



Monitoring Report

CARBON OFFSET UNIT (CoU) PROJECT



Title: Carbon Credit Generation Project by NSL Sugars Ltd. at Ramakrishnapur, Telangana, India

Version: 2.0,

Date: 17/05/2025

First CoU Issuance Period: 12 years

Date: 01/01/2013 to 31/12/2024 (inclusive of both dates)





Monitoring Report (MR) CARBON OFFSET UNIT (CoU) PROJECT

Monitoring Report	
Title of the project activity	Carbon Credit Generation Project by NSL Sugars Ltd. at Ramakrishnapur, Telangana, India
UCR Project Registration Number	469
Version	2.0
Completion date of the MR	17/05/2025
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 01 Duration of this monitoring Period: (first and last days included (01/01/2013 to 31/12/2024)
Project participants	NSL Sugars Ltd.
Host Party	India
Applied methodologies and standardized baselines	CDM Methodologies: 1) ACM0006: Electricity and heat generation from biomass, version 16.0 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 GHG emission reductions for this monitoring period in the registered PCN	2013: 85,040 CoUs (85,040 tCO ₂ eq)
	2014: 141,620 CoUs (141,620 tCO ₂ eq)
	2015: 129,113 CoUs (129,113 tCO ₂ eq)
	2016: 68,030 CoUs (68,030 tCO ₂ eq)
	2017: 9,826 CoUs (9,826 tCO ₂ eq)
	2018: 6,397 CoUs (6,397 tCO ₂ eq)
	2019: 9,700 CoUs (9,700 tCO ₂ eq)
	2020: 0 CoUs (0 tCO ₂ eq)
	2021: 3,962 CoUs (3,962 tCO ₂ eq)
	2022: 25,555 CoUs (25,555 tCO ₂ eq)
	2023: 31,594 CoUs (31,594 tCO ₂ eq)
	2024: 0 CoUs (0 tCO ₂ eq)
Total:	510,837 CoUs (510,837 tCO₂eq)

SECTION A. Description of project activity

A.1. Purpose and general description of project activity >>

a) Purpose of the project activity and the measures taken for GHG emission reductions >>

NSL Sugars Limited (NSL), is one of the most efficient sugar companies in south India and a sugar arm of 'NSL' group. NSL Group entered the 'sugar' business being related to agro-commercial crop business. NSL Krishnaveni sugars ltd is a green field sugar plant established in 2011 with a capacity of 3500 TCD along with 28.2 MW cogen plant. Both Sugar & Cogen Plant operations are commenced in February 2011. The Project is owned by M/s NSL KRISHNAVENI SUGARS LTD (also hereinafter referred to as NSL KSL) and hereby to be called as Project Proponent.

NSL Sugars plant has been working with the state of art equipment's for sugar to achieve 3500 MT/day crushing and 28.2 MW bagasse based co-gen power plant since commissioning in 01/02/2011.

This is a GHG Project registered under UCR with Project ID 469. This registered project activity is a combination of two scopes included under the KSL unit of NSL Sugars Ltd. which is located in Ramakrishnapur Village, Kothakota Mandal in the district of Mahbubnagar in Telangana state.

The main scopes are:

Scope 1: Generation of carbon credits due to an existing 28.2 MW bagasse-based co-generation unit at Ramakrishnapur sugar mill.

Scope 2: Generation of carbon credits due to production and applicability of bioethanol produced in the 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. This has been registered.

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 Indian Grid.

As per design specification, the unit has an existing co-generation unit with installed capacity of 28.2 MW turbine, out of which 2% of gross electricity generated is assumed to be imported electricity. During the off season the plant generates 25.5 MW of power with 2.7 MW of captive consumption load and during the season the plant generates 16 MW of power with 5.5 MW of captive consumption load. PLF for the plant during off season is 90.43% and during the season it is 73.56% and the plant is operational since commissioning on 01/02/2011.

The major equipment of the project activity comprises 110 Tons Per Hour (TPH) capacity steam generator with the outlet steam parameters of 110 atm and 540°C, 28.2 MW BHEL make double extraction cum condensing Turbine.

Plant operates for 365 days per annum approximately, which includes 150 days of crushing season, and 215 days of 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, hemicellulose 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 plant is the output of series process that goes through Fermentation, Distillation and Molecular Sieve Dehydration (MSDH) process.

The project activity was commissioned on **01/11/2012** 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	: 120 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.

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

b) Brief description of the installed technology and equipment>>

The Co-generation & Bioethanol are given below:

Activity Type 1:

The Co-generation Unit:

The project activity involves 1 x 110 TPH boiler with high pressure and temperature configuration (110 kg/m² and 540 °C), 1 x 18 MW back pressure and 1 x 28.2 MW 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
Boiler working pressure	110 atm.
Boiler Number	AP/5273
Steam capacity	110TPH
Steam Temperature	540 °C ± 5 °C
Steam Pressure	110Kg/sq.mm
Boiler Make	THE KCP Limited
Type	Single Drum, Water Tube Type

Steam Turbine Specification	Values
Make	BHEL
Type of machine	Double extraction cum condensing Turbine Generator (EHNK-40/60 – 3)
Speed	5650 RPM

Generator	Values
Make	BHEL
Volts	11000 kV
Amps	1850 A
Frequency	50 Hz
RPM	1500

Activity Type 2:

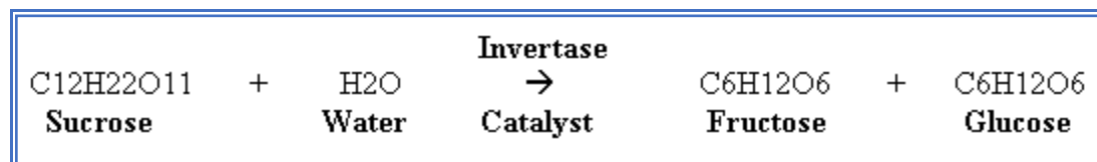
The Bioethanol Unit:

Capacity : 120 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:

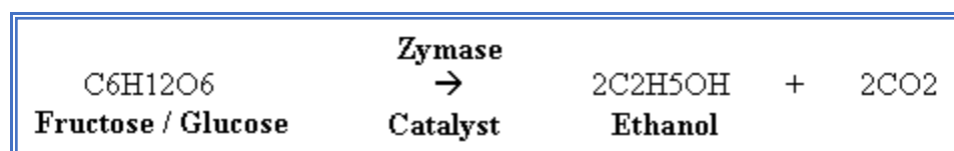
The hydrolysis process breaks down the cellulosic part of the biomass or corn into sugar solutions that can then be fermented into ethanol. Yeast is added to the solution, which is then heated. The yeast contains an enzyme called invertase, which acts as a catalyst and helps to convert the sucrose sugars into glucose and fructose (both $C_6H_{12}O_6$).

