Universal Carbon Registry

PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: 132 MW Sugarcane Bagasse based co-generation Energy USINA CORURIPE

Version 2.0

Date August 6, 2025

First CoU Issuance Period: 12 years

Date: Jan 1, 2013 to Dec 31, 2024

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

BASIC INFORMATION	
Title of the project activity	132 MW Sugarcane Bagasse based co-generation Energy USINA CORURIPE
Scale of the project activity	Large Scale
Completion date of the PCN	August 6, 2025
Project participants	SA USINA CORURIPE AÇUCAR E ALCOOL (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	1,444,832 CoUs (1,444,832 tCO_2eq)

SECTION A. Description of project activity

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

The project titled "132 MW Sugarcane Bagasse based co-generation Energy USINA CORURIPE" is a 100% Brazilian company headquartered in the city of Coruripe, Alagoas, with five production units: one located in Coruripe (AL), and four in the state of Minas Gerais, in the municipalities of Iturama, Campo Florido, Limeira do Oeste, and Carneirinho.

Altogether, the units have a combined crushing capacity of 16.2 million tons of sugarcane per harvest season.

Coruripe uses sugarcane bagasse as biomass for energy generation. The bagasse, which is rich in cellulose, is burned in boilers to produce steam, which is then converted into thermal energy and subsequently into renewable electricity through a cogeneration process.

The energy generated not only supplies the industrial units and administrative offices but also enables the surplus to be sold in both the regulated and free markets, contributing to a more sustainable energy system by replacing fossil-based energy sources.

Among all units, energy export is distributed as follows:

Carneirinho Unit (UTE Carneirinho): equipped with two 12 MW generators, totaling 24 MW of installed capacity, with an energy export contract of **13 MW**.

Iturama Unit: divided into two thermal power plants (UTEs):

- UTE Usina Iturama: has one 20 MW generator, with an export contract of **12 MW**;

- UTE Coruripe Energética Iturama: has two 12 MW generators, totaling 24 MW of installed capacity, with an energy export contract of **22 MW**.

Campo Florido Unit: divided into two thermal power plants (UTEs):

- UTE Usina Coruripe Campo Florido: equipped with one 30 MW generator, with an energy export contract of **15 MW**;

- UTE Coruripe Energética Campo Florido: equipped with one 30 MW generator, with an energy export contract of **30 MW**.

Coruripe Headquarters Unit: divided into two thermal power plants (UTEs):

- UTE COR: equipped with one 16 MW generator, with an energy export contract of **16 MW**;

- UTE CVW Energética: equipped with one 40 MW generator, with an energy export contract of **24 MW**.

Unit	Installed Capacity	Export Contract	Location	Commercial Operation Date
UTE COR	16 MW	**16 MW**	Coruripe, Alagoas	February 4, 2006 (16 MW) ANEEL Dispatch Nº 237
UTE CVW Energética	40 MW	**24 MW**	Coruripe, Alagoas	February 17, 2023 (40 MW) ANEEL Dispatch Nº 450
UTE Usina Iturama	20 MW	**12 MW**	Iturama, Minas Gerais	August 16, 2011 (20 MW) ANEEL Dispatch Nº 3321
UTE Coruripe Energética Iturama	24 MW	**22 MW**	Iturama, Minas Gerais	October 31, 2002 (24 MW) ANEEL Dispatch Nº 081/2003
UTE Usina Coruripe Campo Florido	30 MW	**15 MW**	Campo Florido, Minas Gerais	July 20, 2004 (12 MW) ANEEL Dispatch Nº 574
UTE Coruripe Energética Campo Florido	30 MW	**30 MW**	Campo Florido, Minas Gerais	July 23, 2008 (30 MW) ANEEL Dispatch Nº 2711
UTE Carneirinho	24 MW	**13 MW**	Carneirinho, Minas Gerais	July 24, 2008 (12 MW) ANEEL Dispatch Nº 3459 September 19, 2008 (12MW) ANEEL Dispatch Nº 2727
Total	184 MW	**132 MW**		

The details of the registered project are as follows:

Purpose of the project activity:

The purpose of the project activity is to generate electricity using renewable biomass, specifically sugarcane bagasse, a by-product of the juice extraction process during ethanol and sugar production and thereby reduce GHG emissions by displacing fossil fuel-based electricity from the grid.

The project consists of grid-connected biomass cogeneration power plants operating with high-pressure steam turbine configurations. Bagasse-fired high-pressure boilers generate steam, which drives the turbines to produce electricity. The power generated is used for the captive consumption of the sugar production units, with surplus electricity exported to the Brazilian grid.

By displacing electricity that would otherwise be generated from more greenhouse gas (GHG)-intensive sources, the project contributes to long-term climate change mitigation. It qualifies under the environmental positive list of pre-approved project types eligible for the issuance of voluntary carbon credits under the UCR carbon incentive model.

Usina Coruripe operates five industrial units:

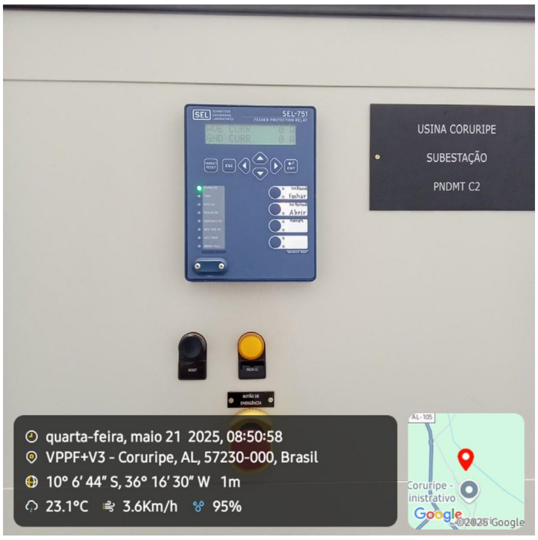
1. Coruripe Unit (AL)

Located in Coruripe, Alagoas.
Headquarters of the company.
Crushing capacity: ~3.5 million tons of sugarcane per harvest.
Recently expanded with the CVW thermal power plant for additional electricity generation.

Coruripe Unit

UTE CVW

UTE Coruripe



Feeder Protection Relay

Boiler

Turbine Control

2. Iturama Unit (MG)

Located in Iturama, Minas Gerais.
Crushing capacity: ~3.5 million tons per harvest.
Hosts two power plants: UTE Usina Iturama and UTE Coruripe Energética Iturama.

Boiler

UTE Coruripe Energética Iturama

Electrical panels

Bagasse yard and conveyor

3. Campo Florido Unit (MG)

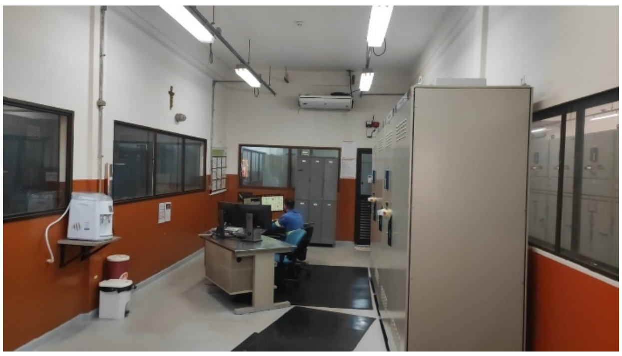
Located in Campo Florido, Minas Gerais.
Crushing capacity: ~4.3 million tons per harvest.
Includes UTE Usina Coruripe Campo Florido and UTE Coruripe Energética Campo Florido.

Campo Florido Unit

Boiler

Powerhouse

Bagasse Conveyors



Mill Operation

Bagasse Yard

4. Carneirinho Unit (MG)

Located in Carneirinho, Minas Gerais.
Crushing capacity: ~2.5 million tons per harvest.
Operates UTE Carneirinho with two 12 MW generators.

General view of the unit

Chimney and gas scrubber

Electrical substation

Bagasse yard

Conveyor belt

Generator 02

5. Limeira do Oeste Unit (MG)

Located in Limeira do Oeste, Minas Gerais.
Crushing capacity: ~2.5 million tons per harvest.
Recently received investments for a new sugar production facility.

It Generates electricity from biomass, using sugarcane bagasse as its primary fuel source. However, the energy generated by this unit is used exclusively for internal consumption at the industrial facility and is not exported to the National Interconnected System (SIN), and it will not be included in this report.

Although it does not export electricity, the Limeira do Oeste unit is recognized for its production and use of clean and renewable energy. It has been awarded the "Energia Verde" (Green Energy) seal by the Brazilian Sugarcane Industry Association (UNICA) and the Electric Energy Commercialization Chamber (CCEE).

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 Coruripe sugar and ethanol plants provide significant employment opportunities in Alagoas and Minas Gerais, engaging aproximately 8,000 direct employees work across its five industrial units. Additionally, the company generates around 25,000 indirect jobs per year, significantly contributing to the local and regional economy. The company promotes a strong culture of safety, ethics, and continuous professional development for all its entire workforce.

- Coruripe is committed to workplace safety and invests in initiatives that improve employee well-being, alongside programs supporting community development and education in its area of influence.

- The company also maintains transparent data privacy and protection policies for all stakeholders interacting with its operations.

