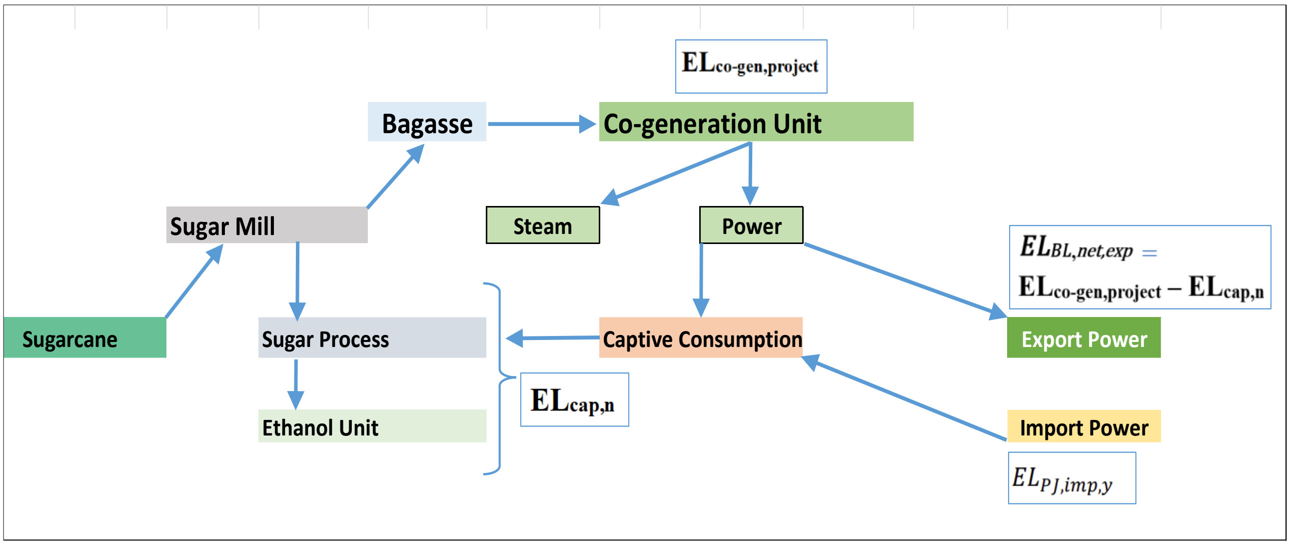
$PE_{GR1,y}$	=	Emissions during the year *y* due to grid electricity imports to the project site (t CO_2)
$EL_{PJ,imp,y}$	=	Project electricity imports from the grid in year *y* (MWh)
$EF_{EG,GR,y}$	=	Grid emission factor in year *y* (t CO_2/MWh)

……………………………………….**Final Eq 4**

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

LE_y = 0.

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



B. For Scope-2: Bioethanol unit

As per para 17 of the applied methodology, following points are prescribed:

Procedure for the selection of the baseline scenario:
The baseline scenario shall be separately identified among all realistic and credible alternative(s) for the following elements:

(a) Production of fuels (P): what would have happened at the production level in the absence of the CDM project activity?
(b) Consumption (C): which fuel would have been consumed in the absence of the CDM project activity?
(c) Material (M): what would have happened to the material used as input for production of biofuel in the absence of the CDM project activity?

Additionally, it has been prescribed that if the biofuel is produced from seeds or crops from plants cultivated in dedicated plantations, the following element should be taken into account:
(a) Land used for plantations (L): what would be the land use in the absence of the CDM project activity?

Consideration for the project activity:

Here, for the current project activity the bioethanol is produced for the purpose of supplying to the OMCs for production of blended biofuel and then same will be used for consumption as fuel mainly in transportation sector which directly replaces existing fossil fuels used for transportation. Also, the bioethanol is produced from the sugar mill in the fermentation process hence there is no direct use of any dedicated plantation or seeds; whereas sugarcane is a dedicated plantation for the sugar mill only, hence can't be considered as that for the bioethanol process. Thus, land use practice or effects are not applicable under this project activity scope.

Thus, based on the realistic and credible alternatives of the given elements, the following baseline scenario has been established for this project activity under this scope.