The chemical reaction is shown below:



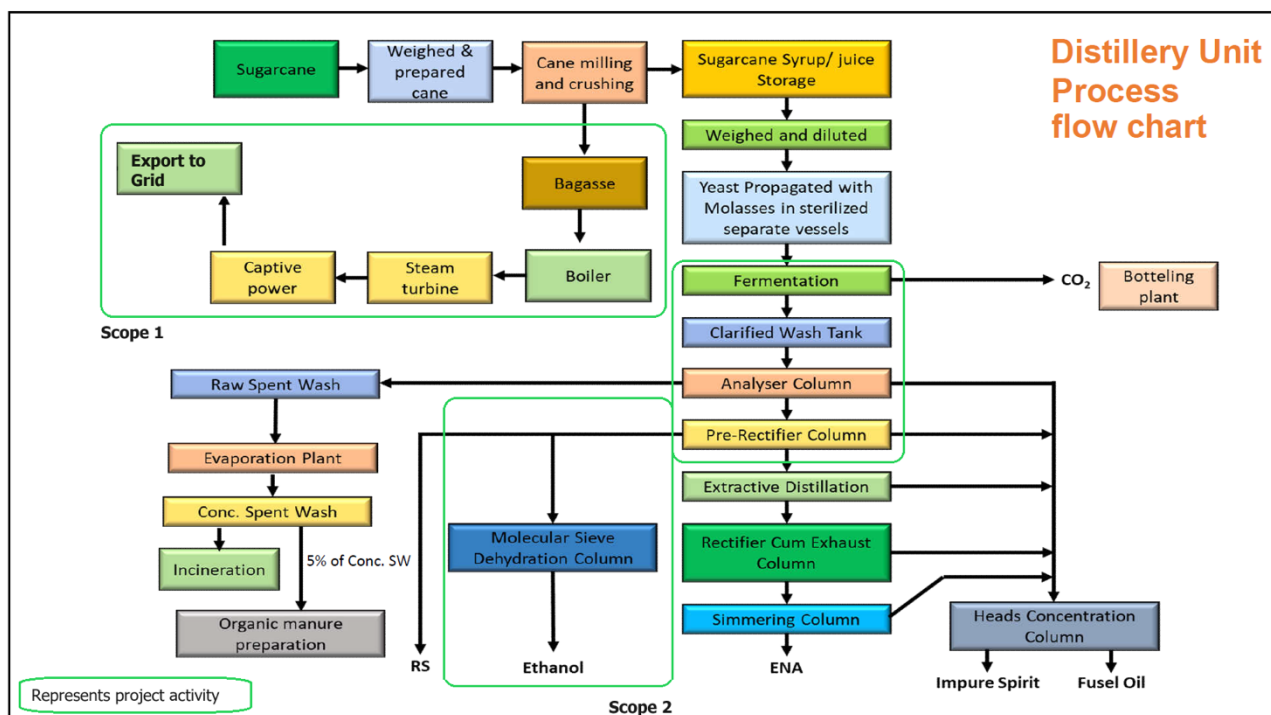
The fructose and glucose sugars then react with another enzyme called zymase, which is also contained in the yeast to produce ethanol and carbon dioxide.

The chemical reaction is shown below:



The fermentation process takes around three days to complete and is carried out at a temperature of between 25°C and 30°C.

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



c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)>>

UCR Project ID or Date of Authorization	: 469
Start Date of Crediting Period	: 01/01/2013
Project Commissioning dates	: 01/02/2011 & 01/11/2012
Current Monitoring Period	: 01/01/2013 to 31/12/2024

d) Total GHG emission reductions achieved or net anthropogenic GHG removals by sinks achieved in this monitoring period>>

The total GHG emission reductions achieved in this monitoring period is as follows:

Summary of the CoUs Generated for the Monitoring Period (Scope 1)

Start date of this Monitoring Period	01/01/2013
Carbon credits claimed up to	31/12/2024
Total BEy generated (tCO _{2eq})	567,771.86 tCO _{2eq}
Project Emissions (tCO _{2eq})	2,338.74 tCO _{2eq}
Leakage	0
Net ER (tCO _{2e})	565,434 tCO _{2eq}
Adjustment factor of 10% as per UCR guidance for PE	10% of 565,434 tCO _{2eq} (but applied vintage wise)
Hence, final net adjusted CoUs	508,889 tCO_{2eq}

Summary of the CoUs Generated for the Monitoring Period (Scope 2)

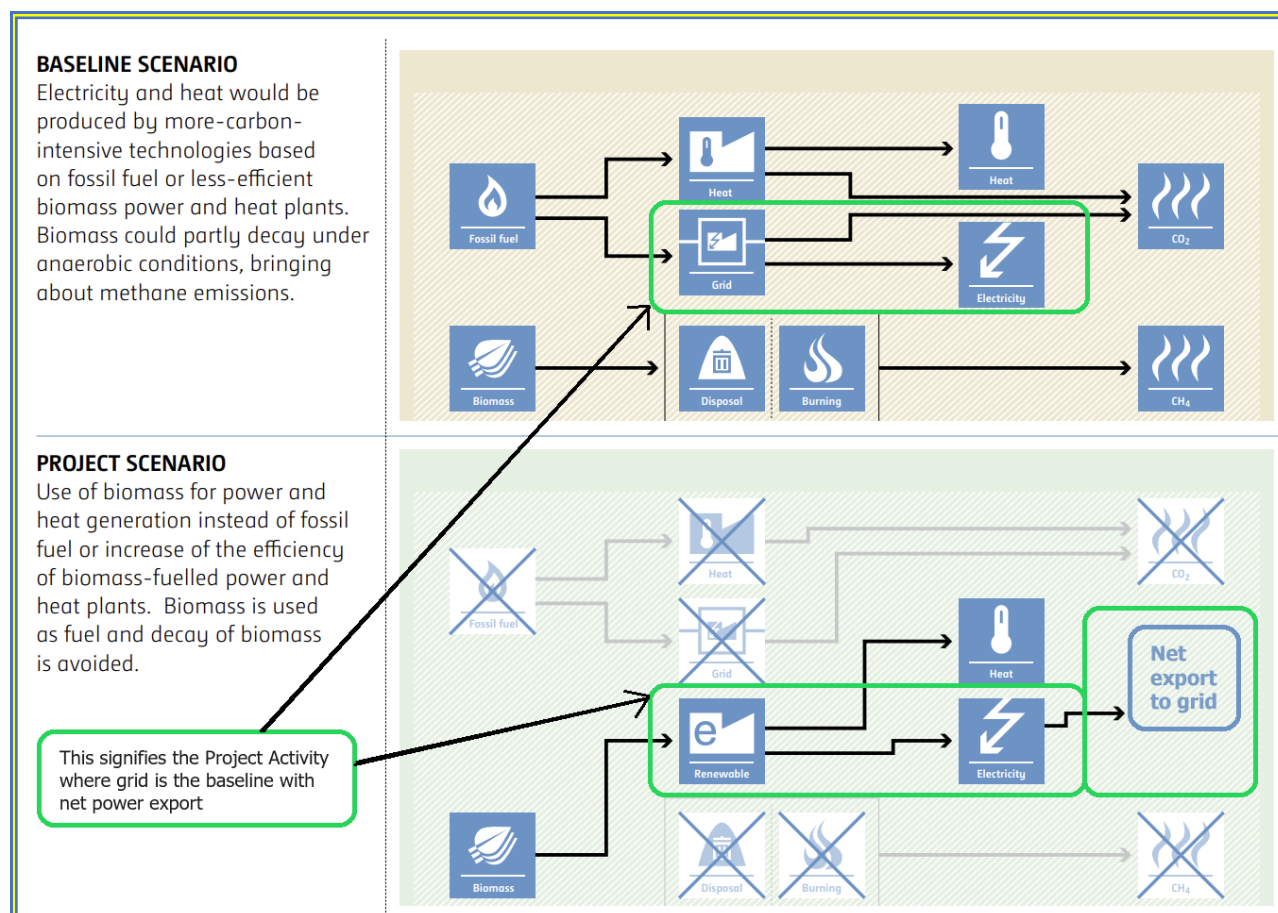
Start date of this Monitoring Period	01/01/2013
Carbon credits claimed up to	31/12/2024
Total BEy generated (tCO _{2eq})	2,170.06 tCO _{2eq}
Leakage Emission	0
Project Emission or adjustments	0
Adjustment factor of 10% as per UCR guidance for PE	10% of 2170.06 tCO _{2eq} (but applied vintage wise)
Hence, final net adjusted CoUs	1,948 tCO_{2eq}

Total Net CoUs Claimed for both scopes are 510,837 tCO_{2eq}

e) Baseline Scenario>>

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 zero CO₂ on-site emissions associated with bagasse combustion.

On an average the plant involves 365 days in a year including the 150 days of crushing season and 215 days off season days which is considered for the project activity¹. 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.

