PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: 120 MW Sugarcane Bagasse based co-generation Energy SJC BIOENERGIA

Version 2.0

Date July 11, 2025

First CoU Issuance Period: 12 years

Date: Jan 01, 2013 to Dec 31, 2024

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

BASIC INFORMATION	
Title of the project activity	120 MW Sugarcane Bagasse based co-generation Energy SJC BIOENERGIA
Scale of the project activity	Large Scale
Completion date of the PCN	July 11/2025
Project participants	CARGILL BIOENERGIA LTDA., previously called SJC BIOENERGIA (OWNER) FASTCARBON (AGGREGATOR)
Host Party	BRAZIL
Applied methodologies and standardized baselines	CHOOSE METHODOLOGY CDMUNFCCC Methodology ACM0006: Electricity and heat generation from biomass (Ver.16) &UCR Standard for Emission Factor
Sectoral scopes	01- Energy industries (renewable / non-renewable sources)
SDG Impacts:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 17
Total amount of total GHG emission reductions	1,441,847 CoUs (1,441,847 tCO2eq)

SECTION A. Description of project activity

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

The project titled "120 MW Sugarcane Bagasse based co-generation Energy SJC BIOENERGIA" is composed of two sugar cane plants, located in the cities of Quirinópolis (UTE Quirinópolis, São Francisco Plant, USF) and Cachoeira Dourada (UTE Cachoeira Dourada, Rio Dourado Plant, URD), both in the state of Goiás, Brazil.

Unit	Installed Capacity	Location	Commercial Operation Date
UTE Quirinópolis São Francisco Plant (USF)	80 MW	Quirinópolis, Goiás	November 22, 2007
UTE Cachoeira Dourada Rio Dourado Plant (URD)	40 MW	Cachoeira Dourada, Goiás	January 19, 2013

The details of the registered project are as follows:

Purpose of the project activity:

The purpose of the activity is to generate electricity using renewable biomass (sugarcane bagasse, which is the residue from the juice extraction process for the production of ethanol and sugar), and, thus, reduce GHG emissions by displacing fossil fuel in grid-based electricity.

It is a grid-connected biomass cogeneration power plant with a high-pressure steam-turbine configuration. The high-pressure boilers are fired by bagasse to generate steam which in turn is fed to the steam turbine to generate power. The power co-generation units generate biomass-based power for captive consumption of the sugar plant and the sale of surplus power to the Brazilian electricity grid.

The UCR Project activity is the construction and operation of power plants/units that use renewable energy sources and supplies renewable electricity to the grid. The UCR project activity is thus the displacement of electricity that would be provided to the grid by more-GHG-intensive means and provides long-term benefits to the mitigation of climate change. The UCR project activity qualifies under the environmental additional positive list of pre-approved project types under the UCR carbon incentive model for issuance of voluntary carbon credits.

The activity currently produces more than 650,000 MWh of electrical energy per year and, of this total, and 430,000 MWh are injected into the Brazilian electrical system, enough to supply a city of approximately 200,000 inhabitants, and thereby contributes to climate change mitigation efforts.

São Francisco Plant – USF - (UTE Quirinópolis):

The municipality of Quirinópolis was chosen to host the group's new industrial unit due to its privileged location in the southwest of the state. To build the new plant, the first step was to prepare the land at Fazenda São Francisco II. Then, in 2005 the first buildings appeared and, in parallel, a broad process of selection and training of personnel to join the team of employees at Usina São Francisco (USF) began. In 2006, the industrial unit began operations, focusing on the production of sugar, ethanol and electricity.

In 2007, the company decided to build the second diffuser at USF, expanding its production capacity. With the new structure, the first step was taken towards becoming one of the largest bioenergy producers in the state of Goiás.

Rio Dourado Plant – URD (UTE Cachoeira Dourada):

To expand its operations in the state of Goiás, the USJ Group began, in 2009, the construction of the second industrial unit, the Rio Dourado Plant (URD). The location chosen for the new headquarters was the municipality of Cachoeira Dourada, as it is close to the USF, which would allow the optimization of agricultural and industrial operations.

In July 2013, the Rio Dourado Plant (URD) was inaugurated, with the most modern industrial structure in the country at the time. The unit is dedicated to the production of ethanol and electricity.

A.2 Do no harm or Impact test of the project activity>>

There are social, environmental, economic and technological benefits which contribute to sustainable development.

- **Social benefits:**
- The project activity contributes to employment generation in the local area. Currently, the Rio Dourado and São Francisco plants together employ more than 4 thousand people in the agricultural, industrial and administrative areas and operate under values that encourage commitment to safety, ethics and personal and professional development.
- CARGILL Bioenergia is committed to life, applies workplace safety policies in all processes, aiming for the well-being of employees, and invests in renewable energy alternatives, as well as being committed to protecting the privacy and personal data of everyone who interacts with the Company, whether employees or third parties, through systems, website, social networks, applications and even physically in our facilities.

