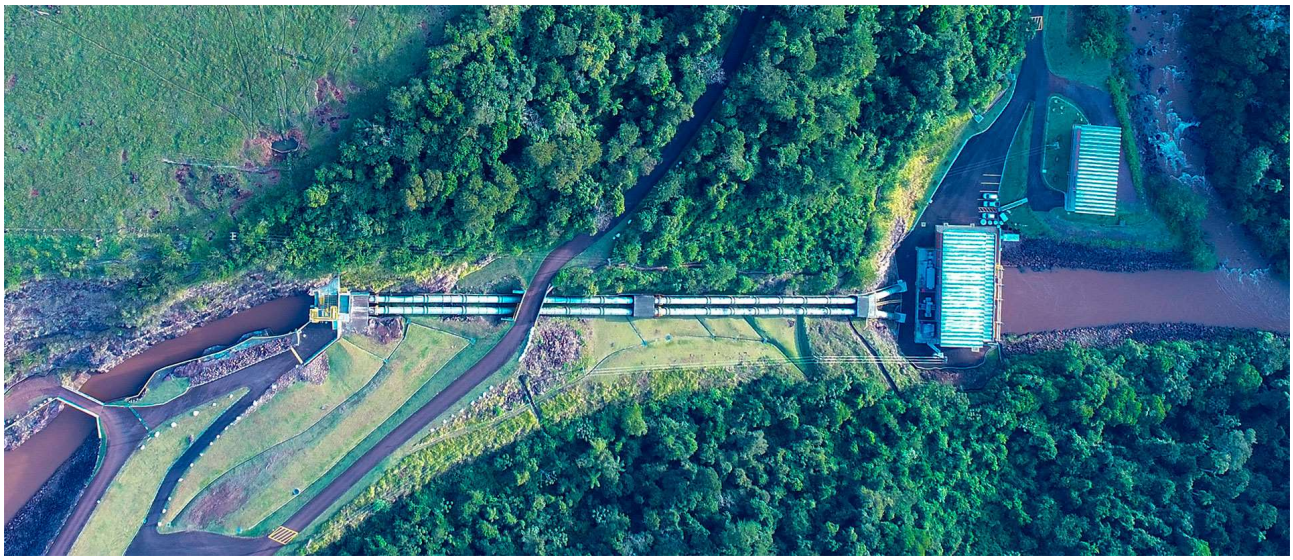
Monitoring Report

CARBON OFFSET UNIT (CoU) PROJECT



Title: 14 MW SHP SÃO FRANCISCO

Version 1.0

Date 26/07/2023

First CoU Issuance Period: 10 years

Monitoring Period: 01/01/2013 to 31/12/2022

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

Monitoring Report	
Title of the project activity	14 MW SHP São Francisco
UCR Project Registration Number	338
Version	Version 1
Completion date of the MR	26/07/2023
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 1 Duration of this monitoring Period: (first and last days included (01/01/2013 to 31/12/2022)
Project participants	GÊNESIS ENERGÉTICA SA (OWNER) EG S CONSULTORIA E NEGÓCIOS LTDA (AGGREGATOR)
Host Party	Brazil
Applied methodologies and standardized baselines	Applied Baseline Methodology: AMS I.D.: "Grid connected renewable electricity generation" Version 18.0 Standardized Methodology: Not Applicable.
Sectoral scopes	01 Energy industries (Renewable/Non-Renewable Sources)
Amount of GHG emission reductions for this monitoring period in the registered PCN	2013: 38,850 CoUs (38,850 tCO2eq)
	2014: 37,670 CoUs (37,670 tCO2eq)
	2015: 35,780 CoUs (35,780 tCO2eq)
	2016: 36,672 CoUs (36,672 tCO2eq)
	2017: 21,287 CoUs (21,287 tCO2eq)
	2018: 26,886 CoUs (26,886 tCO2eq)
	2019: 13,229 CoUs (13,229 tCO2eq)
	2020: 6,569 CoUs (6,569 tCO2eq)
	2021: 13,757 CoUs (13,757 tCO2eq)
	2022: 13,548 CoUs (13,548 tCO2eq)
Total:	244,248 CoUs (244,248 tCO2eq)

SECTION A. Description of project activity

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

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

The proposed project title under UCR is "14 MW SHP SÃO FRANCISCO", which is a Hydro Power project located in the cities of Toledo and Ouro Verde do Oeste, state of Paraná, Brazil. The project is an operational activity with continuous reduction of GHG, currently being applied under "Universal Carbon Registry" (UCR). This is a run of the river project located on River São Francisco Verdadeiro.

The SHP uses the hydraulic energy from the river, a renewable source, to generate power. The generated power feeds the local grid which is connected to the national grid and is negotiated by the Project Owner through the Electric Energy Trading Chamber (CCEE). The Brazilian national grid has a diversified mix of power sources, including fossil fuel based, that are used in occasions when the hydro source (major source in Brazil) or other renewable sources (intermittent sources) are insufficient to attend the demand, occurring mainly during peak hours and/or dry seasons.

The project activity doesn't involve any GHG emission sources and during the monitoring period, displaced the total of 686,076.61 MWh of electricity from the national grid, which otherwise would have been supplied with more polluting sources.

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

The SHP consists of 2 Francis Turbines, with horizontal axis, having individual capacity of 7.2 MW and with aggregated installed capacity of 14 MW. The adduction channel directs the water through 201 meters to the intake, and from there, the water reaches the power house through 2 circular steel made penstocks and them, the Kinect energy from this moving water is transferred to the turbines to generate power.