- **Continuation of fossil fuel consumption (as there is no mandatory regulations for blended fuel) from the perspective of Consumption (C) element, as per para 22 (a) of the applied methodology.**

- **Whereas, at the Production level (P) the realistic and credible alternative includes, inter alia: "Continuation of current practices with no investment in biofuel production capacity", however Project Proponent is currently not blending the biofuel or distributing the blended biofuel to the consumer; whereas they are the producer of bioethanol which is the main element of blending in the fuel. Hence from the production prospective no specific scenario is identified.**

- **However, from the Material use (M) prospective the para 28(b) of the applied methodology can be referred which states "Use for material production of substances other than fuel". This is because, sugarcane molasses is primarily used for sweetening and flavouring foods in many places as an alternative or replacement for sucrose. Also, there are other commercial utilization of these raw materials other than going for ethanol production.**

Baseline Emission Calculations:

As per para 38 of the applied methodology, the baseline emissions from displaced fossil fuel are determined as follows:

$$BE_y = BF_y \times NCV_{BF,y} \times EF_{CO2,FF} \qquad \text{Equation (1)}$$

With

$$BF_y = \left[min\left\{ \left(P_{BF,y} - P_{BF,on-site,y}\right); \left(\sum_i f_{PJ,i,y} \times C_{BF,i,y}\right)\right\} - P_{BF,other,y}\right] \qquad \text{Equation (2)}$$

$$\times \left[\frac{\sum_i C_{BF,i,y} \times \left(\frac{f_{PJ,i,y} - f_{reg,y}}{f_{PJ,i,y}}\right)}{\sum_i C_{BF,i,y}} \right]$$

Where:

BE_y	= Baseline emissions during the year y (tCO2)
BF_y	= Quantity of biofuel eligible for crediting in year y (t)
$NCV_{BF,y}$	= Net calorific value of biofuel produced in year y (GJ/t)
$EF_{CO2,FF}$	= Carbon dioxide emissions factor for displaced fossil fuel (tCO2/GJ)
$P_{BF,y}$	= Quantity of biofuel produced in the project plant in year y (t)
$P_{BF,on-site,y}$	= Quantity of biofuel consumed at the project plant(s) (biofuel production and/or feedstock processing) in year y (t)
$P_{BF,other,y}$	= Quantity of biofuel that is either produced with alcohols other than methanol from fossil origin or produced using feedstock or waste oil(s)/fat(s) other than those eligible under this methodology according to the applicability conditions in year y (t)
$C_{BF,i,y}$	= Quantity of biofuel type i consumed/sold/blended in year y (t)
$f_{PJ,i,y}$	= Fraction of biofuel in the blended biofuel type i in year y (ratio)
$f_{reg,y}$	= Fraction of biofuel in the blended biofuel which is required by mandatory regulations of the host country in year y (ratio)
i	= Blended biofuel type (e.g. B5, B10, B20, B50 etc.)

As per para 39 and 40 of the applied Methodology, it has been prescribed that Project participants shall determine $C_{BF,i,y}$ as follows:

- **(a)** For (blended) biofuels that are consumed in stationary installations, $C_{BF,i,y}$ shall be based on the monitored amount of biofuels consumed;
- **(b)** For (blended) biofuels that are sold to an identified consumer group, $C_{BF,i,y}$, shall be based on the monitored amount of (blended) biofuel sold;
- **(c)** For biofuels that are blended but neither used in stationary facilities nor sold to an identified consumer group, $\boldsymbol{C_{BF,i,y}}$ shall be based on the amount of biofuel blended at the blending facility(ies).

Deviation considered w.r.t. the current project activity scope:

As already described in previous sections, the bioethanol produced by NSL is specifically for blending with fuel by OMCs. However, NSL does not control, manage, monitor or record the usability/consumption or the consumer behaviour or the end use of the blended biofuel. Thus, it is the case of "no identified consumer group" for the biofuel as mentioned under #(c) above. However, NSL is producing and supplying bioethanol to OMCs for the purpose of blending and hence it can be considered that the amount of bioethanol supplied for blending purpose can achieve the maximum % of blending done by the OMCs in their fuel.