Environmental benefits:

- The project displaces fossil fuel-based electricity generation by producing renewable electricity from sugarcane bagasse, significantly reducing greenhouse gas (GHG) emissions and local air pollution.
- Coruripe engages in sustainable agriculture practices, including reusing sugarcane ash as fertilizer to improve soil health and reduce chemical fertilizer use.
- The company implements waste management techniques such as composting organic residues and fertigation by recycling vinasse and treated wastewater, further promoting circular economy principles.
- Coruripe holds certifications and recognition for its renewable electricity energy generation, including the "Energia Verde" seal awarded to units such as Limeira do Oeste, highlighting its commitment to renewable energy.
- The company's renewable energy generation supports the Brazilian grid with cleaner power, contributing to national climate goals and energy transition.
- Preservation of Natural Areas: Usina Coruripe maintains over 28,000 hectares of preserved areas, including seven Private Natural Heritage Reserves (RPPNs) such as Porto Cajueiro in Januária (MG) and Mutum de Alagoas in Coruripe (AL). These reserves protect approximately 7,000 hectares of original Atlantic Forest, contributing to biodiversity conservation and ecological balance.
- Native Seedling Production: The company operates a nursery in Alagoas capable of producing up to 80,000 native Atlantic Forest seedlings annually. These seedlings are utilized for reforestation, forest restoration, and ecological corridor formation in partnership with municipal and environmental agencies.
- Water Resource Management: Coruripe monitors springs, stream margins, and riverbanks to ensure sustainable water use. This includes partnerships for the release of animals rescued from illegal captivity, promoting ecological balance and wildlife protection.
- Waste Management and Fertilization: The company employs sustainable practices such as composting organic waste from cafeterias and fertigation using vinasse and treated wastewater. These methods reduce chemical fertilizer use and minimize water consumption, enhancing soil health and crop productivity.

Economic benefits:

- The project provides reliable, low-cost renewable energy that supports local industrial and residential consumers, fostering regional economic growth.
- By generating renewable electricity and biofuels, Coruripe contributes to energy security and diversification of the Brazilian energy matrix.

- The project encourages technological development and investments in modern cogeneration and bioenergy facilities, strengthening local economies and creating job opportunities.

Through these positive impacts, the project activity clearly supports sustainable development without causing harm to social, environmental, or economic systems in its operational regions.

Coruripe contribute significantly to economic, environmental and social matters, however, stands out as it contributed to all 17 SDG's.

SDG	Target	How was it achieved?
	1.2 - By 2030, reduce at least by half the proportion of men, women and children living in poverty in all its dimensions according to national definitions.	Projects like "Barriga Cheia" and the territorial strengthening of the Pontes community have increased household income by over 1000%.
	2.1 - By 2030, end hunger and ensure access by all people to safe, nutritious and sufficient food all year round.	Donation of food and support for family farming in neighboring communities demonstrate action against hunger.
	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	Implementation of occupational health and safety programs and the "Programa Acolher" for emotional support during and after the pandemic.
	4.4 - By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship	Investments in early childhood education and socio-environmental education programs in municipal schools.
	5.5 - Ensure women's full and effective participation and equal opportunities for leadership at all levels of decisionmaking in political, economic and public life	Creation of a Women's Committee, executive bonus tied to hiring women, and adherence to UN Women Empowerment Principles.
	6.3 - By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials.	Monitoring of water resources and reuse of treated effluents (vinasse and wastewater) via fertigation in sugarcane crops.

7 AFFORDABLE AND CLEAN ENERGY	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix.	100% of the energy consumed in operations is self-generated from renewable sources.
8 DECENT WORK AND ECONOMIC GROWTH	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	Job creation, prohibition of child labor, emphasis on safety, and support for local suppliers in a responsible value chain.
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	Expansion of production units, investment in transport infrastructure, and development of the Conecta innovation program.
10 REDUCED INEQUALITIES	10.2 - By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status	Internal inclusion policies, support for diverse supplier hiring, and social projects to empower vulnerable communities.
11 SUSTAINABLE CITIES AND COMMUNITIES	11.5 – By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.	Built urban infrastructure, such as an airstrip to support firefighting efforts in the Januária region (MG).
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	12.2 - By 2030, achieve the sustainable management and efficient use of natural resources 12.5 - By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	Adoption of circular economy principles, full reuse of waste, Bonsucro and RenovaBio certifications.
13 CLIMATE ACTION	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.	Annual GHG inventories, investments in logistics to reduce emissions, and compliance with sustainability-linked bonds.

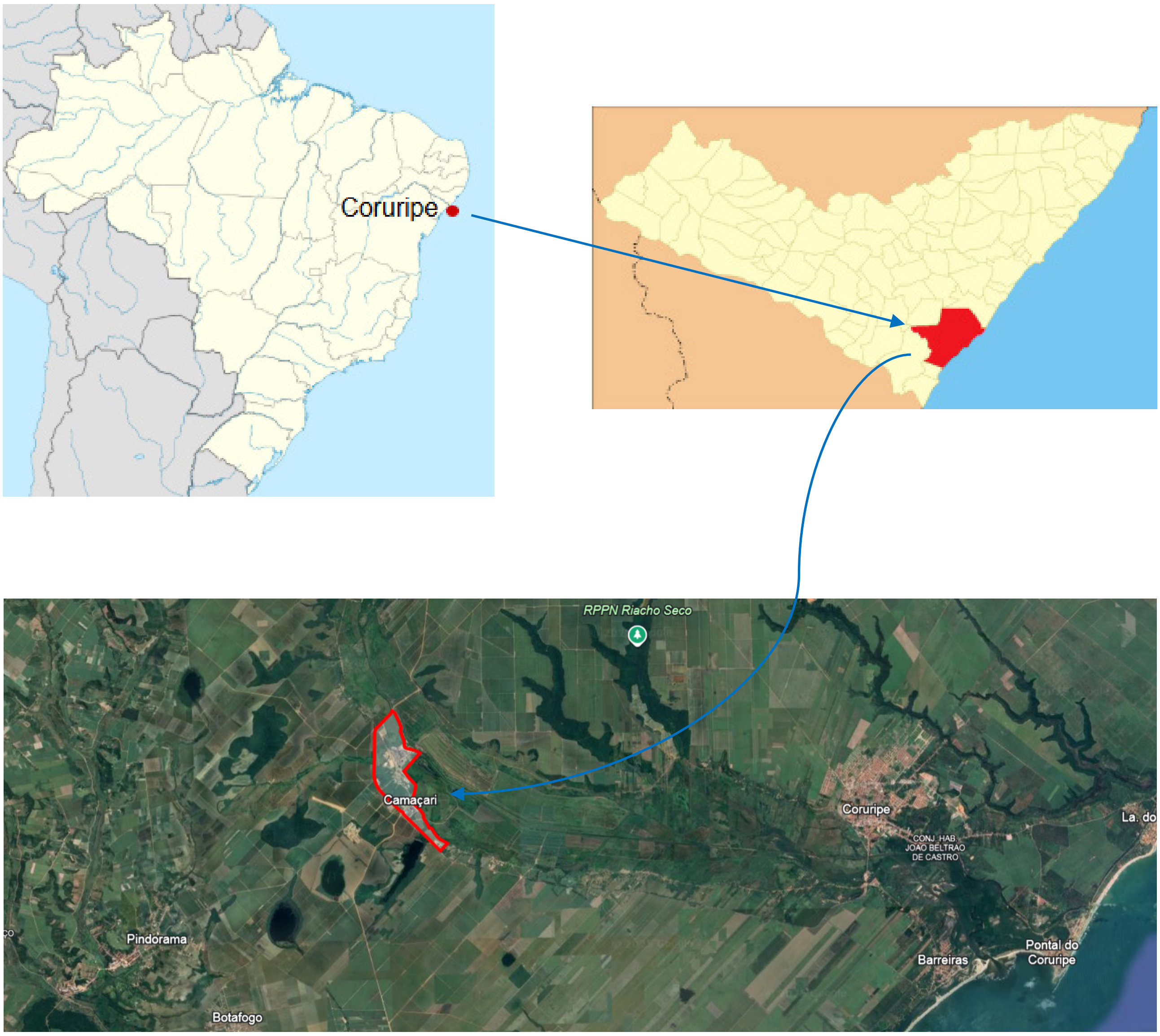
14 LIFE BELOW WATER	14.2 – Sustainably manage and protect marine and coastal ecosystems 14.4 – Effectively regulate harvesting and end overfishing 14.a – Increase scientific knowledge, develop research capacity and transfer marine technology	Promotes the sustainable management and protection of aquatic ecosystems by restoring native fish populations, thereby improving biodiversity and the resilience of freshwater habitats. Contributes to the recovery of native fish stocks, supporting small-scale artisanal fisheries and enhancing food security in local communities. Supports the generation and dissemination of scientific and technical knowledge for the effective management of aquatic ecosystems through community engagement, environmental education, and ecosystem monitoring.
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.a - Mobilize significant resources from all sources to conserve and sustainably use biodiversity and ecosystems.	Conservation of over 23,000 hectares of native vegetation, flora and fauna monitoring, and active management of RPPNs.
16 PEACE, JUSTICE AND STRONG INSTITUTIONS	16.6 - Develop effective, accountable and transparent institutions at all levels	Presence of ethics code, whistleblower channels, anti-corruption policies, and certified governance practices.
17 PARTNERSHIPS FOR THE GOALS	17.17 - Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships	Signatory to the UN Global Compact and UN Women, and active collaboration with stakeholders through sustainability forums.