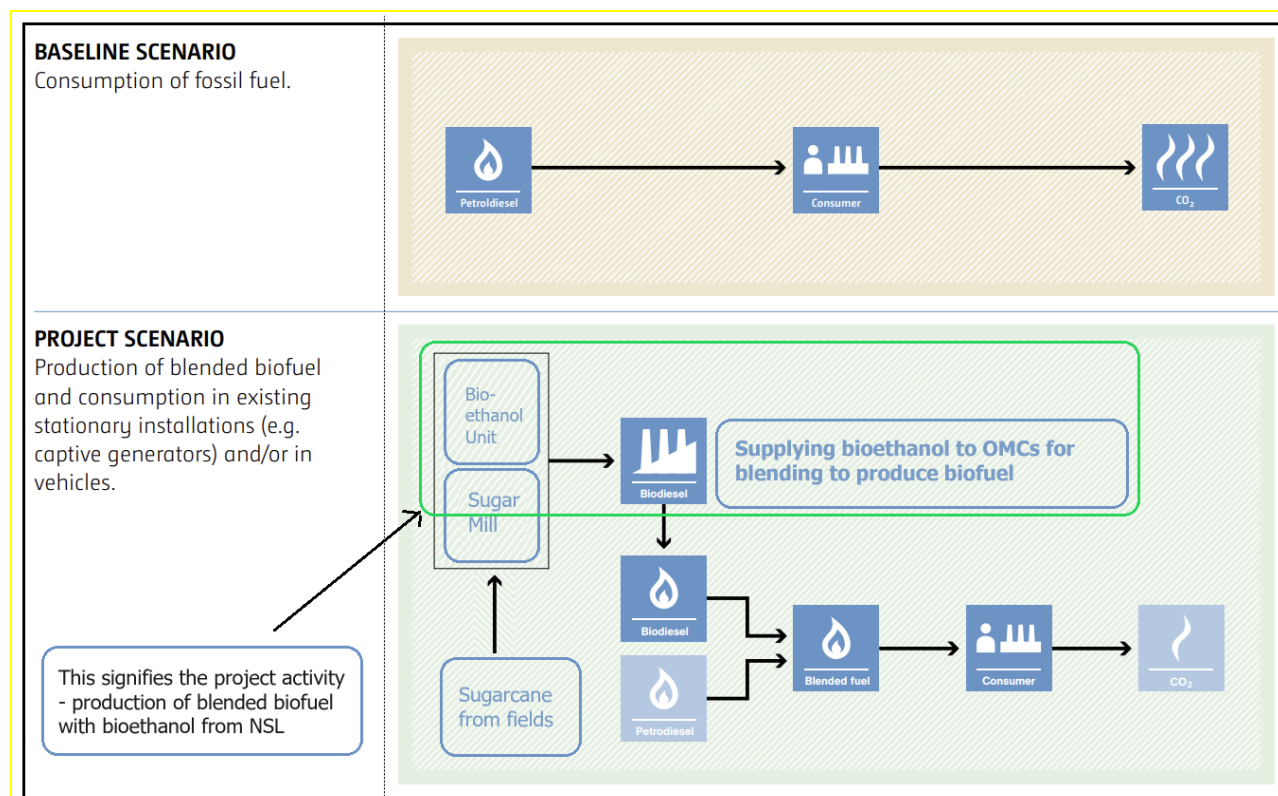
Scope 2:

The baseline for the scope 2 (i.e. bioethanol for the purpose of blended fuel) is fossil fuel.

¹ Actual generation days will be monitored for each monitoring period to calculate the gross electricity generation from the project activity.

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.

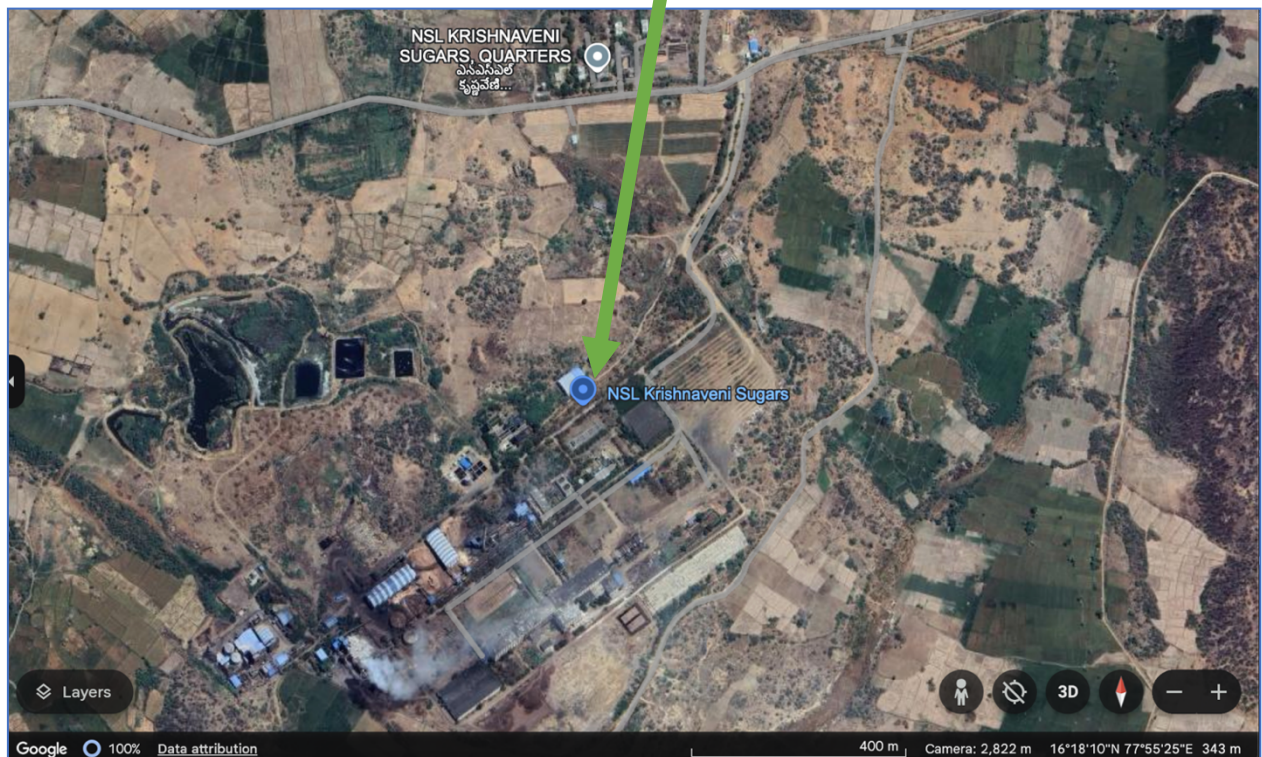
Thus, the baseline and project scenario for Scope 2 is shown below as per methodological guidance:



A.2. Location of project activity>>>

Project has been implemented at Ramakrishnapur village, District– Mahbubnagar, Telangana, India. It is located at latitude of 16°18'10" N and longitude of 77°55'07" E.

Country : India
 District : Mahbubnagar
 Village : Ramakrishnapur
 Tehsil : Kothakota
 State : Telangana
 Pin Code : 509381
 Latitude : 16°18'10" N
 Longitude : 77°55'07" E



Maps Showing the exact project location

A.3. Parties and project participants >>

Party (Host)	Participants
India	Project Owner: M/s NSL Sugars Limited Address: Ramakrishnapur, Kothakota Taluka, Mahbubnagar District, Telangana - 509381, India.

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

A.4. 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.

Applicability of methodologies and standardized baselines >>

The scale of the activity is under the project Type-I and the project activity remained under the limit of 26 MW every year during the crediting period. Therefore, the GHG emission reductions that are claimed remains within the limit of its type as per the applied methodologies.

A.5. Crediting period of project activity >>

Length of the crediting period corresponding to this monitoring period: 12 years.
Date: 01/01/2013 to 31/12/2024 (inclusive of both dates).