In this regard, above equations and their parameters are redefined for the purpose of this project activity scope as follows:

$P_{BF,y}$	= Quantity of biofuel produced in the project plant in year y (t) = Quantity of bioethanol blended fuel w.r.t the current project activity in a year y (t) = The quantity of final biofuel that can be produced as blended biofuel with the help of bioethanol supplied by NSL (Say "$Q_{bioeth,y}$"), considering an avg. % of blending achieved (say $f_{PJ,i,y}$) in the year (y)
$P_{BF,on-site,y}$	= Quantity of biofuel consumed at the project plant(s) (biofuel production and/or feedstock processing) in year y (t) = considered as zero for the current project activity as PP is limited to the bioethanol production only and there is no consumption of bioethanol at production level; also the quantity of bioethanol supplied for blending is going to be the final quantity used for this project
$P_{BF,other,y}$	= Quantity of biofuel that is either produced with alcohols other than methanol from fossil origin or produced using feedstock or waste oil(s)/fat(s) other than those eligible under this methodology according to the applicability conditions in year y (t) = Not applicable or Nil, as PP is limited to the bioethanol production only which will be directly sent for blending
$C_{BF,i,y}$	= Quantity of biofuel type i consumed/sold/blended in year y (t) = $P_{BF,y}$ as explained above.
$f_{PJ,i,y}$	= Fraction of biofuel in the blended biofuel type i in year y (ratio) = the % of blending based on which the above parameter $P_{BF,y}$ is estimated.
$f_{reg,y}$	= Fraction of biofuel in the blended biofuel which is required by mandatory regulations of the host country in year y (ratio) = Currently zero for the current project activity period.

Thus, the above equation 2 reduces to or can be redefined as below:

$$\boxed{BF_y = min\left[\left(P_{BF,y} - P_{BF,on-site,y} - P_{BF,other,y}\right), \left(f_{PJ,y} \times f_{FF,y} \times C_{BF,y} - P_{BF,other,y}\right)\right]}$$

(this equation has been also referred under the small scale methodology AMS.III.AK)

And considering the above project specific considerations, the final equation has been further simplified for application under this project activity and shall be applied as follows:

$$BF_y = \left[min\ (P_{BF,y}); \left(\sum_i f_{PJ,i,y} \times C_{BF,i,y} \right) \right] \times \left[\frac{\sum_i C_{BF,i,y} \times \left(\frac{f_{PJ,i,y} - f_{reg,y}}{f_{PJ,i,y}} \right)}{\sum_i C_{BF,i,y}} \right]$$

Since, $f_{reg,y} = 0$, hence the equation further reduces to

$$= \left[min\ (P_{BF,y}); \left(\sum_i f_{PJ,i,y} \times C_{BF,i,y} \right) \right]$$

As prescribed under the previous section, the parameters $P_{BF,y}$ and $C_{BF,i,y}$ both are considered to be equal, this is because PP here is NSL and the quantity of bioethanol supplied for the purpose of blending will be finally the quantity of blended biofuel contributed by the project activity. Hence, for PP the parameter $P_{BF,y} = C_{BF,i,y}$; therefore this quantity is calculated using the new parameter into the equation as "$Q_{bioeth,y}$" and the avg. % of blending achieved ($f_{PJ,i,y}$) in the year (y). Therefore, the final equation has been simplified as:

$$BE_y = BF_y \times NCV_{BF,y} \times EF_{CO2,FF}$$

With

$$BF_y = \left[\left(Q_{bioeth,y} / f_{PJ,i,y} \right) \times f_{FF,y} \right]$$

....**Final Eq 5**

Here,

$Q_{bioeth,y}$ = The quantity of final bioethanol produced & supplied by NSL under this project activity that can be blended with fuel to produce the final quantity of blended biofuel as referred under the primary equation of the methodology.

$f_{PJ,i,y}$ = Fraction of biofuel in the blended biofuel type i in year y (ratio)
= the % of blending based on which the above parameter $P_{BF,y}$ is estimated.

Thus, the total blended biofuel considered under the project activity will be resulted from this section of the above methodology:

$$\left(Q_{bioeth,y} / f_{PJ,i,y} \right)$$

$f_{FF,y}$ = Blending fraction of fuel used for blending. Use 1.0 if pure fossil fuel is used for blending otherwise use the fraction of fossil fuel in the fuel used for blending (blending rate shall be established volume by volume)

$NCV_{BF,y}$ = Net calorific value of biofuel produced in year y (GJ/t)
$EF_{CO2,FF}$ = Carbon dioxide emissions factor for displaced fossil fuel (tCO2/GJ)

Project & Leakage Emissions:
The project emission consideration can be referred from the para 41 of the applied methodology:

$$PE_y = PE_{Biomass,y} + AF_{1,y} \times PE_{MeOH,y}$$

Here, as per the description of the para 42 and 43 of the methodology, it can be considered that the project emissions for the aforementioned parameters are not applicable.