- **Environmental benefits:**
- Avoids global and local environmental pollution, leading to reduction of GHG emissions.
- CARGILL Bioenergia has a nursery for the production of seedlings native to the region with a production capacity of 25 thousand seedlings/year. To collect the seeds, produce and guide the plants to the planting phase, the company has six employees. Until 2016, approximately 335 thousand seedlings were planted, enabling the recovery of 220 hectares, between Permanent Preservation Areas (APP) and Legal Reserve. During the same period, more than 10 thousand seedlings were donated to partners, sugarcane suppliers, schools, among other institutions. At the beginning of 2017, the nursery underwent a revitalization, increasing production capacity.
- The company has a project that is “Think Green”. The project is developed by a multidisciplinary professional team, involving the areas of sustainability, communication, agriculture and industry. The initiative seeks to guide employees, partners/suppliers, students and the community in general about the importance of preserving the environment and the sustainable use of natural resources in daily activities. Furthermore, it disseminates knowledge about the programs carried out by the company focusing on environmental education. The project has already been carried out in 16 schools and reached an audience of approximately 3 thousand people from the municipalities that make up CARGILL Bioenergia's area of influence.
- Waste Management: Ash is the residue resulting from the burning of sugarcane bagasse in the process of cogeneration of electricity and steam. CARGILL Bioenergia uses this residue as fertilizer in its sugarcane fields, as it is a product rich in nutrients. Furthermore, it helps reduce soil acidity, which guarantees benefits for sugarcane planting.
- Composting is a process of transforming organic matter, which normally goes to waste, into organic fertilizer, in order to eliminate the disposal of waste generated in cafeterias and take care of the soil of your plantations. The process is extremely important for the environment, which is why it is a practice of CARGILL Bioenergia.
- Fertigation: the procedure is carried out by reusing the vinasse generated in the alcohol manufacturing process and also using waste water, which is obtained after cleaning the industry equipment. CARGILL Bioenergia uses this fertilization technique in the cultivation of sugar cane because it is rich in organic matter and potassium, in addition to reducing the application of chemical fertilizers and the use of water collected from springs.

- CARGILL Bioenergia produces ethanol derived from sugar cane and from corn. As their products are entirely plant-based, the resulting biofuel is both renewable and sustainable. In addition to the socio-economic benefits, ethanol is less harmful to the environment than fossil fuels, such as gasoline. That is why carbon emissions are lower, both in the manufacturing process and in final use. Nowadays, CARGILL Bioenergia produces 500 million liters of fuel per year (500,000 m^3), distributed into anhydrous ethanol, used as an additive for gasoline, and hydrated ethanol, which is commercialized as final fuel for vehicles.

- CARGILL Bioenergia is certified by Renovabio, which is Brazilian National Biofuels Program, created to encourage the production and use of sustainable biofuels, such as ethanol and biodiesel, replacing gasoline and diesel, which are more polluting fossil fuels. It certifies companies based on the environmental efficiency of production, allowing them to issue CBios (Decarbonization Credits), which can be sold.

- **Economic benefits:**
- Greater supply of cheap energy, ensuring the development of the region.
- Ensure the growth of region where the plants were installed, providing clean and cheaper energy, ensuring the creation of jobs and business opportunities.
- Low-cost energy to consumers.
- Clean technology development in Brazil.
- Investments in new technologies.
- Investment in responsible consumption and production actions.

The CARGILL Bioenergia contribute significantly to economic, environmental and social matters, however, it´s notable for contributing to all 17 SDGs.

SDG	Target	How was it achieved?
1 NO POVERTY	1.1 - By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	Income generation through the creation of more than 4,500 jobs and training of workers to the job.
2 ZERO HUNGER	2.4 - By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	Engebio program, which focuses on the production of biological inputs for fertilizer and pesticides, for pest control, avoiding chemicals fertilizers/ pesticides, with less impact on the environment
3 GOOD HEALTH AND WELL-BEING	3.8 - Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	Provides health plans for all employees, promotes flu vaccination campaigns annually, as well as information campaigns against other diseases
4 QUALITY EDUCATION	4.3 - By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, at affordable prices, including university	Offers a discount plan to employees, through as agreement with educational institutions, such as SENAC, SESI and SENAI, encouraging employees to study. Provides professional courses in partnership with the Goiás State Government
5 GENDER EQUALITY	5.1 - End all forms of discrimination against all women and girls everywhere	Implementation of the Code of Ethics Program with a focus on encouraging diversity, gender equality and female empowerment.
6 CLEAN WATER AND SANITATION	6.3 - By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	Investments in monitoring water quality of effluents, using the fertigation process, sewage treatment stations and carries out application of vinasse and wastewater in sugarcane fields, helping to minimize the demand for water use.

7 AFFORDABLE AND CLEAN ENERGY	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix.	Clean Energy Generation
8 DECENT WORK AND ECONOMIC GROWTH	8.3 - Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services. 8.8 - Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment	Generation of 4,500 jobs. Occupational Health and Safety program, which focuses on the safety of everyone at work, providing and monitoring the use of PPE
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	9.1 - Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all 9.5 - Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.	Innovative practices for improving products, processes, and business models: use of drones to monitor crops, release of wasps to combat leafhoppers, vehicles monitored by GPS, 100% automated harvesting
10 REDUCED INEQUALITIES	10.4 - Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality.	Investments in the municipalities where the power plants where installed, including through taxation, contributing to the positive increase of its economy.
11 SUSTAINABLE CITIES AND COMMUNITIES	11.4 - Strengthen efforts to protect and safeguard the world's cultural and natural heritage	Preservation and rescue of archaeological sites

12 RESPONSIBLE CONSUMPTION AND PRODUCTION	12.2 - By 2030, achieve the sustainable management and efficient use of natural resources 12.4 - By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment 12.5 - By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	Investment in responsible consumption and production actions. Implementation of waste monitoring programs in plants for correct destination, recycling or disposal of waste. Solid waste management plan, identification, segregation, storage, collection, transportation, transshipment, treatment and final disposal, environmentally adequate disposal of solid waste
13 CLIMATE ACTION	13.2 – Integrate climate change measures into national policies, strategies and planning.	Reduction of GHG emissions through renewable energy generation, monitors gas emissions and uses gas screbber
14 LIFE BELOW WATER	14.5 - By 2020, conserve at least 10 per cent of coastal and marine areas, consistente with national and international law and based on the best available scientific information	Analyses of water sources, monitoring of aquatic fauna and water management plan
15 LIFE ON LAND	15.1 - By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. 15.2 - By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. 15.a – Mobilize significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystemas	Margin Verde Project, which has a nursery for the production of seedlings native to the region with a production capacity of 25 thousand seedlings/ year Monitoring the terrestrial fauna Biodiversity plan