A.6. Contact information of responsible persons/entities >>

Entity	Details
NSL Sugars Ltd.	Project Proponent (Project Owner): M/s NSL Sugars Limited, Address: Ramakrishnapur, Kothakota Taluka, Mahbubnagar District, Telangana - 509381, India.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity >>

a) Provide information on the implementation status of the project activity during this monitoring period in accordance with UCR PCN>>

(Technical information given in **Section – A.1.(b)**)

b) For the description of the installed technology(ies), technical process and equipment, include diagrams, where appropriate>>

(Technical information given in **Section – A.1.(b)**)

B.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.
- Employees living in campus are provided with various facilities such as Primary School, School bus, Dispensary with Medical officer, Male nurse, Ambulance etc
- It has created a steady income and improved skills in the jobs for the workers at the facility.
- The project activity is also contributing to the national energy security by reducing the consumption of fossil fuels.
- The technology used in the project is proven and safe for power generation.
- The technological advancement and will help in capacity building.

Environmental benefits:

- The project has a renewable energy component that uses bagasse as a fuel for power generation and heat. It is a voluntary process and not mandated by any environmental laws of India. As the power generation and heat requirement is done by use of renewable biomass, project activity positively contributes to reduction in use of finite natural resources like coal, gas and oil which would have otherwise been used for equivalent power production. Therefore, this project activity helps in creating environment sustainability by reduction of GHG emission in the atmosphere.
- 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 sulphur 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.

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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:

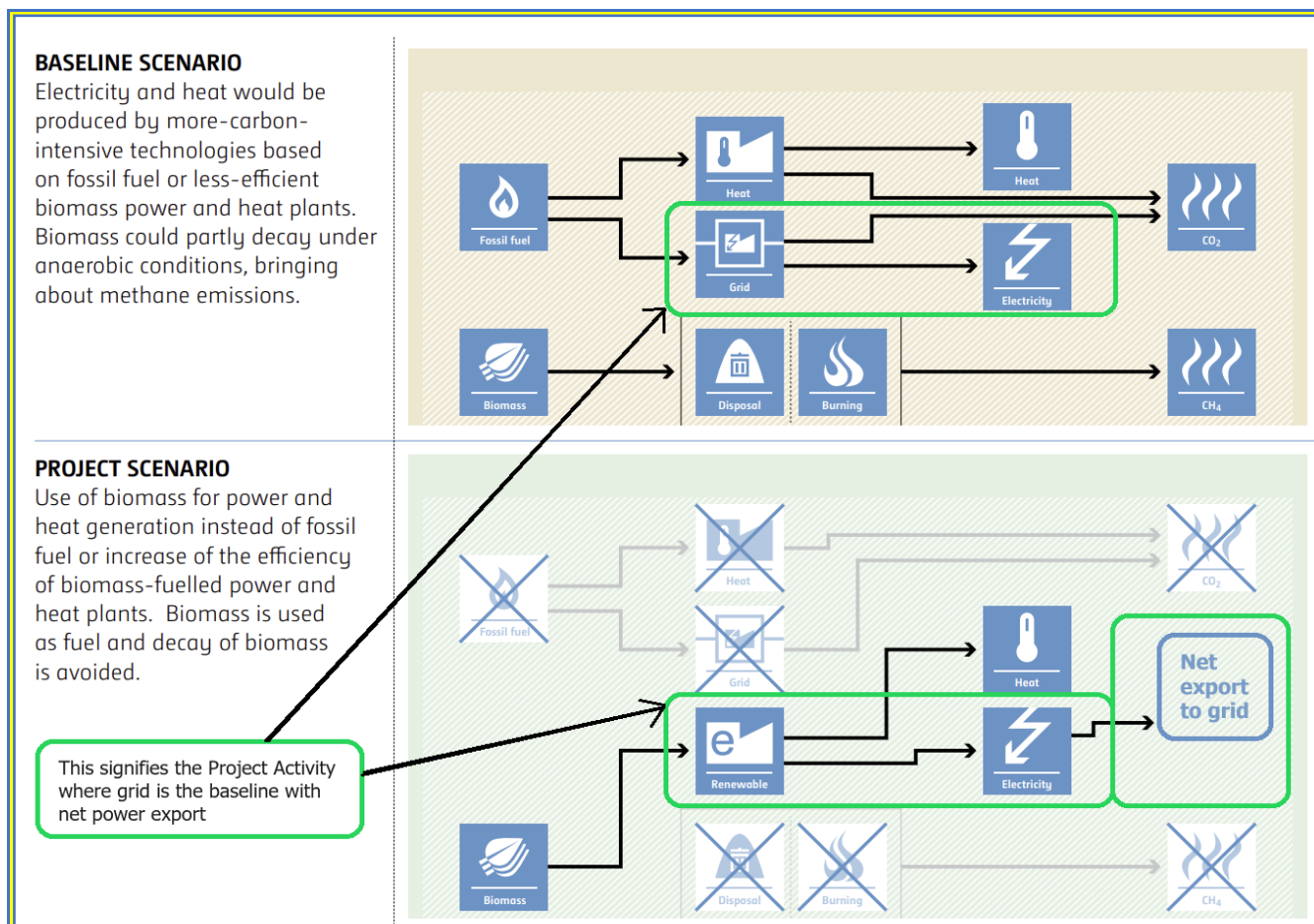
- **Reduced Greenhouse Gas Emissions:** One of the most significant benefits of bioethanol is its potential to reduce greenhouse gas emissions compared to fossil fuels. Bioethanol is considered a "carbon-neutral" fuel because the carbon dioxide released during its combustion is roughly equivalent to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

B.3. 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 zero CO₂ on-site emissions associated with bagasse combustion.

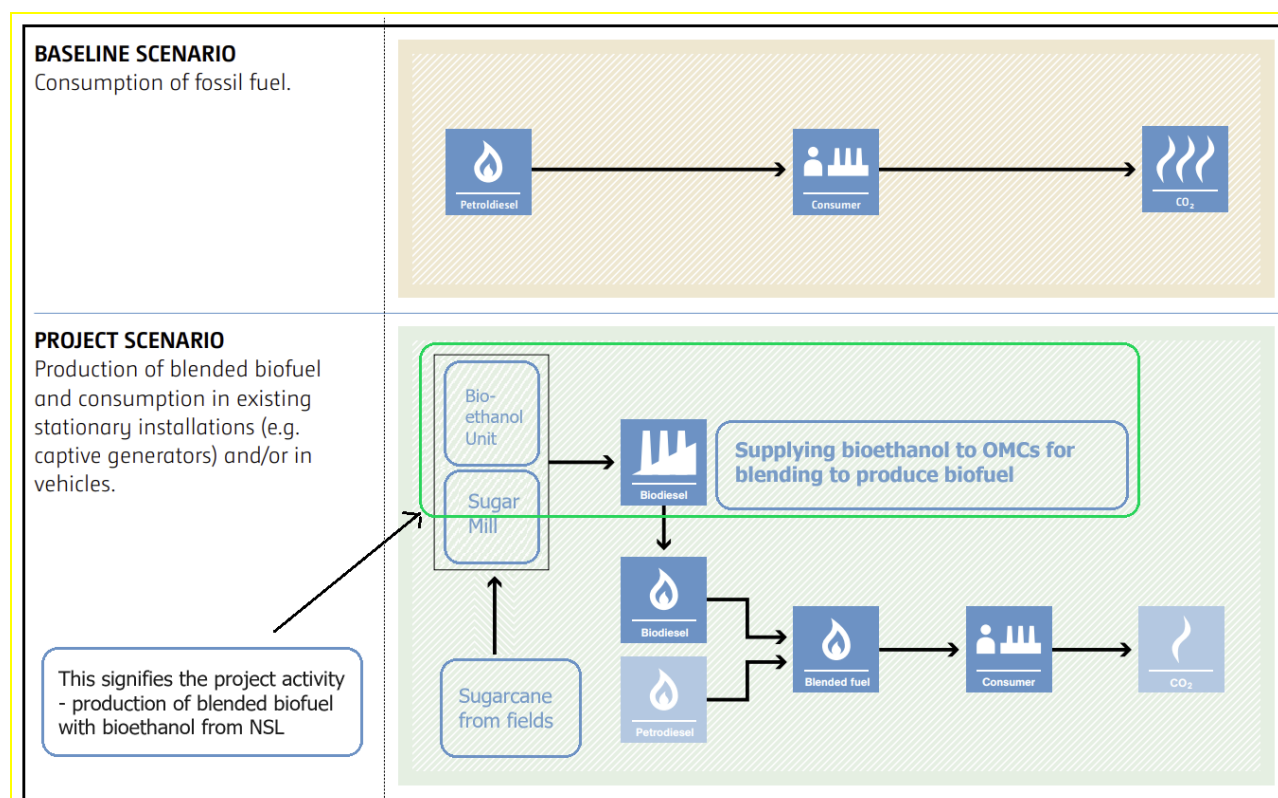
The crushing season of 310 days is considered for the project activity. Without the project activity, the required amount of electricity would have been supplied to the grid by the fossil fuel dominated grid mix and which would have led to continuous CO₂ emissions. With the use of biomass fuel, there 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:



Thus, this project activity (both the scopes) has been a voluntary investment which replaced equivalent amount of electricity and thermal energy from renewable source, the bagasse-based co-gen unit and also replaced fossil fuel to bioethanol blending in commercial fuel.

Though the sugar industry has scope of such investments, the project proponent was not bound to incur this investment on the scopes that led to carbon revenue. This is because it was not mandatory by national and sectoral policies to produce extra power for grid supply and also production of bioethanol and selling to OMCs is also not mandatory. Thus, the continued operation of the project activity would continue to replace grid power and significant component of fossil fuel in locomotive sector and enable fight the impacts of climate change. The Project Proponent hopes that carbon revenues from 2013-2024 accumulated as a result of carbon credits generated will help repay the loans and other related operational expenses and in the continued maintenance of this project activity.

B.4. 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 Ramakrishnapur Unit is a stand-alone plant with no other adjacent facilities nearby.

SECTION C. Application of methodologies and standardized baselines

C.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.

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

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

3. If biogas is used for power and heat generation, the biogas must be generated by anaerobic digestion of wastewater, and:
 - a. If the wastewater generation source is registered as a CDM project activity, the details of the wastewater project shall be included in the PDD, and emission reductions from biogas energy generation are claimed using this methodology;
 - b. If the wastewater source is not a CDM project, the amount of biogas does not exceed 50% of the total fuel fired on energy basis.

There is no production of biogas and hence this criterion is not applicable.

4. In the case biomass from dedicated plantations is used, the “TOOL16: Project and leakage emissions from biomass” shall apply to determine the relevant project and leakage emissions from cultivation of biomass and from the utilization of biomass residues.

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

5. The methodology is only applicable if the baseline scenario, as identified per the “Selection of the baseline scenario and demonstration of additionality” section hereunder, is:
 - a. For power generation: scenarios P2 to P7, or a combination of any of those scenarios; and
 - b. For heat generation: scenarios H2 to H7, or a combination of any of those scenarios;
 - c. If some of the heat generated by the CDM project activity is converted to mechanical power through steam turbines, for mechanical power generation: scenarios M2 to M5:

- i. In cases M2 and M3, if the steam turbine(s) are used for mechanical power in the project, the turbine(s) used in the baseline shall be at least as efficient as the steam turbine(s) used for mechanical power in the project;
 - ii. In cases M4 and M5, steam turbine(s) generating mechanical power to be used for the same purpose as in the baseline are not allowed;
- d. For the use of biomass residues: scenarios B1 to B5, or a combination of any of those scenarios;
- e. For the use of biogas: scenarios BG1 to BG3, or a combination of any of those scenarios.

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

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

This methodology ACM0017 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 CO₂ 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 & 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.

NSL has provided 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 not 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 percent 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 percent.

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.

C.3 Applicability of double counting emission reductions >>

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

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

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.

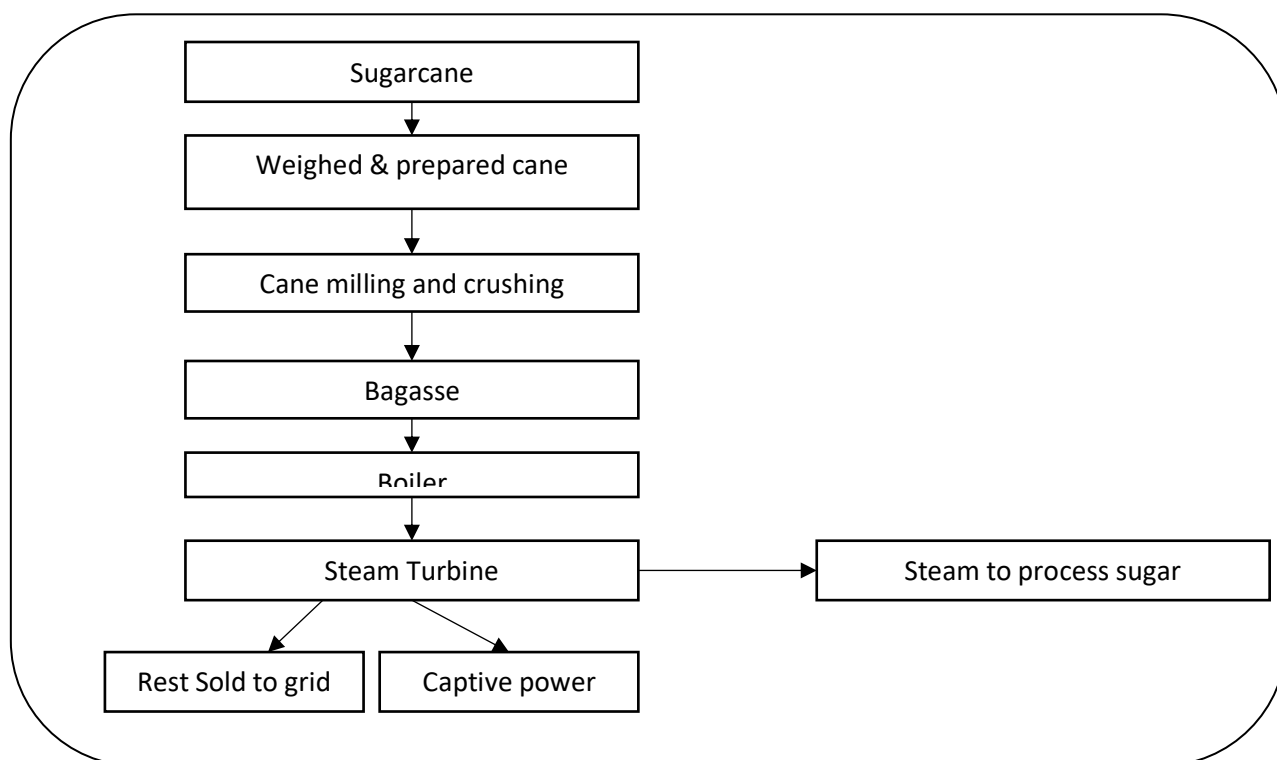
Also, as on the date of crediting period assigned under this document, the project activities are not part of any ongoing or upcoming domestic program or schemes and a Declaration for No-double accounting is also submitted by PP.

C.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:

EXAMPLE	Source	GHG	Included?	Justification/Explanation
Baseline Activity	Emissions from fossil fuel in Grid baseline power generation	CO ₂	Yes	It is the major source of emission
		CH ₄	No	Excluded for simplification. This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
	Emissions from uncontrolled burning or decay of biomass residue	CO ₂	No	Excluded for simplification. This is conservative
		CH ₄	No	Excluded for simplification. This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
Project Activity	Emissions from onsite fossil fuel consumption	CO ₂	Yes	There is no fossil fuel, however electricity is consumed at the project site due to the project activity. Hence, import grid electricity is considered for project emissions.
		CH ₄	No	Excluded for simplification.