Hence **PEy = 0.**

The leakage emission consideration has been referred from the para 48, as follows:

$$LE_y = LE_{MeOH,y} + LE_{BR,y} - LE_{FF,y}$$

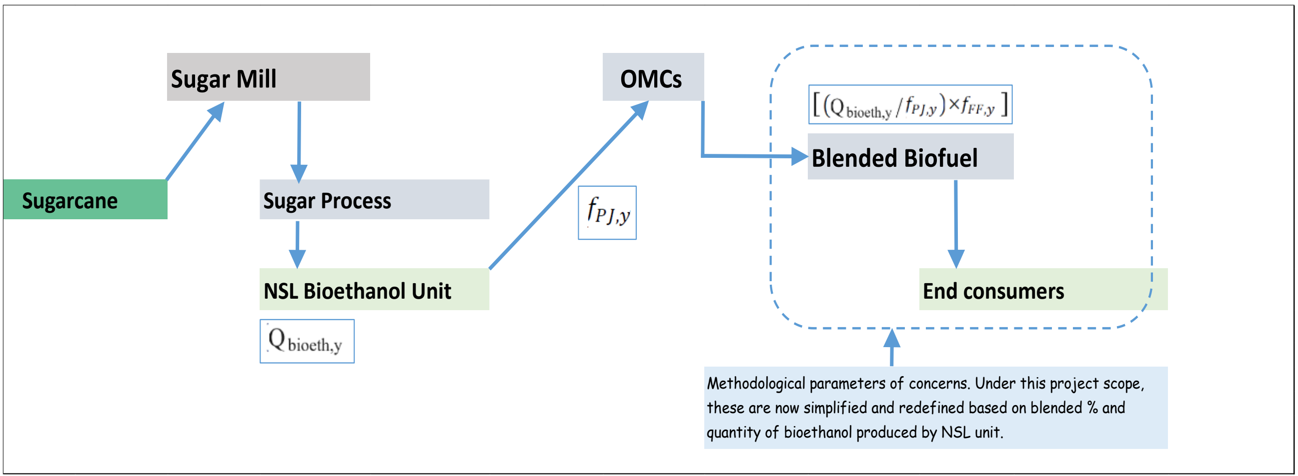
Where:

LE_y	=	Leakage emissions in year *y* (tCO_2)
$LE_{MeOH,y}$	=	Leakage emissions associated with production of methanol used in biodiesel production in year *y* (tCO_2)
$LE_{BR,y}$	=	Leakage emissions from displacement of existing uses of waste oil/fat or biomass residues in year *y* (tCO_2)
$LE_{FF,y}$	=	Leakage related to the avoided production of fossil fuel in year *y* (tCO_2)

Here, PP refers to the para 47 to 58 of the applied methodology and as per these prescriptions, the leakage emissions specific to this project activity scope can be consider as zero.

Hence, LEy = 0.

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



C. Ex-ante estimated emission reductions for reporting purposes:

(a) For Scope-1: Biomass co-gen unit:

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 the Scope-1 of the project activity has been performed, the result is as follows:

$EL_{BL,GR,y}$ = $EL_{BL,net,exp}$
= $EL_{co\text{-}gen,project} - EL_{cap,n}$ = 1,36,656 MWh – 44,000 MWh **= 92,656 MWh**[1]

Hence, BE_y = $EL_{BL,GR,y} \times EF_{EG,GR,y}$ = 92,656 MWh x 0.9 tCO_2e/MWh **= 83,390 tCO_2e**

PE_y = $EF_{EG,GR,y} \times EL_{PJ,imp,y}$ = 1,385 MWh X 0.9 tCO_2e/MWh = **1,247 tCO_2e**

Thus, net annual CoUs (ex-ante estimate) = 83,390 – 1,247 tCO_2e = 82,143 tCO_2e

(b) For Scope-2: Bioethanol production for blended biofuel:

$Q_{bioeth,y}$ (calculated annual quantity of bioethanol)	16262.31[2]	tons/year
$NCV_{BD,y}$ (net calorific value of blended biofuel)	42.65	GJ/ton
$EF_{CO2,PD}$ (emission factor of the avoided fuel)	0.0741	tCO2/GJ
$f_{PJ,y}$ (fraction to calculate adjusted value of blended biofuel)	13%	Fraction
$f_{FF,y}$ (fraction upto which current blending is considered)	15%	Fraction
BE_y	**51,397**	**tCO2/yr**

Thus, net annual CoUs (ex-ante estimate) to be considered = 51,397 tCO_2e

[1] For the purpose of ex-ante estimate, historic values are evaluated and then an fair estimation was done using a PLF of 60% for co-gen unit and corresponding captive demand for the entire plant. Actual values will be considered during verification process and final CoUs shall be calculated.