16 PEACE, JUSTICE AND STRONG INSTITUTIONS	16.5 – Substantially reduce corruption and bribery in all their forms. 16.6 - Develop effective, accountable and transparent institutions at all levels 16.7 – Ensure responsive, inclusive, participatory, and representative decision-making at all levels.	The company adopts good corporate governance practices, aligning interests and ensuring transparency and integrity in management Code of Ethics and Conduct and a Reporting Channel CARGILL Bioenergia maintains governance, ethics, and integrity policies, ensuring compliance with regulatory standards and fostering a responsible corporate environment The company follows a governance model that involves different stakeholders in the decision-making process, promoting engagement and continuous dialogue
17 PARTNERSHIPS FOR THE GOALS	17.16 – Enhance the global partnership for sustainable development. 17.17 - Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships	CARGILL Bioenergia collaborates with research institutions and organizations to implement sustainable energy and agricultural solutions, such as a Technical and Financial Cooperation Agreement with Embrapa Agroenergia and the Arthur Bernardes Foundation (Funarbe) to develop the project "Fungal Bioinput Obtained from Corn Vinasse for Application in Sugarcane Cultivation." This project aims to create a biofertilizer using fungi cultivated in corn vinasse, promoting more sustainable agricultural practices. The company engages with local communities, educational institutions, and government initiatives to drive economic growth and environmental responsibility.

A.3. Location of project activity >>

São Francisco Plant – USF - (UTE Quirinópolis):

Country: Brazil
District: Quirinópolis
State: Goiás
Zip Code: 75860-000

Latitude: -18.432117972706212º
Longitude: -50.25815098361247º

Rio Dourado Plant – URD (UTE Cachoeira Dourada):

Country: Brazil
District: Cachoeira Dourada
State: Goiás
Zip Code: 75560-000

Latitude: -18.50473413915859
Longitude: -49.65439691516649

A.4. Technologies/measures >>

The UCR project activity is a grid-connected bagasse-based cogeneration power plant with a high-pressure steam-turbine configuration. The UCR project activity is the electricity generation capacity and the installation of facilities for allowing captive use and export of electricity to the electricity grid.

The primary technology for the project activity is direct combustion of biomass residues, and power generation using the Rankine cycle technology. Power generation through this method involves combustion of biomass residues directly in the boiler, which is capable to generate high-pressure high-temperature steam, which is fed to a steam turbine that drives a generator.

The main elements of the power plant are as follows.
- A boiler unit which converts the energy available in the fuels into thermal energy;
- A steam turbine unit which converts thermal energy into mechanical energy;
- An alternator unit, which converts mechanical energy into electrical power.

A number of other equipment components, as listed below, also form part of the biomass power plant.
- Fuel and ash handling equipment
- Water cooled condenser system for cooling the exhaust steam
- DM Water system and Air Compressor Plant
- Electrical systems and Automation system

São Francisco Plant – USF (UTE Quirinópolis):

Power Generator 1

Power Generator 2

Thermal Generation Center

Automation System

Electrical Systems

Thermal Generation Center

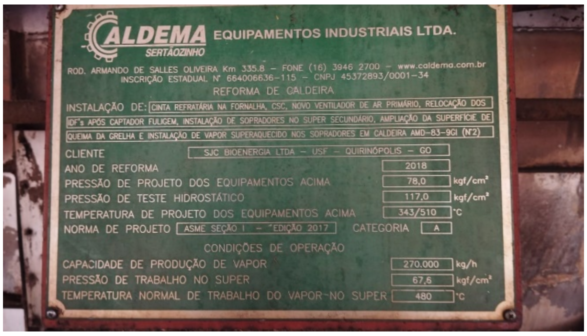
Thermal Generation Center

Thermal Generation Center

Thermal Generation Center

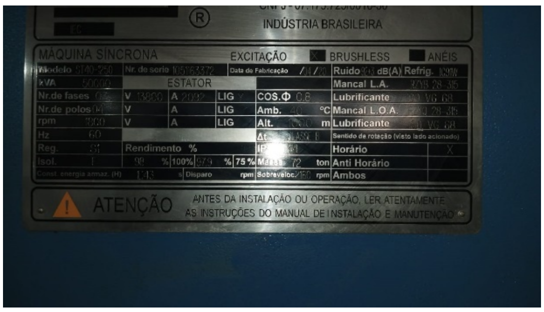
Boiler	Nº 1	Nº 2
Manufacturer	Caldema	Caldema
Capacity (Tons/h)	270	270
Pressure (kgf/cm^2)	67.6	67.6
Degree of super heat ºC (Steam)	480	480

Boiler nº 1

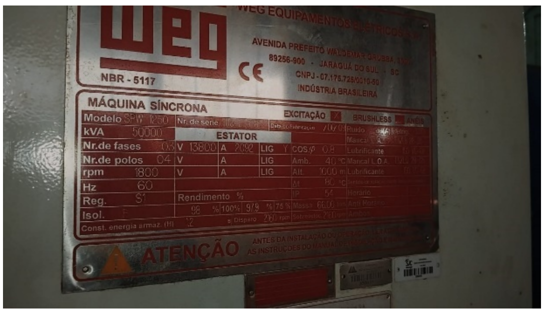


Boiler nº 2

Alternator	Nº 1	Nº 2
Year of manufacturer	2020	2009
Manufacturer	WEG	WEG
Power Rated (kW)	50,000	50,000
Voltage (V)	13,800	13,800
Current (Amps)	2,092	2,092
Power Factor (cos φ)	0.80	0.80
Efficiency (25%, 50%, 75%, 100% of load)	75%, 97.9%, 100%, 98%	75%, 97.9%, 100%, 98%
Generator Rated Speed (rpm)	1,800	1,800
Frequency (Hz)	60	60
Generator Model	ST40-1250	SPW 1250