				This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
	Emissions from off-site transportation of biomass	CO ₂	No	Though it is an important emission source, but the input biomass is bagasse which is available within the sugar mill, hence off-site transportation is not applicable.
		CH ₄	No	Excluded for simplification. This emission source is assumed to be very small.
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from combustion of biomass for electricity and heat	CO ₂	No	It is assumed that CO ₂ emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH ₄	No	This emission is not included as CH ₄ emissions from uncontrolled burning or decay of biomass residue in the baseline scenario is not included.
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from wastewater from the treatment of biomass	CO ₂	No	As per methodology, it is assumed that CO ₂ emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH ₄	No	As per methodology, this emission source shall be included in cases where the waste-water is treated (partly) under anaerobic conditions. However, there is a proper waste-water treatment facility and methane is not captured or utilized, hence not included.
		N ₂ O	No	Excluded for simplification.

				This emission source is assumed to be very small. in cases biomass from dedicated plantation is used. Hence, excluded
	Emission from Cultivation of land to produce biomass feedstock	CO ₂	No	As per methodology, this emission source shall be included in cases biomass from dedicated plantation is used. However, as already demonstrated under the methodology eligibility section, though the origin of feedstock is sugarcane which is a dedicated plantation however the input biomass feedstock in the co-generation unit is only bagasse, which is a waste biomass comes under 'renewable biomass' category
		CH ₄	No	As per methodology, this emission source shall be included in cases biomass from dedicated plantation is used. Hence, excluded
		N ₂ O	No	As per methodology, this emission source shall be included in cases biomass from dedicated plantation is used. Hence, excluded

I. Other adjustments as may be applied

10% adjustment : For large-scale project activities, apply a net-to-gross adjustment of 10%, i.e. multiply the emission reductions determined based on the applied methodology by 0.9 to determine the final amount of emission reductions that can be claimed per vintage.

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:

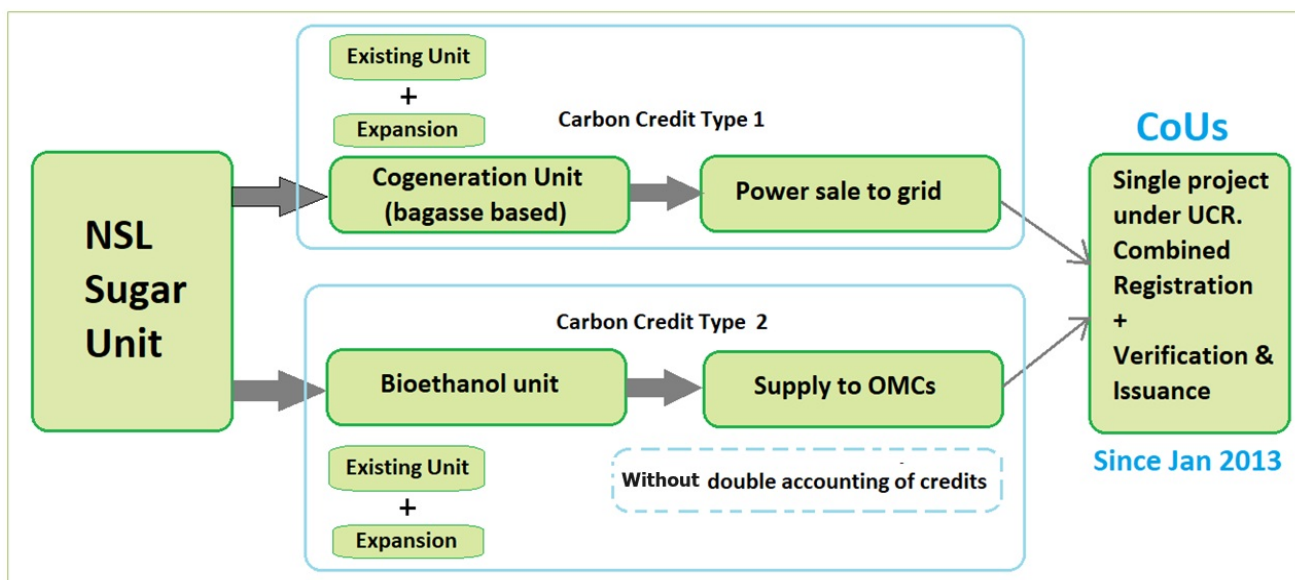
- (a) where applicable, transportation of:
 - (i) Raw materials (e.g. seeds and/or biomass residues) to the project plant(s);
 - (ii) Feedstock (e.g. vegetable oil and/or waste oil/fats) to the biofuel production plant; and
 - (iii) The biofuels to the site where it is blended with fossil fuels or used 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, overall project boundary is simplified with inclusions and exclusions of GHG sources in a relevant manner.

The inclusion and exclusion of GHG Source from Scope-2 of the project boundary is demonstrated below:

EXAMPLE	Source	GHG	Included?	Justification/Explanation
Baseline Activity	Emissions from Vehicles and stationary combustion installations consuming fossil fuels	CO ₂	Yes	It is the major source of emission
		CH ₄	No	Excluded for simplification. This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
Project Activity	Emissions from onsite fossil fuel consumption	CO ₂	Yes	There is 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 ₂ O	No	Excluded for simplification.

				This is conservative
	Emissions from Combustion of fossil fuel derived methanol in the biodiesel ester	CO ₂	No	Not Applicable
		CH ₄	No	Not Applicable
		N ₂ O	No	Not Applicable
	Emissions from Transportation of feedstock	CO ₂	No	Not included under the project boundary
		CH ₄	No	Not included
		N ₂ O	No	Not included
	Emissions from Transportation of biofuel to blending facility	CO ₂	No	Not included under the project boundary
		CH ₄	No	Not included
		N ₂ O	No	Not included
	Emission from Anaerobic wastewater treatment feedstock production in	CO ₂	No	Not included
		CH ₄	No	There is a proper waste-water treatment facility and methane is not captured or utilized, hence not included
		N ₂ O	No	Not included
	Emission from Cultivation of biomass in a dedicated plantation	CO ₂	No	Not applicable
		CH ₄	No	Not applicable
		N ₂ O	No	Not applicable



A representative diagram of the overall project activity is given below

C.5. Establishment and description of baseline scenario (UCR Protocol) >>

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 (tCO₂)

BE_y = Baseline emissions in year y (tCO₂)

PE_y = Project emissions in year y (tCO₂)

LE_y = Leakage emissions in year y (tCO₂)

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:

- 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;
- 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 cited below:

Baseline emissions are calculated as follows:

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

BE_y = Baseline emissions in year y (tCO₂)

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

$EF_{EG,GR,y}$ = Grid emission factor in year y (tCO₂/MWh)

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

$EF_{FF,y,f}$ = CO₂ emission factor for fossil fuel type f in year y (tCO₂/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)

$EF_{EG,FF,y}$ = CO₂ emission factor for electricity generation at the project site or off-site plants in the baseline in year y (tCO₂/MWh)

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

f = Fossil fuel type

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

$$BE_y = EL_{BL,GR,y} \times EF_{EG,GR,y} \dots\dots\dots \text{Final Eq 1}$$

Where,

- BE_y = Baseline emissions in year y (t CO₂)
- $EL_{BL,GR,y}$ = 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 CO₂/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:

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

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:

$EL_{BL,net,exp} = EL_{co-gen,project} - EL_{cap,n}$ **Final Eq 3**

Where:

$EL_{co-gen, project}$ = 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, latest [CEA database version 19.0](#) recommends the combined emission factor as 0.91 tCO₂/MWh which is higher than the UCR recommended emission factor hence following the conservative approach UCR default emission factor has been considered to calculate the emission reduction under conservative approach.