A.3. Location of project activity >>

1. Coruripe Unit (AL)

Country: Brazil
District: Coruripe
State: Alagoas
Zip Code: 57230-000

- **Latitude:** 10° 7' 24.24" S
- **Longitude:** 36° 16' 27.12" W



2. Iturama Unit (MG)

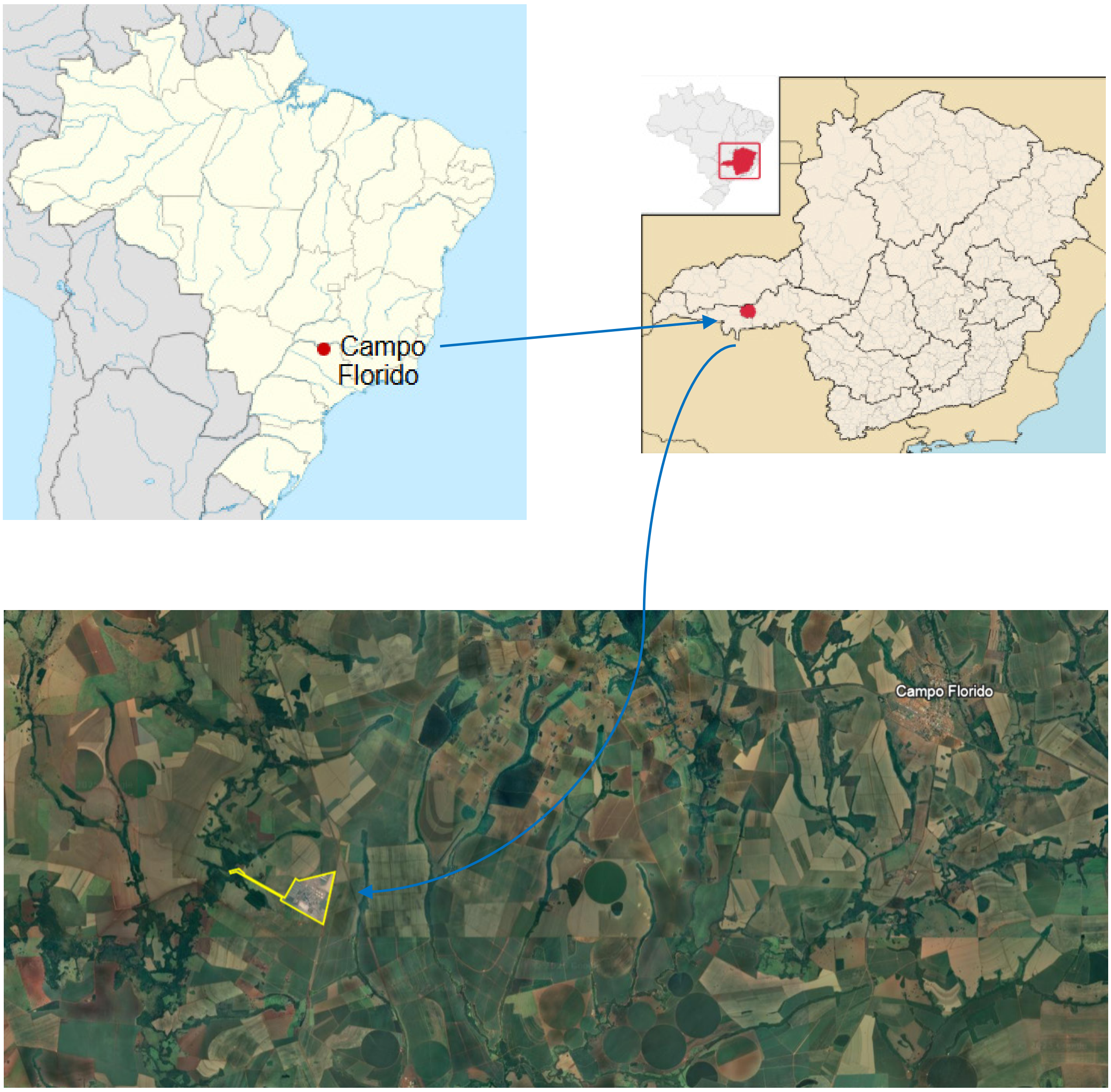
Country: Brazil
District: Iturama
State: Minas Grais
Zip Code: 38280-971

- **Latitude:** 19°43' 41.02" S
- **Longitude:** 50°11' 44.02" W

3. Campo Florido Unit (MG)

Country: Brazil
District: Campo Florido
State: Minas Grais
Zip Code: 38130-000

- **Latitude:** 19°46' 51" S
- **Longitude:** 48°43'56" W



4. Carneirinho Unit (MG)

Country: Brazil
District: Carneirinho
State: Minas Grais
Zip Code: 38290-000

- **Latitude:** 20° 4' 11.02" S
- **Longitude:** 50° 59' 57.60" W

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

1. Coruripe Unit (AL)

The system consists of one energy generating unit of 16 MW, supplied by two boilers (boilers number 4 and 7) for UTE Coruripe Usina (COR).
And one energy generating unit (40 MW), supplied by one boiler (boiler number 8) for UTE CVW Coruripe Energética.

Alternator/ Generator nº 5
(UTE Coruripe Usina COR)

Nameplate data: Alternator/ Generator nº 5
(UTE Coruripe Usina COR)

Alternator/ Generator nº 6
(UTE Coruripe CVW Energética)

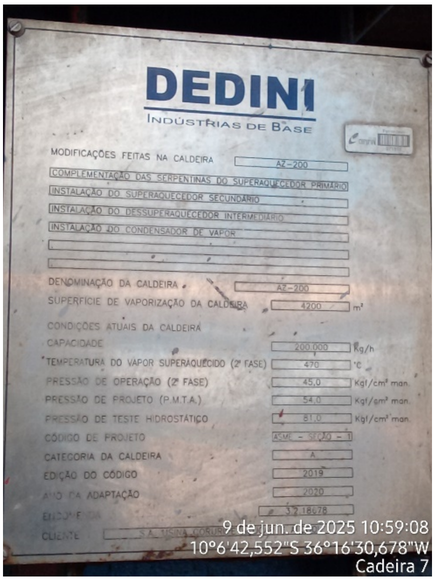
Nameplate data: Alternator/ Generator nº 6
(UTE Coruripe CVW Energética)

Alternator/ Generator	Nº 5	Nº 6
Year of manufacturer	April 2004	November 2021
Manufacturer	GE - Gevisa	WEG
Power Rated (kVA)	20	50
Serial Number	RWH 227001365	1061128808
Voltage (V)	13,800	13,800
Current (Amps)	837	2,092
Power Factor (cos φ)	0.8	0.80
Efficiency (75%, 100% of load)	98.1%	97.6%, 97.7%
Generator Rated Speed (rpm)	1,800	1,800
Frequency (Hz)	60	60
Generator Model	271R524G1	ST41-1120

Boiler nº 4 Coruripe Usina (COR)

Nameplate data: Boiler nº 4 Coruripe Usina (COR)

Boiler nº 7 Coruripe Usina (COR)



Nameplate data: Boiler nº 7 Coruripe Usina (COR)

Boiler nº 8 Coruripe Energética (CVW)

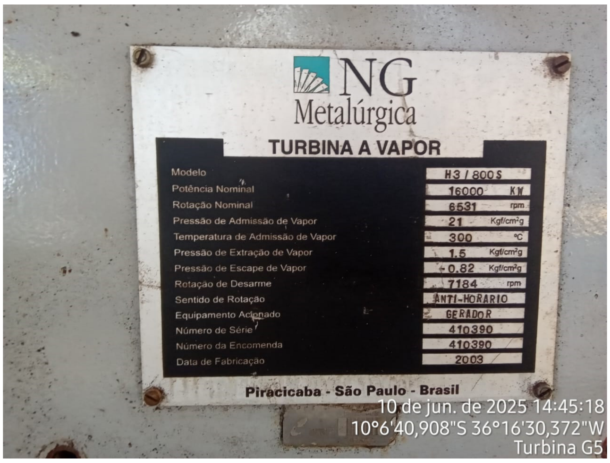
Nameplate data: Boiler nº 8 Coruripe Energética (CVW)

Boiler	**Nº 4 (COR S.A.)**	**Nº 7 (COR S.A.)**	**Nº 8 (CVW)**
Manufacturer	M. Dedini	Dedini	Triniton
Capacity (Tons/h)	110	200	250
Model	V 2 / 4 GB Aumentada	AZ-200	TSG-250
Year of manufacturer / Refurbished	1974 / 2009	2019 / 2020	2020 / 2021
Maximum allowable working pressure (kgf/cm^2g)	23.0	54.0	54.0
Hydrostatic Test Pressure (kgf/cm^2g)	34.5	81.0	80
Pressure (kgf/cm^2)	20.5	45.0	45.0
Degree of super heat °C (Steam)	300	470	450
Heating surface area (m^2)	2,500	4,200	5,100
Design Standard	ASME Section 1	ASME Section 1	ASME Section 1 / 2019
category	A	A	A

Turbines No. 6 does not have the nameplate data affixed. However, below is the screenshots of the turbine technical data extracted from its manual.