Alternator nº 1



Alternator nº 2

Turbine	Nº 1	Nº 2
Year of manufacturer	2005	2008
Manufacturer	TGM Turbinas	TGM Turbinas
Power Rated (kW)	42,163	41,438
Live Steam Pressure (Bar)	65	65
Live Steam Temperature (ºC)	480	480
Steam Pressure at Outlet (Bar)	22	16
Steam Exhaust Pressure (Bar)	2.5	2.5
Turbine Rated Speed (rpm)	6,000	6,000
Turbine Disarm Speed (rpm)	6,600	6,600
Turbine Model	TME 35000 A	TM 35000 A

Turbine nº 1

Turbine nº 2

Rio Dourado Plant – URD (UTE Cachoeira Dourada):

Power Generator

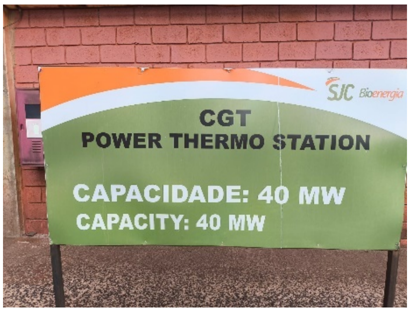
Turbine

Alternator

Power Generator

Power Generator

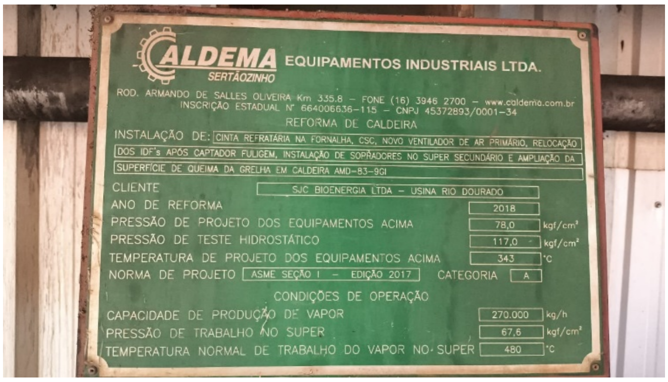
Automation System



Thermal Generation Center

Electrical Systems

Boiler	Nº 1
Manufacturer	Caldema
Capacity (Tons/h)	270
Pressure (kgf/cm^2)	67.6
Degree of super heat °C (Steam)	480



Boiler nº 1

Alternator	Nº 1
Year of manufacturer	2008
Manufacturer	WEG
Power Rated (kW)	50,000
Voltage (V)	13,800
Current (Amps)	2,092
Power Factor (cos φ)	0,80
Efficiency (25%, 50%, 75%, 100% of load)	75%, 97.9%, 100%, 98%
Generator Rated Speed (rpm)	1,800
Frequency (Hz)	60
Generator Model	SPW 1250

Alternator nº 1

Turbine	Nº 1
Year of manufacturer	2012
Manufacturer	TGM Turbinas
Power Rated (kW)	41,438
Live Steam Pressure (Bar)	65
Live Steam Temperature (ºC)	480
Steam Pressure at Outlet (Bar)	16
Steam Exhaust Pressure (Bar)	2.5
Turbine Rated Speed (rpm)	6,000
Turbine Disarm Speed (rpm)	6,600
Turbine Model	TM 35000 A

Turbine nº 1

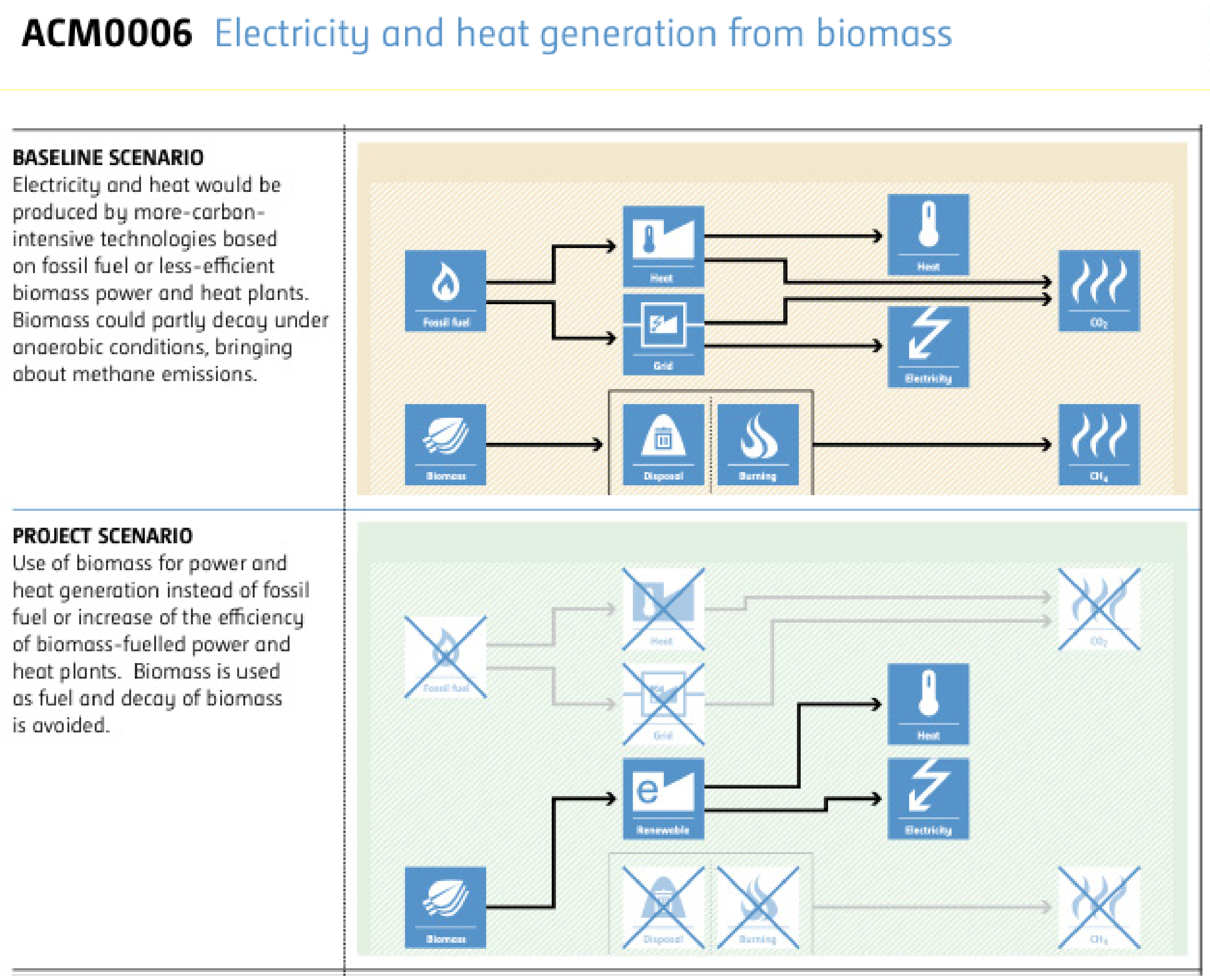
A.5. Parties and project participants >>