Thus, $EF_{EG,GR,y} = 0.9 \text{ tCO}_2\text{eq/MWh}$.

Project & Leakage Emissions:

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

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

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:

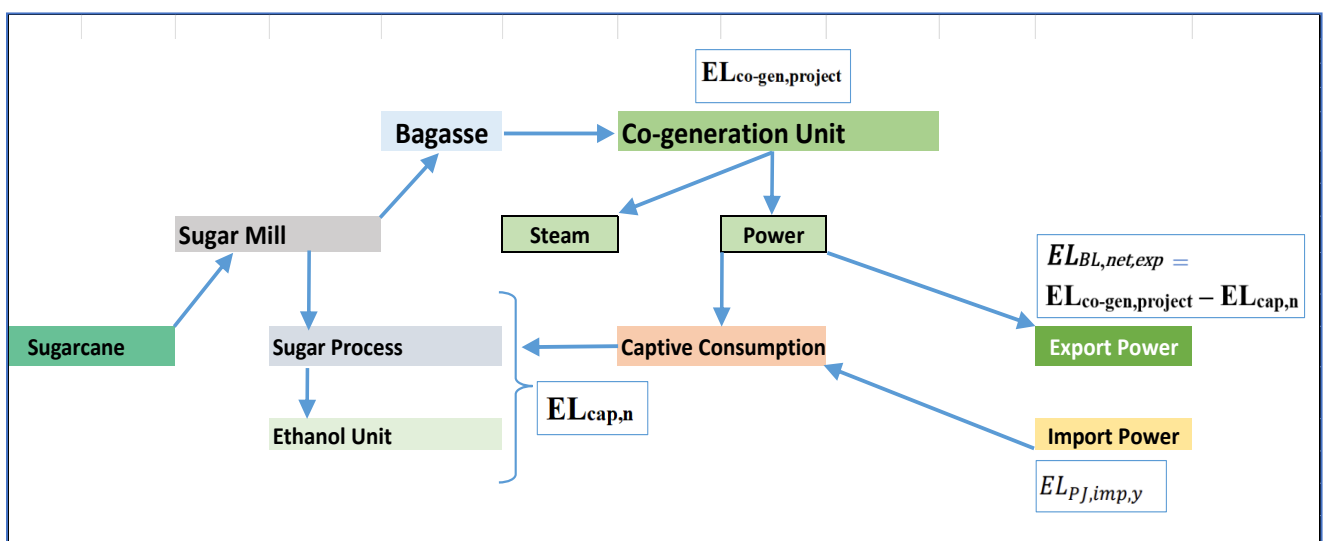
$PE_{GR1,y}$	= Emissions during the year y due to grid electricity imports to the project site (t CO ₂)
$EL_{PJ,imp,y}$	= Project electricity imports from the grid in year y (MWh)
$EF_{EG,GR,y}$	= Grid emission factor in year y (t CO ₂ /MWh)

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

LE_y = 0.

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

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



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:

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

With

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

Where:

BE_y	= Baseline emissions during the year y (tCO ₂)
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 (tCO ₂ /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, $C_{BF,i,y}$ 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:

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

(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

$$BF_y = \left[\left(Q_{bioeth,y} / f_{PJ,i,y} \right) \times f_{FF,y} \right] \dots \dots \dots \text{Final Eq 5}$$

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 **PE_y = 0**.

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

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

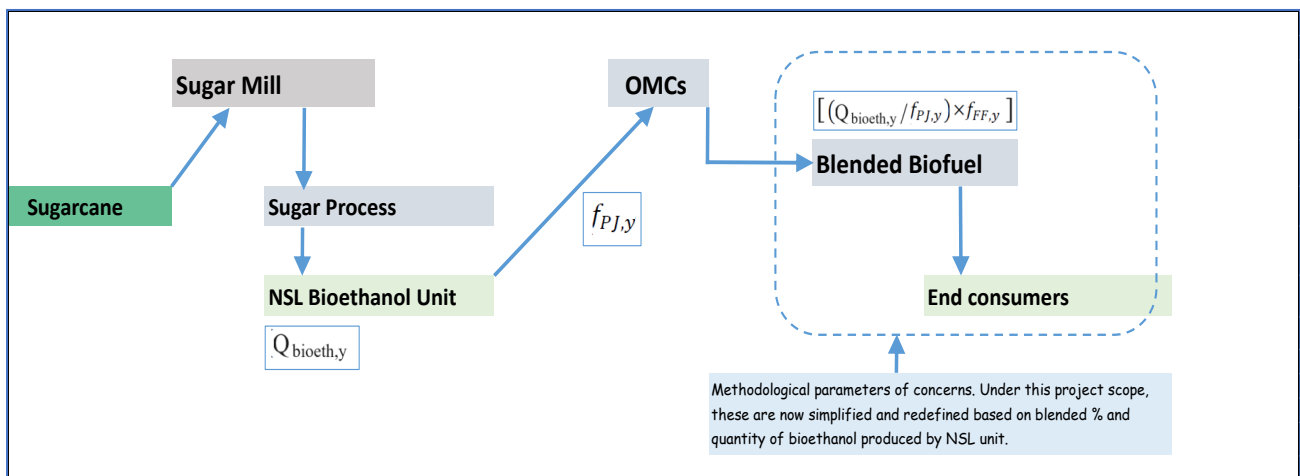
Where:

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, **LE_y = 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.

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

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

$$EL_{BL,GR,y} = EL_{BL,net,exp} = EL_{co-gen,project} - EL_{cap,n} = 189,180.00 \text{ MWh} - 27,163.60 \text{ MWh} = 162,016.40 \text{ MWh}^2$$

$$\text{Hence, } BE_y = EL_{BL,GR,y} \times EF_{EG,GR,y} = 162,016.40 \text{ MWh} \times 0.9 \text{ tCO}_2\text{e/MWh} = 145,814.76 \text{ tCO}_2\text{e}$$

$$PE_y = EF_{EG,GR,y} \times EL_{PJ,imp,y} = 3,783.60 \text{ MWh} \times 0.9 \text{ tCO}_2\text{e/MWh} = 3,405.24 \text{ tCO}_2\text{e}$$

$$ER_y = 145,814.76 - 3,405.24 = 142,409.52 \text{ tCO}_2\text{e}$$

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

$Q_{bioeth,y}$ (calculated annual quantity of bioethanol)	29,640.00 ³	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	tCO ₂ /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	108,090	tCO₂/yr

The exact ER estimation and accounting for current monitoring period to be referred from the ER sheet submitted.

² For the purpose of ex-ante estimates and values refer ER sheet. Actual values will be considered during verification process and final CoUs shall be calculated.

³ This ex-ante value has been derived from the rated capacity of the plant, i.e. 128 KLPD bioethanol which is converted to annual volume in tons using 154 days of operation, density of 0.000783 tons/litre.

C.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 for both scopes.

However, the plant 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.

C.7. Monitoring period number and duration>>

Monitoring period : First Monitoring period
Period : 12 years.
Start date & End date: 01/01/2013 to 31/12/2024

C.8. Changes to start date of crediting period >>

There is no change in the start date of crediting period under UCR⁴.

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

C.9. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

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

⁴ There is no change in crediting period dates, however, PP have extended the monitoring period by 2 months and now the end date of current monitoring period is 31/12/2024 as compared to 31/10/2024.