Turbine 5
UTE Coruripe Usina COR

Turbine 6
Coruripe Energética (CVW)



TGM WEG Energia
Unidade Turbinas

Proposta nº: 21246996 R3 - Técnica | Emissão: 19/03/2020 | Página: 10 / 33

3. Informação Técnica da Turbina

3.1. Condições de operação

Máquina Acionada	Gerador	
Modelo da turbina	BT 50	
Ponto de carga	**1**	**Unidades**
Potência nos bornes do gerador	**40.000**	**kW**
Pressão de vapor na entrada	45	bar (g)
Temperatura de vapor na entrada	450	ºC
Vazão de vapor na entrada	244.159	kg/h
Pressão de vapor no escape	1,5	Kgf/cm2(g)
Vazão de vapor no escape	244.159	kg/h
Rotação da turbina	5.440	rpm
Rotação da máquina acionada	1.800	rpm
Consumo específico	6,1	kgvap/kwh
Tolerância	3,0	%

Eficiências adotadas: Gerador: 97,7% / Redutor: 98,7%

Sentido de rotação visto do fluxo do vapor
- Turbina: Anti-horário
- Gerador: Horário

Nameplate data: Turbine no 5 (UTE Coruripe Usina COR)

Nameplate data: Turbine no 6 (UTE Coruripe Usina COR)

Turbine	**Nº 5**	**Nº 6**
Year of manufacturer or Retrofit	2003	2000
Manufacturer	NG Metalúrgica	TGM Weg
Power Rated (kW)	16,000	40,000
Live Steam Pressure (Bar)	21	45
Live Steam Temperature (ºC)	300	450
Steam Exhaust Pressure (Bar)	1.5	1.5
Turbine Rated Speed (rpm)	6,531	5,440
Turbine Disarm Speed (rpm)	7,184	Not Available
Turbine Model	H3 / 800 S	BT 50

2. Iturama Unit (MG)

The system consists of two energy generating units, supplied by one boiler for UTE Coruripe Energética Iturama and one energy generating unit, supplied by one boiler for UTE Usina Iturama.

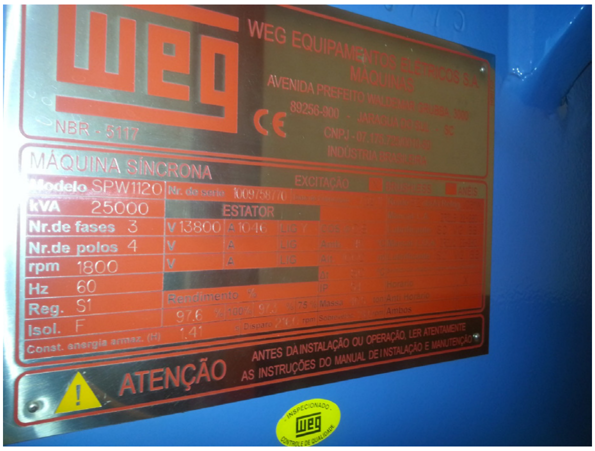
Alternator/ Generator nº 1
(UTE Coruripe Energética Iturama)

Nameplate data: Alternator/ Generator nº 1
(UTE Coruripe Energética Iturama)

Alternator/ Generator nº 2
(UTE Coruripe Energética Iturama)

Nameplate data: Alternator/ Generator nº 2
(UTE Coruripe Energética Iturama)

Alternator/ Generator nº 3
(UTE Coruripe Iturama)



Nameplate data: Alternator/ Generator nº 3
(UTE Coruripe Iturama)

Nameplate data: Alternator/ Generator nº 3
(UTE Coruripe Iturama)

Alternator/ Generator	**Nº 1**	**Nº 2**	**Nº 3**
Year of manufacturer	February 2002	January 2002	February 2011
Manufacturer	WEG	WEG	WEG
Power Rated (kVA)	15	15	25
Serial Number	104603	89006	1009758770
Voltage (V)	13,800	13,800	13,800
Current (Amps)	627.6	627.6	1046
Power Factor (cos φ)	0.80	0.80	0.80
Efficiency (75%, 100% of load)	Not available	Not available	97.3 / 97.6
Generator Rated Speed (rpm)	1,800	1,800	1,800
Frequency (Hz)	60	60	60
Generator Model	SSW900	SSW900	SPW1120

Boiler nº 1 Iturama

Nameplate data: Boiler nº 1 Iturama

Boiler nº 2 Iturama

Nameplate data: Boiler nº 2 Iturama

Boiler nº 2 Iturama

Boiler nº 3 Energética Iturama

Boiler nº 3 Energética Iturama

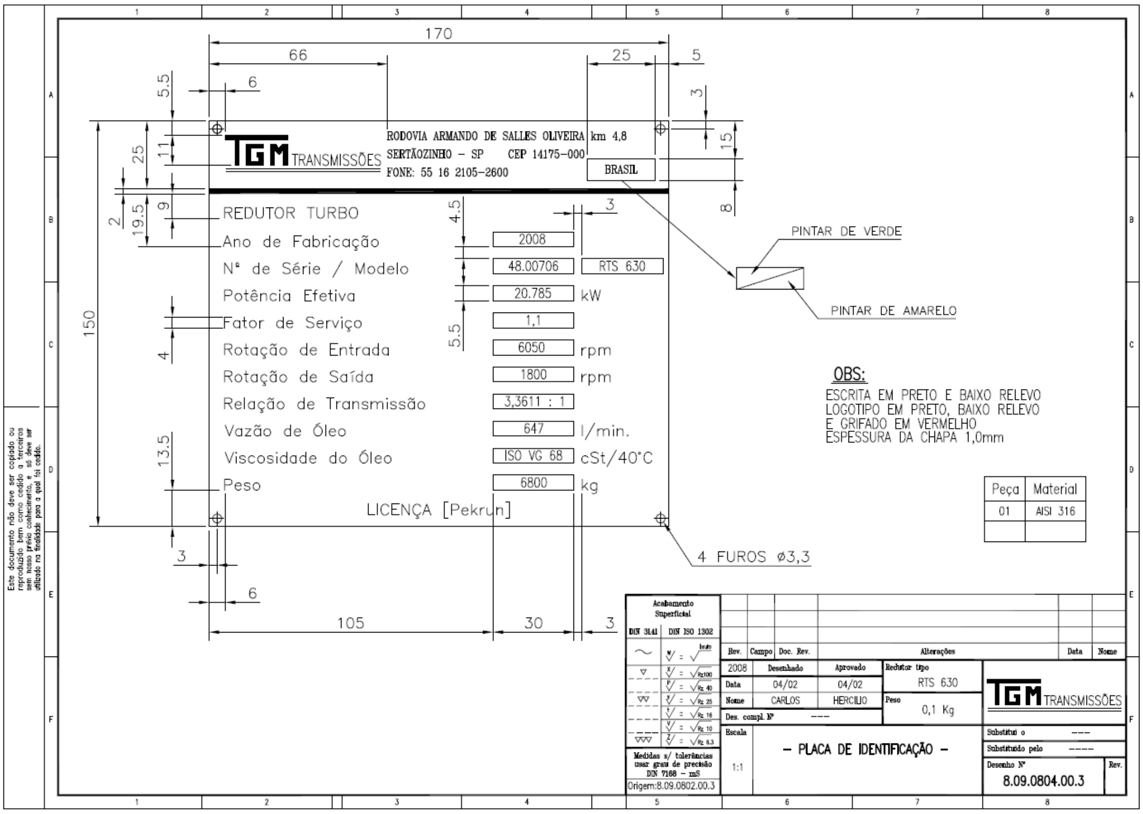
Nameplate data: Boiler nº 3 Energética Iturama

Boiler	**Nº 01 (ITU S.A.)**	**Nº 02 (ITU S.A.)**	**Nº 03 (ITU ENE)**
Manufacturer	Sermatec	Equipalcool	Sermatec
Capacity (Tons/h)	95	150	200
Serial number	21-25	174/12	52002
Year of manufacturer	2001	2010	2002
Maximum allowable working pressure (kgf/cm^2g)	33	54	53
Hydrostatic Test Pressure (kgf/cm^2g)	49	81	79,5
Pressure (kgf/cm^2)	29	45	45
Degree of super heat ºC (Steam)	350	455	455
Heating surface area (m^2)	2245	2010	4620
Design Standard	ASME Section I / 1995	ASME Section I / 2007	ASME -98
category	A	A	A

Nameplate data: Turbine nº 1
(UTE Coruripe Energética Iturama)

Nameplate data: Turbine nº 2
(UTE Coruripe Energética Iturama)

Turbine nº 3 does not have the nameplate data affixed. However, below are some screenshots of the technical data extracted from its manual.