[2] This ex-ante value has been derived from the rated capacity of the plant, i.e. 60 KLPD bioethanol which is converted to annual volume in tons using 300 days of operation, density of 0.000783 tons/litre.

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. However, the scope 1 of the project has a carbon history, can be reviewed as follows:

The Scope-1 of this entire project activity (i.e. bagasse based co-generation unit) was registered with Clean Development Mechanism (CDM) of UNFCCC with the Project ID 0865 and initial verifications were conducted under CDM only till 31 March 2007, followed by an incomplete submission of monitoring period till 31 March 2010. However, there was no further verification conducted under CDM or under any other mechanism; whereas UCR registration is being considered with crediting period only from 01 January 2013. Additionally, the Scope-2 of this project activity (i.e. bioethanol plant) is not a part of any other GHG mechanism and has never been applied under any such mechanisms.

However, the plan is operational since the date of its commencement which signifies that the GHG contributions are continuous. Additionally, NSL keeps different good practices within the project boundary to achieve all possible sustainability.

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 January 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 January 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.

B.9. Monitoring period number and duration>>

Monitoring period	: First Monitoring period
Period	: 10 years, 00 months.
Start date	: 01 January 2013
End date	: 31 December 2022

B.10. Monitoring plan>>

For Scope-1 (bagasse based co-generation):

The key monitoring parameter for scope-1 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. Hence, the same 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
Additional Comment	The combined margin emission factor as per CEA database (current version 16, Year 2021) results into higher emission factor. Hence for 2021 vintage UCR default emission factor remains conservative.

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. Thus, the overall calculation is simplified as well as the most conservative, defined as follows: $EL_{BL,net,exp} = \mathbf{EL_{co\text{-}gen,project} - EL_{cap,n}}$ Where: $EL_{co\text{-}gen,\ project}$ = 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 $EL_{BL,net,exp}$.
Measurement Frequency:	Monthly records
Value applied:	92,656[3] (This is an annualized average value considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	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.
Purpose of data:	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.

[3] For the purpose of ex-ante estimate, historic values are evaluated and a fair estimation was done using a PLF of 60% for co-gen unit and corresponding captive demand for the entire plant. Actual values will be considered during verification process and final CoUs shall be calculated.

Data / Parameter	$EL_{co-gen,project}$
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
Measurement Frequency:	Monthly records
Value applied:	136,656 (This is an annualized average value considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	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.
Purpose of data:	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.

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
Measurement Frequency:	Monthly records
Value applied:	44,000 (This is an annualized average value considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	Calibration of the 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.
Purpose of data:	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.

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.

For Scope-2 (bioethanol production unit):

The key monitoring parameter for scope-2 project activity is mainly dependent on the total amount of bioethanol produced and supplied to the OMCs for blending. Therefore, production data and the monitoring of supplied data, information related to blending etc. are the key required monitoring parameters to enable us quantifying the COUs for this particular scope.

Also, while monitoring follows key aspects will be the guiding factors:

Data type	: monitored and recorded data
Recording process	: on-site recording using energy meters
Monitoring tools	: meters and/or SCADA or equivalent monitoring tools/systems.
Archive	: to be recorded and archived in excel formats.
QA/QC process	: the meters/devices used for monitoring are calibrated on regular interval or as and when required. For reference, "at least once in 5 years" shall be referred.
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	$EF_{CO2,FF}$
Data unit	tCO_2/GJ
Description	Carbon dioxide emissions factor for displaced fossil fuel
Source of data	Default value is derived from 2006 IPCC Guidelines
Value applied	0.0741
Measurement methods and procedures	Not applicable, as this choice is a default value
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For the calculation of baseline emission
Additional Comment	NA

Data / Parameter	$NCV_{BF,y}$
Data unit	GJ/t
Description	Net calorific value of biofuel produced in year y
Source of data	Default value can be considered, alternatively laboratory analysis can be done to derive the value
Value applied	42.65
Measurement methods and procedures	Not applicable as default value is considered.
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For the calculation of baseline emission
Additional Comment	NA