Party (Host)	Participants
Brazil	**Owner:** CARGILL Bioenergia Ltda Av. Dr. Chucri Zaidan, 1240, 8º andar, Sala 802, Vila São Francisco São Paulo/ SP Zip Code: 04.711-130 https://www.sjcbioenergia.com.br/ **Aggregator:** FastCarbon Consultoria e Negócios Ltda Rua Viradouro, 63, conjunto 61, Itaim Bibi São Paulo/SP Zip Code: 04538-110 https://fastcarbon.com.br

A.6. Baseline Emissions>>

The approved baseline methodology has been referred from the indicative simplified baseline and monitoring methodologies for selected large scale UNFCCC CDM project activities that involve generation of power and heat in thermal power plants, including cogeneration plants using biomass.

Typical activities under ACM0006 are new plants, capacity expansions, energy efficiency improvements or fuel switch projects.



A.7. Debundling>>

This "120 MW Sugarcane Bagasse based co-generation Energy SJC BIOENERGIA" project is not a debundled 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:

- By the same project participants;
- In the same project category and technology/measure; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE - 01 Energy industries (Renewable/Non-renewable sources)

TYPE II - Larger renewable energy or energy efficiency projects. (Biomass Energy)

CATEGORY - CDMUNFCCC Methodology ACM0006: Electricity and heat generation from biomass (Ver.16) &UCR Standard for Emission Factor

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

This methodology is applicable to project activities that operate biomass (co-gen) fired power and heat plants.

The project activity is a power generation project using a biomass (bagasse) and displaces CO2 emissions from electricity generation in power plants that are displaced due to the project activity. Since the project activity utilizes biomass (bagasse) for the generation of power and supplies it to the local grid, it displaces fossil fuel, and hence it meets the primary applicability criteria of the methodology.
The project activity is a power plant that encompasses cogeneration plants, i.e. power plant in which at least one heat engine simultaneously generates both process heat and power. The total installed capacity of project activity is 120 MW which is acceptable as per the applied large scale methodology.
The installation of a new biomass residue fired power generation unit, which are places existing power generation capacity fired with fossil fuel as in the project plant (power capacity expansion projects) is also included in this methodology.
For the purposes of this methodology, heat does not include waste heat, i.e. heat that is transferred to the environment without utilization, for example, heating flue gas, heat transferred to cooling towers or any other heat losses.

The biomass used by the project plant is not stored for more than one year. The biomass used by the project plant is not processed chemically or biologically (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio-or chemical degradation, etc.) prior to combustion.
The Project Activity uses biomass residues from a production process (e.g. production of sugar and ethanol), and the implementation of the project does not result in an increase of the processing capacity of (the industrial facility generating the residues) raw input (e.g. sugar and ethanol) or in other substantial changes (e.g. product change) in this process.
The project activity unit does not co-fire fossil fuel and/or does not exceed the limit of 25% co-firing fossil fuel criteria as per the UCR Protocol for such projects.
Bio-mass generated power is used for direct grid supply and for meeting the captive need facility. The project activity is involving the grid-connected bagasse based electricity generation capacity involving the installation of facilities for all owing the export of electricity to the regional grid.
Bio-mass is not sourced from dedicated plantations. The existing installed turbo-generators are fired by bagasse, a by-product of the sugarcane processing and ethanol, a biomass residue
Bagasse is burnt in boilers as generated from the sugar mill and does not require any specific technology for its preparation before combustion. No fuel preparation equipment has been installed at site for preparation of bagasse. Hence no significant energy quantities are required to prepare the biomass residues for fuel combustion.
The project activity also does not include any GHG emissions related to the decomposition or burning of biomass. The baseline heat emissions for the project activity are not included in the project boundary nor does it claim for emission reductions from heat.

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

The project is not registered in any other GHG mechanism. Hence, there will not be any double counting possibility.

The biomass-based boiler and turbine have unique serial numbers which are visible on the units. The generated electricity is measured using energy meters who also has unique serial numbers. The Monitoring Report will have the details of the same and will be provided to the UCR verifier during the verification process.

The UTE Quirinópolis and UTE Cachoeira Dourada are qualified for i-RECs certification (UTEQTHER001 and UTECTHER003). But only UTE Quirinópolis issued i-RECs for only a specified period. To be conservative and avoid double counting, the amount of MWh converted into i-REC will be deducted from the total MWh available for issuing carbon credits.