Máquina acionada	Gerador	
Potência nos bornes do gerador	20000	kW
Pressão do vapor de entrada	42	Kgf/cm²
Temperatura do vapor de entrada	450	° C
Vazão do vapor de entrada	137.000	Kg/h
Pressão do vapor de saída	1,5	Kgf/cm²
Consumo específico	6,85	Kg/kWh
Rotação da turbina	6000	Rpm
Rotação do gerador	1800	Rpm
Tolerância	3	%

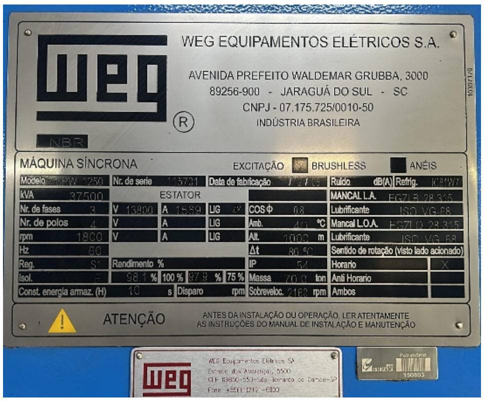
Critério	Tag TGM	Alarme	Desarme de Emergência	Intertravamento	Unidade
Sobrevelocidade (mecânico)	20.10	----	6600	----	rpm
Sobrevelocidade (eletrônico)	20.42	----	----	Trip por sobrevelocidade	----
	53.08	----	----	Turbina armada	----
Deslocamento axial do eixo da turbina	39.21.3/39.22.3	≤-0,34/ ≥0,34	≤-0,54/ ≥0,54	----	mm
Vibração dos mancais da turbina	37.00.3/37.01.3	≥89	≥116	----	µm
Vibração dos mancais do eixo do redutor	37.10.3/37.11.3	≥89	≥116	----	µm
	37.12.3/37.13.3	≥162	≥212	----	µm
Vibração dos mancais do eixo do gerador	37.20.3/37.21.3	≥162	≥212	----	µm
Pressão do óleo de lubrificação	31.10.4	≤4	----	Trip turbina	Kgf/cm^2g
	51.30	≤2	----	Desarma turbina	Kgf/cm^2g
	51.35	≤1,5	----	Desarma baixa pressão e aciona bomba emergência	Kgf/cm^2g
Pressão do óleo de impulso (P1)	31.00.4	≤6	----	----	Kgf/cm^2g
	51.40	≤6	----	Aciona bomba auxiliar	Kgf/cm^2g
Pressão de elevação do rotor	51.32	≤3	----	Bloqueia giro lento	Kgf/cm^2g
Pressão diferencial do filtro de óleo	31.01.4	≤0,8	----	----	Kgf/cm^2g
Nível de óleo no tanque	35.00.4	92	----	----	%
Pressão do vapor escape	30.10.4	≥1,5	----	----	Kgf/cm^2g
	51.00	≥2,25		Trip turbina	Kgf/cm^2g
Turbina desarmada	53.00	----	----	Válvula F.R. Admissão - Aberta	----
Alavanca de giro lento	53.02	----	----	Intertravamento Giro lento	----

Turbine	**Nº 1**	**Nº 2**	**Nº 3**
Year of manufacturer	2001	2001	2008
Manufacturer	TGM Turbinas	TGM Turbinas	TGM Turbinas
Power Rated (kW)	12,000	12,000	20,000
Live Steam Pressure (Bar)	45	45	42
Live Steam Temperature (ºC)	450	450	450
Steam Exhaust Pressure (Bar)	1.5	1.5	1.5
Turbine Rated Speed (rpm)	6,500	6,500	6,000
Turbine Disarm Speed (rpm)	7,150	7,150	6,600
Turbine Model	TM 12000 A	TM 12000 A	RTS 630

3. Campo Florido Unit (MG)

The system consists of one energy generating unit, supplied by two boilers for UTE Coruripe Campo Florido, and another energy generating unit, supplied by one boiler for UTE Coruripe Energética Campo Florido

Alternator/ Generator nº 1
(UTE Coruripe Energética Campo Florido)



Nameplate data: Alternator/ Generator nº 1
(UTE Coruripe Energética Campo Florido)

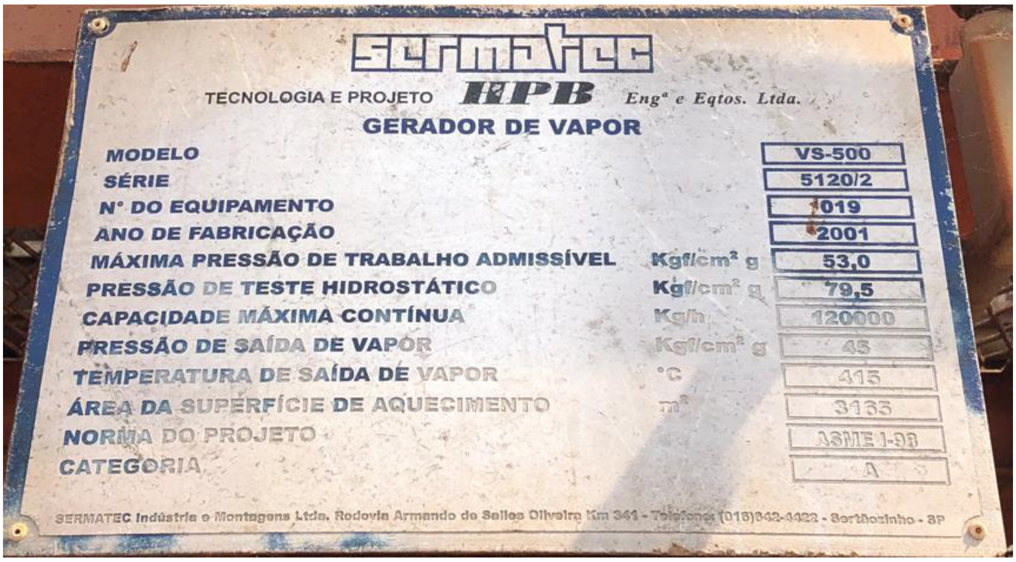
Alternator/ Generator nº 2
(UTE Coruripe Campo Florido)

Nameplate data: Alternator/ Generator nº 2
(UTE Coruripe Campo Florido)

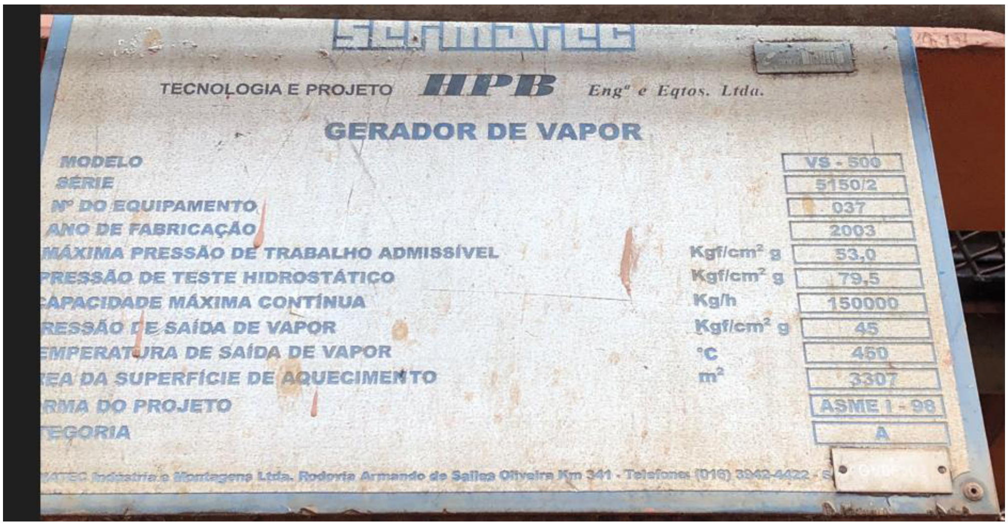
Alternator/ Generator	Nº 1	Nº 2
Year of manufacturer	December 2006	March 2012
Manufacturer	WEG	WEG
Power Rated (kVA)	37,5	37,5
Serial Number	115701	1013725100
Voltage (V)	13,800	13,800
Current (Amps)	1,569	1,569
Power Factor (cos φ)	0.80	0.80
Efficiency (75%, 100% of load)	97.9%, 98.1%	97.8%, 97.9%
Generator Rated Speed (rpm)	1,800	1,800
Frequency (Hz)	60	60
Generator Model	SPW 1250	SPW 1120