C.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 ⁵ : Main Meter- 07659429 & Check Meter- 07659432.
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. <i>"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. Emission factors for the post 2020 period is to be selected as the most conservative estimate between the national electricity/power authority published data set and UCR default of 0.9 tCO₂/MWh".</i> Hence, 0.9 tCO ₂ /MWh is used since latest CEA database version 19.0 recommends the combined emission factor as 0.91 tCO ₂ /MWh which is higher than the UCR recommended emission factor hence following the conservative approach UCR default emission factor has been considered to calculate the emission reduction under conservative approach.
Source of data	https://a23e347601d72166dcd6-16da518ed3035d35cf0439f1cdf449c9.ssl.cf2.rackcdn.com//Documents/UCRStandardNov2021updatedVer2_301121081557551620.pdf
Value applied	0.9
Measurement methods	-

⁵ Since the electricity is supplied through open access and energy meters installed at the plant end are used for the purpose of monitoring.

and procedures	
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For the calculation of Emission Factor of the grid

Data and Parameters 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):	<p>Here, $EL_{BL,GR,y} = EL_{BL,net,exp}$</p> <p>Where, $EL_{BL,net,exp}$ is the net-export units attributed to CoU calculation, which is estimated assuming that the amount of electricity generated on-site using the bagasse based co-gen unit (limited by the installed capacity of the project) after adjusting all the captive load available in the baseline scenario (on-site and off-site); whereas any import power shall be separately accounted for project emission as prescribed in below sections as per applied methodology.</p> <p>Thus, the overall calculation is simplified as well as the most conservative, defined as follows:</p> $EL_{BL,net,exp} = EL_{co-gen,project} - EL_{cap,n}$ <p>Where:</p> <p>$EL_{co-gen, project}$ = Total electricity produced by the co-gen unit in year y (MWh)</p> <p>$EL_{cap,n}$ = Total captive loads (sum of all the consumption points at the plant), in year y (MWh)</p> <p>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 $EL_{BL,net,exp}$.⁶</p>
Value applied:	628,617
QA/QC procedures:	<p>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.</p> <p>The energy meter details shall be provided and QA/QC requirements shall be addressed during monitoring & verification process.</p>
Any comment:	All the data will be archived till a period of two years from the end of the crediting period.

⁶ For the purpose of ex-ante estimate, historic values are evaluated and a fair estimation was done 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:	772,899
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:	144,282
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:	This is the total value for the current monitoring period. All the data will be archived till a period of two years from the end of the crediting period.

Data / Parameter	EL _{PJ, imp,y}
Data unit	MWh
Description	Total import electricity consumed during the period y
Source of data	NSL records
Measurement procedures (if any):	Direct recording at plant level
Measurement Frequency:	Monthly records
Value applied:	2,656
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 Project 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)
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- 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.

Ex-post monitored values:

Total Bagasse consumption = 751,893 MT
Total Fuel Consumption = 105,0511 MT

- 2) Total amount of steam produced from the co-gen unit.

Ex-post monitored values:

Total steam generated = 3,745,170 MT

More details summarized below and supporting data sheets are also made available during the verification process.

Statement showing Bagasse, Steam, Power Generation and consumption report for the period from January 2013 to December 2024										
Year (Finance Year)	Steam Generation	Fuel Consumption			Power					
		IMP Coal	Bagasse	Biomass(paddy husk)	Generation (KWH)	Import (KWH)	DG (KWH)	Consumption KWH		Export(KWH)
		MT	MT	MT	28.2MW			Co-gen	Sugar	
From Jan 2013	219462	17734	44967	1875	44315965	61000	664	3632724	4701905	36043000
2013 to 2014	568736	56577	82143	2675	123153223	324315	10903	9801650	8535824	105481988
2014 to 2015	890934	97195	87288	25	200115000	137000	5069	14779832	9857238	175620000
2015 to 2016	834188	85419	105540	0	184840483	242000	13977	13743095	11064364	160289001
2016 to 2017	304733	25855	53604	0	62619000	326960	12325	5455391	6622581	51245000
2017 to 2018	145693	6271	45023	2718	24948000	773275	7028	3162717	6029408	16879500
2018 to 2019	111368	562	46350	198	19336000	157500	0	2261522	5089294	12143000
2019 to 2020	Plant closed condition									
2020 to 2021										
2021 to 2022	201909	723	87057	559	30842846	340500	128	4065010	8640213	18837000
2022 to 2023	328830	183	141186	40	58590000	117000	7910	5878987	12465759	40752000
2023 to 2024	139317	10	58735	0	24138000	176050	1492	2517832	5976174	16164000
2024 to Dec 2024	0	0	0	0	0	0	0	0	0	0
Total	3745170	290528	751893	8090	772898517	2655600	59496	65298760	78982760.09	633454489
		1050511								

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 monitored (ex-post monitoring values):

Data / Parameter	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):	<p>Here,</p> $BF_y = \left[\left(Q_{bioeth,y} / f_{PJ,i,y} \right) \times f_{FF,y} \right]$ <p>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.</p> <p>$f_{PJ,i,y}$ = 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</p> <p>$f_{FF,y}$ = Blending fraction of fuel used for blending.</p>
Measurement Frequency:	Continuous monitoring and monthly records
Value applied:	759,983 (This is the converted/calculated value from the plant records as per the provision of the registered PCN)
QA/QC procedures applied:	<p>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.</p> <p>The meter details shall be provided and QA/QC requirements shall be addressed during monitoring & verification process.</p>
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	$Q_{bioeth,y}$
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):	<p>Here, $Q_{bioeth,y}$ is the direct measurement at NSL bioethanol plant.</p> <p>The bioethanol is recorded in Liters or m3, therefore the same will be converted to Tons using density of the ethanol, which is defined as a default value = 0.000783 tons/Litre.</p>
Measurement Frequency:	Continuous monitoring and monthly records

Value applied:	876,903.19 (This is the converted/calculated value from the plant records as per the provision of the registered PCN)
QA/QC procedures applied:	Direct measurement at plant
Purpose of data:	The Data/Parameter is required to calculate the baseline emission.
Any comment:	<p>All the data will be archived till a period of two years from the end of the crediting period.</p> <p>The primary record maintained at plant is in Litres. Therefore, the value has been converted to Tons for this parameter using density conversion factor = 0.000783 tons/Litre. Further can be referred in the ER sheet.</p>

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

Ex-post monitored value: 1,050,511 MT

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

Ex-post monitored value = 970,603,786.7 Litres during the current MP.

[the values can be referred from the ER sheet]

- 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.

Ex-post monitored value = 970,603,786.7 Litres during the current MP.

(here 100% of the supply has been considered, however separate records related to sales & OMC Depot wise have been taken from the accounts and submitted separately)

- 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.

The ER values achieved during the current monitoring period have been reported under the ER sheet. Please refer to the ER sheet calculation model for more details. The summary of the calculated results are included under the Appendix 2 below.

Appendix 1: Plant Photographs





Appendix 2: Summary of the ER calculations:

However, for the Scope 1 (i.e. Biomass co-gen), PP has applied a “Net-to-Gross adjustment of 10%” as per UCR guidance for biomass projects. Therefore, as per UCR Guideline dated 04/10/2023 on default PE's for biomass projects, PP has considered default PE adjustment factor for each vintage. Thus, final Net CoUs considered for each vintage is as follows:

Year wise CoUs estimate:			
Year/Description	CoUs for Scope 1 (Biomass co-gen) (Values after gross-to-net adjustment of 10% as per UCR guidance for biomass projects)	CoUs for Scope 2 (Bioethanol Blending) (Values after gross-to-net adjustment of 10% as per UCR guidance for biomass projects)	TOTAL NET ERs/CoUs (tCO ₂ e)
	Net CoUs (tCO ₂ e)	Net CoUs (tCO ₂ e)	(MP 1 under UCR)
Year 1 (2013)	84851	189	85040
Year 2 (2014)	141361	259	141620
Year 3 (2015)	128921	192	129113
Year 4 (2016)	67742	288	68030
Year 5 (2017)	9744	82	9826
Year 6 (2018)	6315	82	6397
Year 7 (2019)	9581	119	9700
Year 8 (2020)	0	0	0
Year 9 (2021)	3896	66	3962
Year 10 (2022)	25223	332	25555
Year 11 (2023)	31255	339	31594
Year 12 (2024)	0	0	0
Total =	508889	1948	510837

Detailed calculations and related parameters shall be referred from the ER sheet.