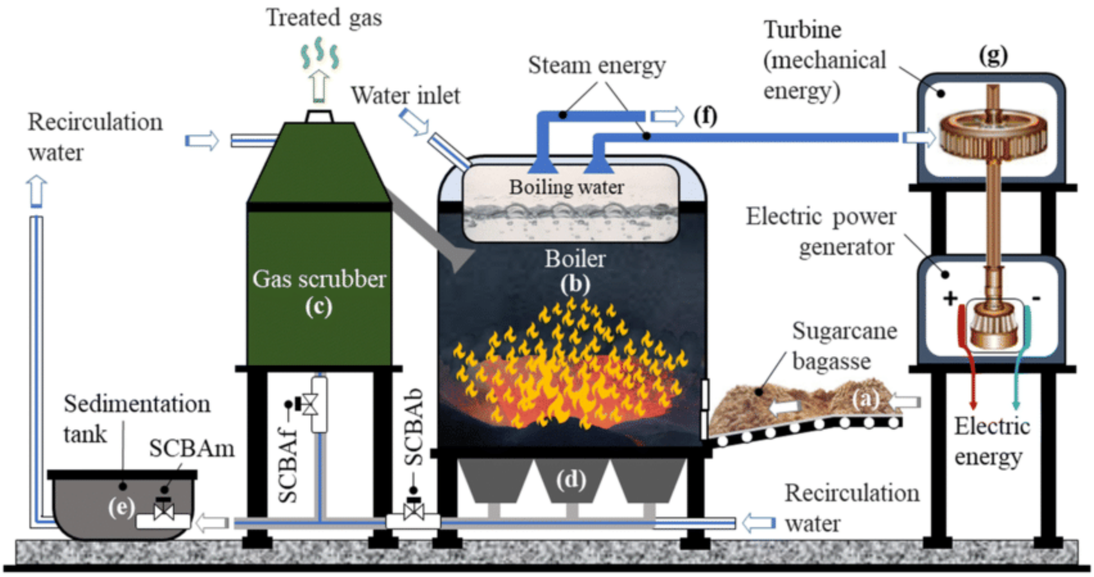
UTE Quirinópolis and UTE Cachoeira Dourada are also certified by Renovabio, which is the Brazilian National Biofuels Program, created to encourage the production and use of sustainable biofuels, such as ethanol and biodiesel, replacing gasoline and diesel, which are more polluting fossil fuels. The lower the carbon intensity of the biofuel, the greater the difference in relation to fossil fuels, resulting in certificates called CBIOs, which can be traded. The impact of exported energy on the number of CBIOs is very small compared to other factors such as agricultural and industrial efficiency, and it's not the focus of Renovabio certification. Exported energy is just one of many factors considered.

Although RenovaBio and the carbon credit certification system have similar objectives with regard to decarbonization, they are different programs and work in different ways, with their own regulations and mechanisms. However, to adopt a conservative position and avoid double counting, the percentage of Carbon Credits will be deducted here in this program, in the same proportion in which the exported energy boosted the generation of CBIOs, in the respective periods in which they were generated.

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

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

- All plants generation power located at the project site.
- All power plants connected physically to the electricity system (grid) that the projects 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 been left for or dumped.



Leakage Emissions (LE_y)

Leakage emissions is not applicable as the project activity does not use technology or equipment transferred from another activity.

Hence $LE_y = 0$

Scenario	Source	GHG	Included?	Justification/Explanation
Baseline	Grid Connected Electricity Generation	CO_2	Yes	Main emission source
		CH_4	No	Not identified in the baseline methodology
		N_2O	No	Not identified in the baseline methodology
Project Activity	Sugarcane Bagasse based co-generation Activity	CO_2	No	Zero-emissions grid connected electricity generation from renewable energy
		CH_4	No	Zero-emissions grid connected electricity generation from renewable energy
		N_2O	No	Zero-emissions grid connected electricity generation from renewable energy

Project Emissions (PE_y)
The project emissions (PEy) under the methodology may include;

N_2O Excluded simplification. conservative

This is

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

Where,

PET_y = are the CO_2 emissions during the year y due to transport of the biomass to the project plant in tons of CO_2,

$PEFF_{CO2,y}$ = are the CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility in tons of CO_2,

PEEC,y = are the CO_2 emissions during the year y due to electricity consumption at the project site that is attributable to the project activity in tons of CO2,

GWPCH4 = is the Global Warming Potential for methane valid for the relevant commitment period and,

$PE_{Biomass},CH_4,y$ = are the CH_4 emissions from the combustion of biomass during the year y. The proposed project activity does not have any CO_2 emissions due to off-site transportation of biomass, or from fossil fuel co-firing and from electricity consumption at site. The project activity also doesn't include CH_4 emissions from the combustion of biomass.

Hence,
$PET_y = 0$, $PEFF_{CO2}$, y = 0, PEEC,y = 0 and, $PE_{Biomass}$,CH4,y = 0.

Therefore, $PE_y = 0$.

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

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

Renewable energy technology that displaces technology using fossil fuels, wherein the simplified baseline is the fuel consumption of the technology that would have been used in the absence of the project activity, times an emission factor for the fossil fuel displaced.

The baseline emissions due to displacement of electricity are determined by net quantity of electricity generation as a result of the project activity (incremental to baseline generation) during the year y in MWh times the CO_2 emission factor for the electricity displaced due to the project activity during the year y in tCO_2/MWh.

Given that power generation for internal consumption is part of the present project activity, emission reductions are only claimed from on-site incremental power generation that is injected to the grid. Therefore, the baseline scenario is the emission of GHG from the present electricity generation mix of the electricity grid.