Boilers nº 1, 2 and 3

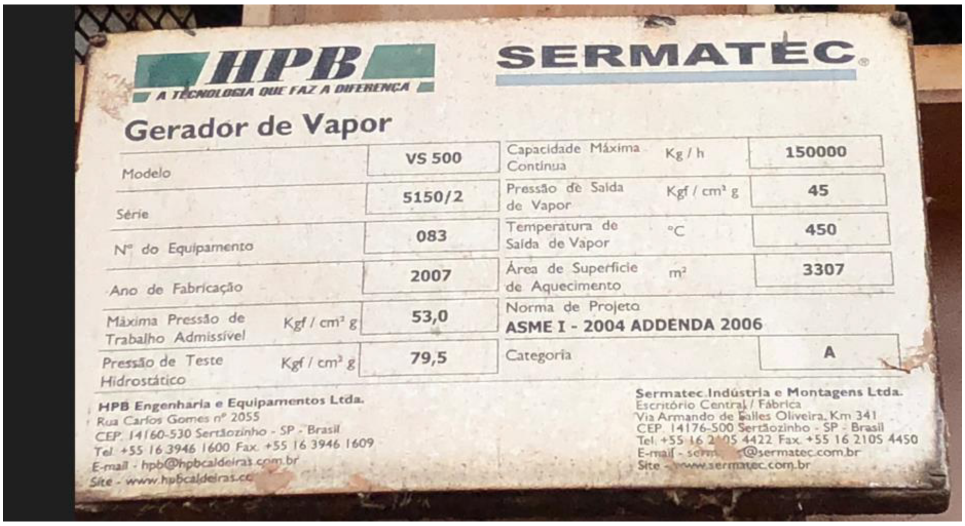
Aerial view of boilers nº 1, 2 and 3



Nameplate data: Boiler nº 1

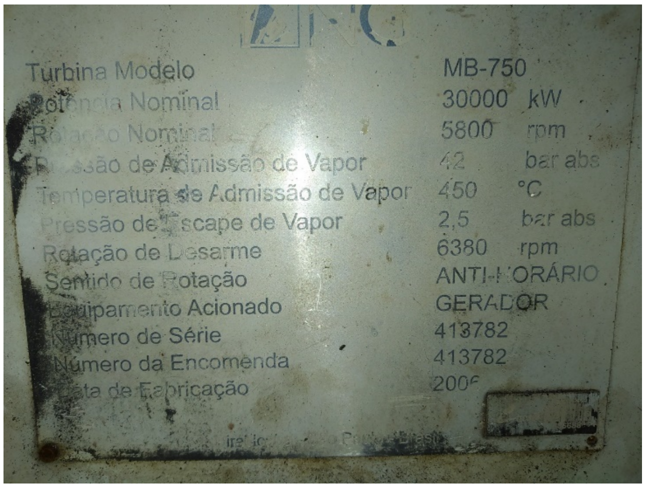


Nameplate data: Boiler nº 2



Nameplate data: Boiler nº 3

Boiler	Nº 01 (CF S.A.)	Nº 02 (CF S.A.)	Nº 03 (CF ENE)
Manufacturer	Sermatec	Sermatec	Sermatec
Capacity (Tons/h)	120	150	150
Serial number	5120/2 - 1019	5150/2	5150/2 - 83
Year of manufacturer	2001	2003	2003
Maximum allowable working pressure (kgf/cm^2g)	53	53	53
Hydrostatic Test Pressure (kgf/cm^2g)	79,5	Sermatec	Sermatec
Pressure (kgf/cm^2)	45	45	45
Degree of super heat ºC (Steam)	415	460	460
Heating surface area (m^2)	3165	3307	3307
Design Standard	ASME I / 98	ASME I / 98	ASME I / 2004 Addenda 2006
category	A	A	A



Nameplate data: Turbine nº 1

Nameplate data: Turbine nº 2

Turbine	**Nº 1**	**Nº 2**
Year of manufacturer	2008	2006
Manufacturer	NG Metalúrgica	NG Metalúrgica
Power Rated (kW)	30,000	30,000
Live Steam Pressure (Bar)	42	42
Live Steam Temperature (ºC)	450	450
Steam Exhaust Pressure (Bar)	2.5	2.5
Turbine Rated Speed (rpm)	5,800	5,800
Turbine Disarm Speed (rpm)	6,380	6,380
Turbine Model	MB - 750	MB - 750

4. Carneirinho Unit (MG)

The system consists of two energy generating units, which are supplied by two boilers:

Alternator/ Generator nº 1

Nameplate data: Alternator/ Generator nº 1

Alternator/ Generator nº 2

Nameplate data: Alternator/ Generator nº 2

Alternator/ Generator	**Nº 1**	**Nº 2**
Year of manufacturer	November 2003	February 2002
Manufacturer	WEG	WEG
Power Rated (kVA)	15	15
Serial Number	118278	104604
Voltage (V)	13,800	13,800
Current (Amps)	627.6	627.6
Power Factor (cos φ)	0.80	0.80
Efficiency (75%, 100% of load)	97.4%, 97.6%	97.4%, 97.6%
Generator Rated Speed (rpm)	1,800	1,800
Frequency (Hz)	60	60
Generator Model	SSW 900	SSW 900

Boilers nº 1 and 2

Aerial view of boilers 1 and 2

Boiler nº 1

Nameplate data: Boiler nº 1

Nameplate data: Boiler nº 2

Boiler	Nº 01	Nº 02
Manufacturer	Equipalcool	Equipalcool
Capacity (Tons/h)	150	150
Serial number	106/06	174/12
Year of manufacturer	2006	2012
Maximum allowable working pressure (kgf/cm^{2}g)	52	76
Hydrostatic Test Pressure (kgf/cm^{2}g)	78	114
Pressure (kgf/cm^2)	45	67
Degree of super heat ºC (Steam)	470	520
Heating surface area (m^2)	4200	4900
Design Standard	ASME Section I / 2001	ASME I / 2010
category	A	A

Turbine nº 1

Turbine nº 2

The turbines are coupled to the generator and are covered with insulation, making it impossible to access the nameplate data. However, below is a screenshot of the technical data extracted from their manuals.

The turbines were originally purchased for the Campo Florido unit, but were later transferred to the Carneirinho unit.

1.2 – CONDIÇÕES DE OPERAÇÃO DA TURBINA

	Pontos de Carga			
Condições de Operação	**A**	**B**	**C**	**Unidade**
Vapor vivo				
Pressão (man)	45,0			Kgf/cm².g
Temperatura	450			°C
Vapor de saída				
Pressão (man)	1,5			Kgf/cm².g
Vazão	84,2			T / h
Consumo específico	7,02			Kg / Kwh
Rotação Nominal				
Turbina	6500			rpm
Máquina Acionada	1800			rpm
Potência				
Acoplamento da turbina	12.240			kW
Rotação do Fecho Rápido (Trip)				
Turbina	7150			rpm
Máquina Acionada	1800			rpm
Ponto de Garantia	X			
Conexão de vapor de admissão ANSI B 16,5				10" 600 lb
Conexão de vapor de escape ANSI 16,5				24" 150 lb
Sentido de Rotação da Turbina Visto da turbina para máquina acionada				Anti-Horário
Suavidade de Operação – Corpo de mancal Norma: VDI 2056 Grupo de avaliação: T Velocidade efetiva de vibração (máx): 2,8 m/ s				

TGM TURBINAS	Cliente:Us. Campo Florido Turbina TM 12000 O.S.: 40167

1.2 – CONDIÇÕES DE OPERAÇÃO DA TURBINA

Condições de Operação	Pontos de Carga			Unidade
	A	B	C	
Vapor vivo				
Pressão (man)	40,0			Kgf / cm²
Temperatura	420			ºC
Vapor de saída				
Pressão (man)	1,5			Kgf / cm²
Vazão	88,2			T / h
Consumo específico	7,35			Kg / Kwh
Rotação Nominal				
Turbina	6500			rpm
Máquina Acionada	1800			rpm
Potência				
Acoplamento da turbina	12000			kW
Rotação do Fecho Rápido (Trip)				
Turbina	7150			rpm
Máquina Acionada	1980			rpm
Ponto de Garantia	X			
Conexão de vapor de admissão ANSI B 16,5	10" 600 lb			
Conexão de vapor de escape ANSI 16,5	24" 150 lb			
Sentido de Rotação da Turbina Visto da turbina para máquina acionada	Anti-horário			
Suavidade de Operação – Corpo de mancal Norma: VDI 2056 Grupo de avaliação: T Velocidade efetiva de vibração (máx): 2,8 m/ s				

Turbine	**Nº 1**	**Nº 2**
Manufacturer	TGM Turbinas	TGM Turbinas
Power Rated (kW)	12,240	12,000
Live Steam Pressure (Bar)	45	40
Live Steam Temperature (ºC)	450	420
Steam Exhaust Pressure (Bar)	1.5	1.5
Turbine Rated Speed (rpm)	6,500	6,500
Turbine Disarm Speed (rpm)	7,150	7,150
Turbine Model	TM 12000	TM 12000