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

Data / Parameter	$\boldsymbol{BF_y}$
Data unit	Tons
Description	Quantity of biofuel eligible for crediting in year y (t)
Source of data	NSL records
Measurement procedures (if any):	Here, $$BF_y = \left[\left(\mathrm{Q_{bioeth,y}} / f_{PJ,i,y}\right) \times f_{FF,y}\right]$$ Here, $Q_{bioeth,y}$= The quantity of final bioethanol produced & supplied by NSL under this project activity that can be blended with fuel to produce the final quantity of blended biofuel as referred under the primary equation of the methodology. $f_{PJ,i,y}$ = Fraction of biofuel in the blended biofuel type i in year y (ratio) = the % of blending based on which the quantity of final biofuel that can be produced as blended biofuel with the help of bioethanol supplied by NSL $f_{FF,y}$ = Blending fraction of fuel used for blending.
Measurement Frequency:	Continuous monitoring and monthly records
Value applied:	16,262.31 (This is an annualized average value considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	Monitoring devices will be carried out as per manufacturer's specification; otherwise at least once in five years as per National Standards (as per the provision of CEA, India) and faulty meters (if any) will be duly replaced immediately as per the provision of electricity authority. The meter details shall be provided and QA/QC requirements shall be addressed during monitoring & verification process.
Purpose of data:	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.

Data / Parameter	$\boldsymbol{Q_{bioeth,y}}$
Data unit	Tons
Description	The quantity of final bioethanol produced & supplied by NSL under this project activity that can be blended with fuel to produce the final quantity of blended biofuel as referred under the primary equation of the methodology.
Source of data	NSL records
Measurement procedures (if any):	Here, $\mathrm{Q_{bioeth,y}}$ is the direct measurement at NSL bioethanol plant. However, in case of bioethanol is recorded in Liters or m3, then the same will be converted to Tons using density of the ethanol, which is defined as a default value = 0.000783 tons/Litre.

Measurement Frequency:	Continuous monitoring and monthly records
Value applied:	14,094 (This is an annualized average value considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	Direct measurement at plant
Purpose of data:	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.

Data / Parameter	$f_{PJ,i,y}$
Data unit	Fraction
Description	Fraction of biofuel in the blended biofuel type i in year y (ratio), which is equal to the % of blending based on which the quantity of final biofuel that can be produced as blended biofuel with the help of bioethanol supplied by NSL
Source of data	NSL records or from the information received from OMCs and/or the final blenders
Measurement procedures (if any):	Direct measurement
Measurement Frequency:	-
Value applied:	13% (This is an annualized average value considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	Not applicable
Purpose of data:	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.

Data / Parameter	$f_{FF,y}$
Data unit	Fraction
Description	Fraction upto which current blending is considered
Source of data	NSL records or from the information received from OMCs and/or the final blenders
Measurement procedures (if any):	Direct measurement
Measurement Frequency:	-
Value applied:	15% (This is an annualized average value considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	Not applicable
Purpose of data:	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.

Additional Parameters	Only for reporting purposes (not mandatory)

1) The type of and total quantity of feedstock/raw materials used for biofuel production at NSL Plant.

2) Total amount of ethanol produced and supplied by NSL.

3) The receiving amount of blended biofuel in the fuel station or final distributor, recorded by a calibrated metering system and the storage fill level is recorded by a calibrated filling level indicator.

4) To source and report blended fraction of the biofuel.

- During the process of creating the biofuel blend at the blending station, the blending operation be monitored to assure adequate mixing of the products in the specified proportions. This includes measuring and recording the volumes and blend levels as verified through bills of lading, meter printouts or other auditable records of both the biofuel and fossil fuel, which comprise the blended biofuel.

- This mass balance shall be based on a combination of purchase/sales records and records of measurements, in accordance with the measuring instruments available at the plant and stationary consumers or fuelling stations of the captive fleet owner in case of use in transport sector. The mass balance serves as a QA/QC instrument to crosscheck results of monitoring parameters as defined in the following section.

5) Various parameters; Compliance of biofuel with national regulations:

- Compliance of produced biofuel with national regulation, biofuel properties.
- It can be done via various methods of measurement and uncertainty analysis.
- The same will be considered according to national or international standards.