The actual emission reduction achieved during the first issuing period shall be submitted as a part of monitoring and verification. For an ex-ante estimation for the period from 2013 to 2024, the following calculation has been submitted:

Emission Reductions are calculated as follows:

ERy = BEy – PEy – LEy Where:
ERy = Emission reductions in year y (tCO_2/y)
BEy = Baseline Emissions in year y (t CO_2/y)
PEy = Project emissions in year y (tCO_2/y)
LEy = Leakage emissions in year y (tCO_2/y)

Estimated Annual Baseline Emission Reduction: $BEy = EG_{PJ,y} \times EF_{grid,y}$

BEy = Baseline emissions in year y (t CO_2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

As determined by “Tool to calculate the emission factor for an electricity system – Version 7.0” for Brazil (am-tool-07-v7.0), the combined margin should be calculated using the “Weighted average CM”, as it follows:

$EF_{grid,CM,y} = EF_{grid,OM,y} \times wOM + EF_{grid,BM,y} \times wBM$ Equation (16)

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (t CO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (t CO_2/MWh)
wOM = Weighting of operating margin emissions factor (per cent)
wBM = Weighting of build margin emissions factor (per cent)

Since the project is a biomass co-generation project:

wOM = 0.5
wBM = 0.5

For the Build and Operation margin emission factor, was considered the public data for the year of 2017 available in the Ministry of Science, Technology and Innovation website

OM = 0.5882

BM = 0.0028

Resulting in $EF_{grid,CM,y}$ = 0.2955

Estimated power generation per year as 430,000 MWh,

Resulting in *BEy* = 127,065 tCO_2

Since the project is a biomass co-generation project:

PEy = 0
LEy = 0

So as result *ERy* = *BEy*

For the current monitoring period no biomass residue was collected from outside, thus for this monitoring period, the value of this parameter is zero (*PEy*), however, using the UCR principles of conservativeness in emission reductions quantification, prevention of over-generation of credits and based on stakeholder comments on project emissions, transport emissions are calculated by applying 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.

ERy = 127,065 x 0.9 = 114,358 tCO_2 / year

Estimated Annual emission reductions: ERy = 114,358 tCO_2 / year (114,358 CoUs /year)

Actual total emission reductions: ERy = 1,441,847 CoUs (1,441,847 tCO2eq)

B.6. Prior History>>

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

The UTE Quirinópolis and UTE Cachoeira Dourada are qualified for i-RECs certification (UTEQTHER001 and UTECTHER003). But only UTE Quirinópolis issued I-RECs for only a specified period. To be conservative and avoid double counting, the amount of MWh converted into I-REC will be deducted from the total MWh available for issuing carbon credits.

UTE Quirinópolis and UTE Cachoeira Dourada are also certified by Renovabio, which is Brazilian National Biofuels Program, created to encourage the production and use of sustainable biofuels, such as ethanol and biodiesel, replacing gasoline and diesel, which are more polluting fossil fuels. It certifies companies based on the environmental efficiency of production, allowing them to issue CBIOs (Decarbonization Credits), which can be sold. Although RenovaBio and the carbon credit certification system have similar objectives when it comes to decarbonization, they are different programs and work in different ways, with their own regulations and mechanisms.

The CBIO is a financial instrument generated **exclusively** by the production **of biofuels**, in this case, **ethanol**. On the other hand, the carbon credits proposed in this project are generated by surplus **renewable energy exported** to the electricity grid.

- Law No. 13,576/2017 (RenovaBio Law, https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/lei/l13576.htm): Establishes the National Biofuels Policy, **focusing on the production and use of biofuels**, without mentioning the generation of carbon credits for surplus energy.

- ANP Resolution No. 758/2018 (https://atosoficiais.com.br/anp/resolucao-n-758-2018-regulamenta-a-certificacao-da-producao-ou-importacao-eficiente-de-biocombustiveis-de-que-trata-o-art-18-da-lei-no-13-576-de-26-de-dezembro-de-2017-e-o-credenciamento-de-firmas-inspetoras?origin=instituicao&q=Resolu%C3%A7%C3%A3o%20ANP%20n%C2%BA%20758/2018): Regulates the certification of efficient production of biofuels, treating electrical energy as a co-product, **but not as a direct source of CBIOs**.

- Technical Note nº 62/2018/SBQ/ANP: Details the methodology for calculating CBIOs, reaffirming that exported electrical energy is considered only as a co-product.

In the Renovabio program, the RenovaCalc tool is used, which uses exported energy as one of the factors to calculate the plant's Energy-Environmental Efficiency Rating (NEEA), that is an indicator of the efficiency of the production process, specifically in the industrial phase. A higher NEEA indicates a more efficient process, which generally results in a lower carbon intensity. Impact on CBIOs: the amount of CBIOs generated is based on the difference between the carbon intensity of the biofuel and that of the equivalent fossil fuel. The lower the carbon intensity of the biofuel, the greater the difference compared to fossil fuel, resulting in more CBIOs generated.

Role of Exported Energy in generating CBIOs:

Exported electrical energy is considered a beneficial co-product. It "credits" the process, effectively reducing the carbon intensity attributed to the biofuel. This is because exported renewable energy replaces potentially more carbon-intensive energy on the grid.

If a plant exports more renewable energy, its NEEA tends to improve. A better NEEA generally results in a lower carbon intensity for the ethanol produced. With lower carbon intensity, the gap with fossil fuel increases. Consequently, more CBIOs are generated per unit of biofuel produced.

Whereas the impact of exported energy on the amount of CBIOs is generally marginal compared to other factors such as agricultural and industrial efficiency, exported energy is just one of the many factors considered in the NEEA calculation. However, to adopt a conservative position and avoid double counting, percentage of Carbon Credits will be deducted here in this program, in the same proportion in which the exported energy boosted the generation of CBIOs, in the respective periods in which they were generated.:

$$NEEA = \left(\frac{EF_{fossil} - EF_{bio}}{EF_{fossil}} \right) \times 100$$

Where:

- EF_{fossil} = **Emission Factor of the reference fossil fuel** (gCO_2eq/MJ)
- EF_{bio} = **Emission Factor of the assessed biofuel** (gCO_2eq/MJ)

The $\boldsymbol{EF_{bio}}$ is obtained by considering all emissions from the biofuel's life cycle, including:

- Biomass production
- Transportation
- Industrial processing
- Distribution

Since the NEEA formula depends on the difference between EF_{fossil} and EF_{bio}, any reduction in EF_{bio} (through fossil fuel replacement or clean energy exports) boosts the efficiency score and allows for the issuance of more CBIOs per liter of ethanol.