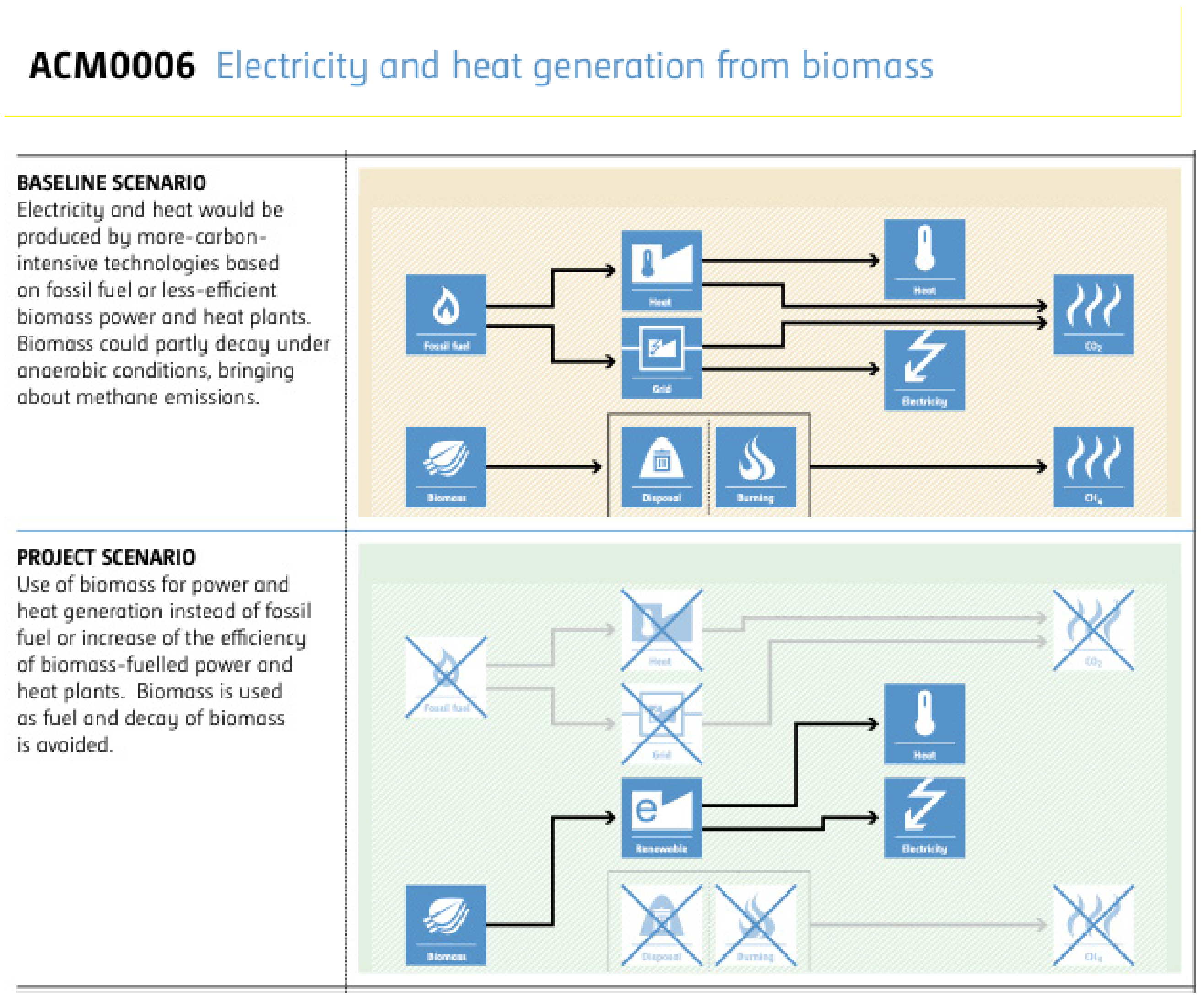
A.5. Parties and project participants >>

Party (Host)	Participants
Brazil	**Owner:** SA USINA CORURIPE AÇUCAR E ALCOOL Fazenda Triunfo S/N, Zona Rural, municipality of Coruripe, State of Alagoas, Zip Code: 5723-000 https://www.usinacoruripe.com.br/ **Aggregator:** FastCarbon Consultoria e Negócios Ltda Rua Viradouro, 63, conjunto 61, Itaim Bibi São Paulo/SP Zip Code: 04538-110 https://www.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 "132 MW Sugarcane Bagasse based co-generation Energy USINA CORURIPE" 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 I - Larger renewable energy or energy efficiency projects. (Biomass Energy)

CATEGORY - ACM0006: "Electricity and heat generation from biomass" Version 16.0

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 132 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.

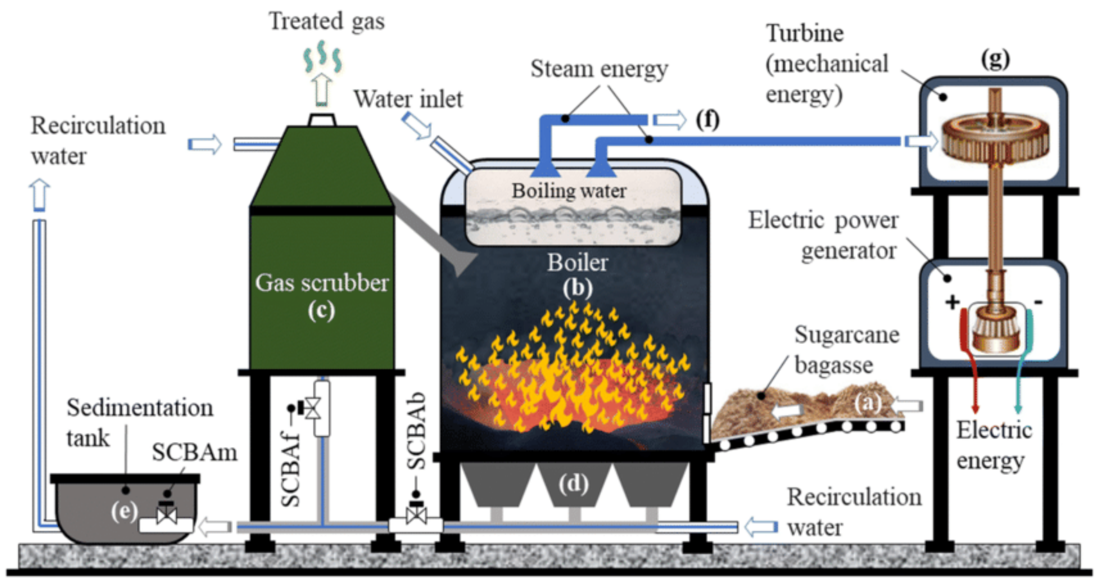
USINA CORURIPE is also certified by Renovabio, which is the Brazilian National Biofuels Program, created to encourage the production and use of sustainable biofuels, such as ethanol and biodiesel, replacing gasoline and diesel, which are more polluting fossil fuels. The lower the carbon intensity of 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,

$PE_{Biomass,CH4,y}$ = 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 2014 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:

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

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 2023 available in the Ministry of Science, Technology and Innovation website:

OM = 0.3785

BM = 0.0467

Resulting in $EF_{grid,CM,y}$ = 0.2126

Estimated power generation per year as 397,980 MWh,

Resulting in BEy = 84,610 tCO_2

Since the project is a biomass co-generation project:

PEy = 0
LEy = 0

So as result $ERy = BEy$

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 = 84,610 x 0.9 = 76,149 tCO_2 / year

Estimated Annual emission reductions: ERy = 76,149 tCO_2 / year (76,149 CoUs /year)

Actual total emission reductions: ERy = 1,444,832 CoUs (1,444,832 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.

CORURIPE is 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.

CBIOs are financial instruments issued **exclusively** from the certified 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 renewable electricity 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:

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

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: 01/01/2013.
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>>

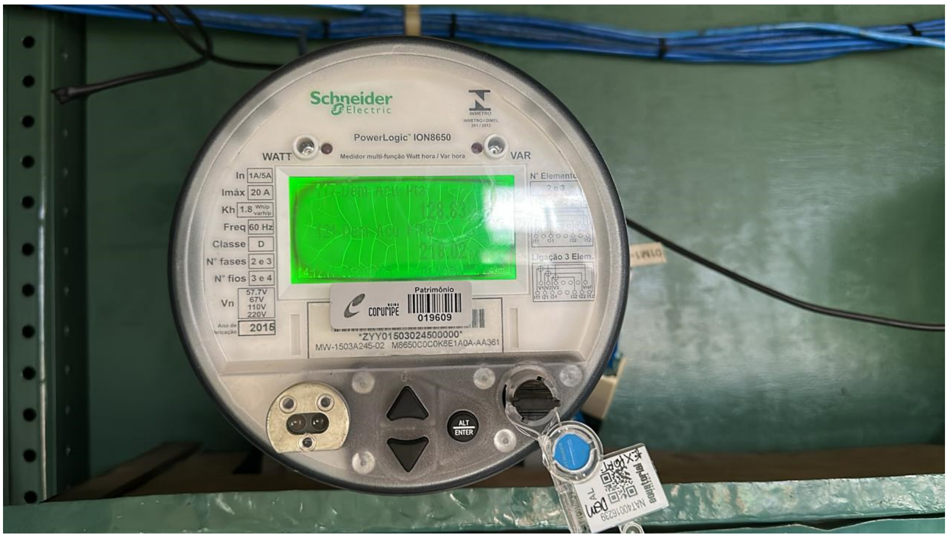
All energy generation data is acquired through CCEE meters installed in CORURIPE substation.

Meter	Serial Number	Specification
1	UTE CORURIPE Headquarters (COR) MW-1503A245-02 (Main) Metering point: ALCORUGER--03P	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/pulse Year of manufacturer: 2015 Last Calibration: 12/02/2025
2	UTE CORURIPE Headquarters (COR) MW-2103A627-02 (Check) Metering point: ALCORUGER--03R	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/pulse Year of manufacturer: 2021 Last Calibration: 13/02/2025
3	UTE CVW ENERGÉTICA MW-2206A933-02 (Main) Metering point: ALCRRPUSINA01P	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/pulse Year of manufacturer: 2021 Last Calibration: 13/02/2025

4	UTE CVW ENERGÉTICA MW-2103A825-02 (Check) Metering point: ALCRRPUSINA01R	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/pulse Year of manufacturer: 2022 Last Calibration: 13/02/2025
5	UTE CVW ENERGÉTICA Complexo Industrial MW-1908B196-02 (Main) Metering point: ALCVWEALCCR01P	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/pulse Year of manufacturer: 2019 Last Calibration: 13/02/2025
6	UTE CVW ENERGÉTICA Complexo Industrial MW-2206B012-02 (Check) Metering point: ALCVWEALCCR01R	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/pulse Year of manufacturer: 2022 Last Calibration: 13/02/2025
7	UTE CORURIPE ITURAMA MW1908A567-02 (Main) Metering point: MGKCK-USCAA03P	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/pulse Year of manufacturer: 2019 Last Calibration: 05/02/2024
8	UTE CORURIPE ITURAMA MW1908A733-02 (Check) Metering point: MGKCK-USCAA03R	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/pulse Year of manufacturer: 2019 Last Calibration: 05/02/2024
9	UTE ENERGÉTICA ITURAMA MW1907A125-02 (Main) Metering point: MGKCK-USCIT02P	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/pulse Year of manufacturer: 2019 Last Calibration: 05/02/2024

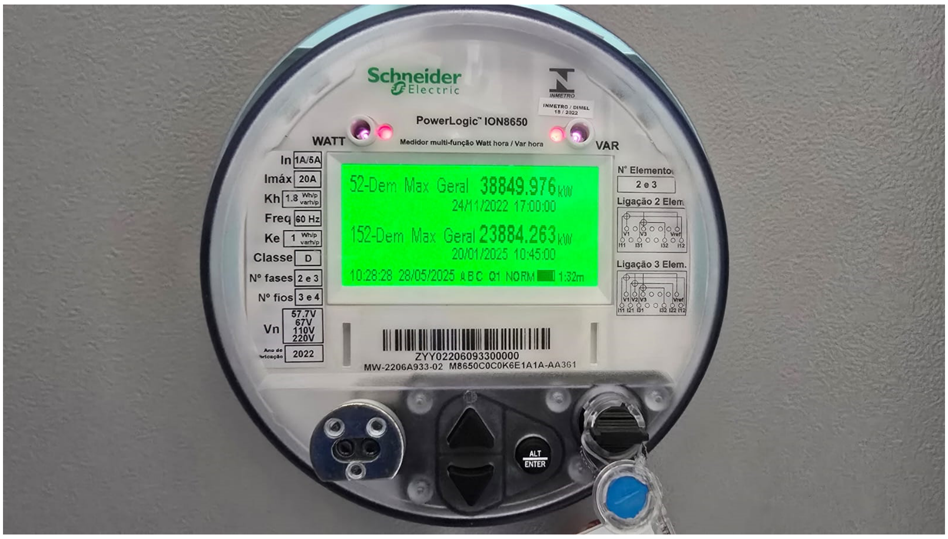
10	UTE ENERGÉTICA ITURAMA MW1908A451-02 (Check) Metering point: MGKCK-USCIT02R	Schneider Power Logic ION8650 3 Phases 57.7 ~ 220 V 1.0 / 5.0 A (max 20 A) 60 Hz Class D kh 1,8 Wh-varh/pulse Year of manufacturer: 2019 Last Calibration: 05/02/2024
11	UTE CORURIPE CAMPO FLORIDO MW-2302B246-02 (Main) Metering point: MGCFLOUCFLO01P	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/pulse Year of manufacturer: 2023 Last Calibration: 15/02/2024
12	UTE CORURIPE CAMPO FLORIDO MW-2011A793-02 (Check) Metering point: MGCFLOUCFLO01R	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/pulse Year of manufacturer: 2020 Last Calibration: 15/02/2024
13	UTE CORURIPE ENERGÉTICA CAMPO FLORIDO MW-2207A088-02 (Main) Metering point: MGCFLOUCOCF02P	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/pulse Year of manufacturer: 2022 Last Calibration: 15/02/2024
14	UTE CORURIPE ENERGÉTICA CAMPO FLORIDO MW-2302B232-02 (Check) Metering point: MGCFLOUCOCF02R	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/pulse Year of manufacturer: 2023 Last Calibration: 15/02/2024
15	UTE CORURIPE CANEIRINHO MW1908B167-02 (Main) Metering point: MGCARNUCARN01P	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/pulse Year of manufacturer: 2019 Last Calibration: 06/02/2024

16	UTE CORURIPE CARNEIRINHO MW-1908B183-02 (Check) Metering point: MGCARNUCARN01R	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/pulse Year of manufacturer: 2019 Last Calibration: 06/02/2024

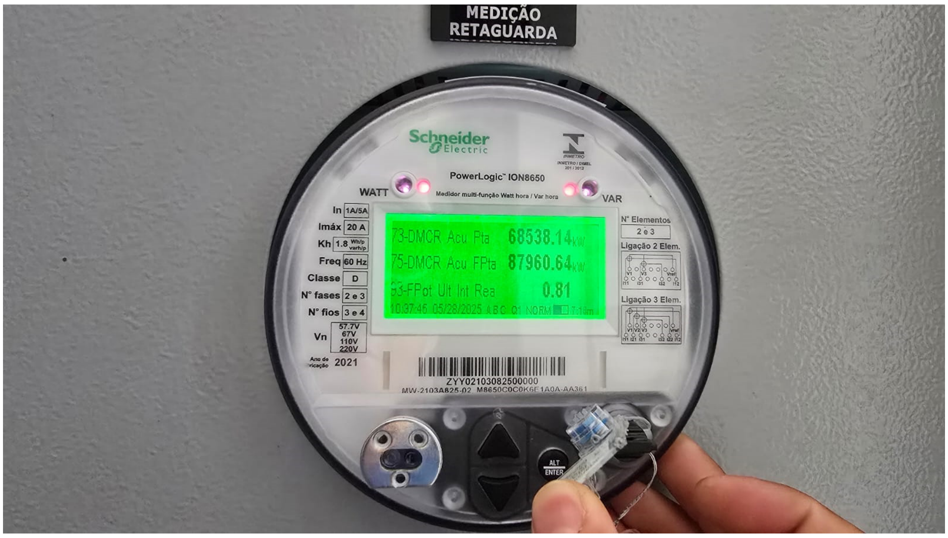


Meter UTE CORURIPE Headquarters (COR) - MAIN - MW-1503A245-02

Meter UTE CORURIPE Headquarters (COR) - CHECK - MW-2103A627-02



Meter UTE CORURIPE CVW ENERGÉTICA - MAIN - MW-2206A933-02



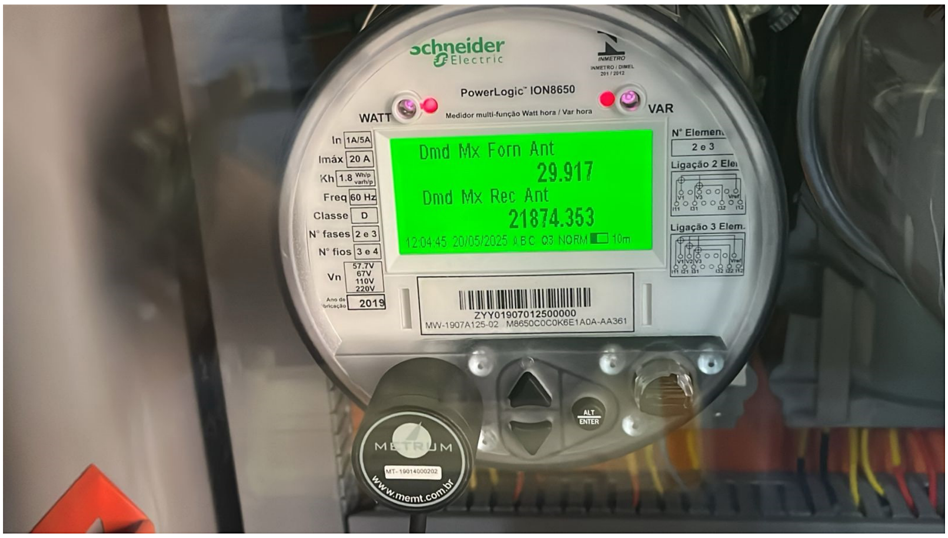
Meter UTE CORURIPE CVW ENERGÉTICA - CHECK- MW-2103A825-02

Meter UTE CORURIPE CVW ENERGÉTICA Complexo Industrial - MAIN - MW-1908B196-02

Meter UTE CORURIPE CVW ENERGÉTICA Complexo Industrial - CHECK - MW-2206B012-02

Meter UTE CORURIPE ITURAMA - MAIN - MW1908A567-02

Meter UTE CORURIPE ITURAMA - CHECK - MW1908A733-02



Meter UTE CORURIPE ENERGÉTICA ITURAMA - MAIN - MW1907A125-02

Meter UTE CORURIPE ENERGÉTICA ITURAMA - CHECK - MW1908A451-02

Meter UTE CORURIPE CAMPO FLORIDO - MAIN - MW-2302B246-02

Meter UTE CORURIPE CAMPO FLORIDO - CHECK - MW-2011A793-02

Meter UTE CORURIPE ENERGÉTICA CAMPO FLORIDO - MAIN - MW-2207A088-02

Meter UTE CORURIPE ENERGÉTICA CAMPO FLORIDO - CHECK - MW-2302B232-02

Meter UTE CORURIPE CARNEIRINHO - MAIN - MW1908B167-02

Meter UTE CORURIPE CARNEIRINHO - CHECK - MW-1908B183-02

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 Coruripe 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.