The number of CBIOs (Decarbonization Credits) generated by a biofuel producer is calculated using the following formula:

$$CBIOs = \frac{V_{bio} \times \mathrm{LCV} \times \mathrm{NEEA} \times D}{10^3}$$

Where:

- V_{bio} = **Volume of biofuel** produced and sold (in cubic meters, m^3)
- **LCV** = **Lower Calorific Value** of the biofuel (MJ/L)
- **NEEA** = **Energy-Environmental Efficiency Score** (%)
- **D** = **Density** of the biofuel (kg/L)

So, we can conclude that NEEA is directly proportional to the generation of CBIOs. Since exported energy is one of the factors that improves the NEEA score, to be conservative, we will calculate how much the exported energy contributes to the increase in the NEEA score. Then, we will deduct this percentage from the Carbon Credits that will be generated here in this program, during the same period in which CBIOs were generated, for the issuance of carbon credits.

NEEA with exported eletricity	X
NEEA without exported eletricity	Y
Increase (%)	$\frac{(X-Y)}{Y}$
Adjustment Factor	$1-\frac{(X-Y)}{Y}$

The table shows the calculation of the adjustment factor to account for the impact of exported electricity on the NEEA score and, consequently, on CBIOs.

- **NEEA with exported electricity (X)** → Efficiency score considering exported electricity.

- **NEEA without exported electricity (Y)** → Efficiency score without considering exported electricity.

- **Increase (%)** → The impact of exported electricity on NEEA is given by:

$$\frac{(X-Y)}{Y}$$

This represents **how much the exported electricity increased the NEEA score**.

Adjustment Factor → To adjust the exported electricity for carbon credit generation without double counting with CBIOs, we apply the factor:

$$1-\frac{(X-Y)}{Y}$$

This factor can be used to **discount the fraction of Carbon Credits,** regarding exported energy that has already contributed to increasing NEEA, and respectively the CBIOs .

This percentage calculation will be applied in the specific period of issuance of the CBIO and credit year.

B.7. Changes to start date of crediting period >>

Crediting period start: Jan 01, 2013.
There is no change in the start date of crediting period.

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

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

B.9. Monitoring period number and duration>>

First Issuance Period: 12 years – Jan 01, 2013 to Dec 31, 2024

B.8. Monitoring plan>>

All energy generation data is acquired through CCEE meters installed in CARGILL Bioenergia substation. In PCN version 1.0, some inaccuracies were identified in the metering data. These have been reviewed and corrected in the current version.

Meter	Serial Number	Specification
USF 1	MW-2402A230-02 (Main)	Schneider Power Logic ION8650 3 Phases 57.7 ~ 220 V 1.0 / 5.0 A (max 20 A) 60 Hz Class D kh 1,8 Wh-varh/impulso Calibration year: 2024
USF 1	MW-2308A568-02 (Check)	Schneider Power Logic ION8650 3 Phases 57.7 ~ 220 V 1.0 / 5.0 A (max 20 A) 60 Hz Class D kh 1,8 Wh-varh/impulso Calibration year: 2023
USF 2	PT-1010A661-01 (Main)	Schneider Power Logic ION8600 3 Phases 57.7 ~ 220 V 5.0 A (max 20 A) 60 Hz Class D kh 1,8 Wh-varh/impulso Calibration year: 2024
USF 2	PT-1010A681-01 (Check)	Schneider Power Logic ION8600 3 Phases 57.7 ~ 220 V 5.0 A (max 20 A) 60 Hz Class D kh 1,8 Wh-varh/impulso Calibration year: 2024

URD	PT-1205A487-01 (Main)	Schneider Power Logic ION8600 3 Phases 57.7 ~ 220 V 5.0 A (max 10 A) 60 Hz Class D kh 1,8 Wh-varh/impulse Calibration year: 2025
URD	PT-1205A488-01 (Check)	Schneider Power Logic ION8600 3 Phases 57.7 ~ 220 V 5.0 A (max 10 A) 60 Hz Class D kh 1,8 Wh-varh/impulse Calibration year: 2025

Meter USF 1 (Main)

Meter USF 1 (Check)

Meter USF 2 (Main)

Meter USF 1 (Check)

Meter URD (Main)

Meter URD (Check)

The meters are locked and can be manipulated only under CCEE or ONS authorization. All generation data is available digitally and can be checked by the CARGILL Bioenergia personnel through CCEE system at CCEE website.

Parameters being monitored or used in emission reductions determination:

Data/Parameter	$EF_{grid,y}$
Data unit	tCO_2e/MWh
Description	CO_2 emission factor of the grid electricity in year y
Source of data Value(s) applied	https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/dados-e-ferramentas/fatores-de-emissao
Measurement methods and procedures	As per the requirements in "Tool to calculate the emission factor for an electricity system"
Monitoring frequency	Monthly
Purpose of data	To estimate baseline emissions

Data / Parameter:	$EG_{pj,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation and export supplied by the project plant/unit to the grid in year y
Source of data:	The data provided by the Câmara de Comercialização de Energia Elétrica – CCEE (Electric Energy Trading Chamber)
Measurement procedures (if any):	This parameter is monitored using bidirectional energy meter
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording
QA/QC procedures:	The meters and current transformers will be subjected to periodic calibrations/audits from ANEEL and CCEE to certify that electric energy injected in the grid data is reliable and precise, in a way to guarantee the reliability of the national grid and energy supply. As determined by government entity ONS (National Electric System Operator), in the "Submodule 6.16 - Maintenance of the billing measurement system" item 1.1.2, the calibration of the meters must occur every 5 years.