The generators generate power at 6.9 kV and at a frequency of 60 Hz, which is Brazilian standard. The voltage is stepped up at the powerplant substation to 34.5 kV to supply the local grid, which is connected to the national grid.

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

Project Commissioned: 30/11/2010.
Start Date of Crediting Period: 01/01/2013.
End Date of Crediting Period: 31/12/2022.
Monitoring Period: 01/01/2013 to 31/12/2022

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

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

Summary of the Project Activity and ERs Generated for the Monitoring Period	
Start date of this Monitoring Period	01/01/2013

Carbon credits claimed up to	31/12/2022
Total ERs generated (tCO_{2eq})	244,248 tCO2eq
Leakage	0

e) Baseline Scenario>>

The electricity supplied to the grid by the SHP (project activity) that would have otherwise been generated by fossil-fuel-fed powerplants connected to the national grid, which are carbon intensive sources of electricity generation.

A.2. Location of project activity>>

Country: Brazil
District: Toledo
State: Paraná
Code: 82520-100

Latitude: -24,73032°
Longitude: -53,896279°

(Source: Raphael Lorenzeto de Abreu/Wikipedia)

A.3. Parties and project participants >>

Party (Host)	Participants
Brazil	Owner: Gênesis Energética SA Rua Wiegando Olsen 2020 Curitiba - PR 80430-180 Aggregator: EG S Consultoria e Negócios LTDA (EGREENER). Rua Tabapuã 245, conj. 31 Itaim Bibi São Paulo – SP 04533-010 egreener.io

A.4. References to methodologies and standardized baselines >>

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

TYPE:
I – Renewable Energy Projects

CATEGORY:
AMS-I.D. - "Grid connected renewable electricity generation", Version 18.0. This methodology comprises of activities that include the construction and operation of a power plant that uses renewable energy sources and supplies electricity to the grid (Greenfield power plant).

A.5. Crediting period of project activity >>

Length of the crediting period corresponding to this monitoring period: 10 years – 01/01/2013-31/12/2022

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

Name: Guilherme Ferreira Mendes
Company (Aggregator): Egreener
Mobile: +55 11 91667 9359
E-mail: guilherme.mendes@egreener.io

SECTION B. Implementation of project activity

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

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

This SHP is operational since November/2010 when it received the clearance (Operation License) from the Environmental Entity from the State of Paraná – IAT (LO 22455), and the authorization for grid power injection from the National Electrical Energy Agency (ANEEL) for the first Generator Unit in November 30, 2010 (dispatch 3.633) and the second Generator Unit in December 11, 2010 (dispatch 3.791). The SHP is connected to the city of Toledo and supplies 14 MW of power to the national grid "SIN" (National Interconnect System) through the local grid.

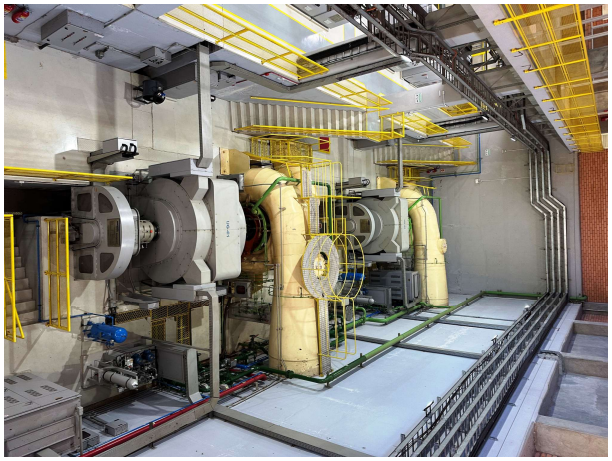
b) For the description of the installed technology(ies), technical process and equipment, include diagrams, where appropriate>>

The project is a Small Hydro Power, which incorporates installation and operation of 2 Horizontal Axis Francis Turbines, having each an individual nominal capacity of 7.20 MW connected to 2 Synchronous Generator with individual capacity of 8,000 kVA.

The generators generate power at 6.9 kV and at a frequency of 60 Hz. The voltage is stepped up at the powerplant substation transformer to 34.5 kV to supply the local grid, which is connected to the national grid.

Specification	Value
Hydrology	Average water flow: 16.6 m³/s Firm water flow: 3.8 m³/s
Adduction Channel	Length: 201 m Section: 13.75 m²
Penstock	2 units Circular Steel Diameter: 1.6 m Length: 211 m
Water Intake	Conventional Type Height: 15.2 m Length: 13.3 m
Power House	Sheltered type Width: 16.87 m Length: 33.45 m Installed Capacity: 14 MW
Spillway Weir / Dam	Gravity Concrete Built Length: 295 m Height: 21.4 m
Spillway	592.0 m³/s
Turbine	2 units Francis - Horizontal Axis Unit Nominal Power: 7.2 MW Synchronous Rotation: 600 rpm
Generator	2 units

	Unit Nominal Power: 8,000 kVA Nominal Voltage: 6.9 kV Power Factor: 0.875
Power Transformer	1 unit Unit Nominal Power: 16,000kVA 6.9kV / 34.5kV
Transmission	Overhead Transmission Line 17.0 km 34.5 kV



Power Generators Units

Penstock

Power House

Turbine

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

For ANEEL (Agência Nacional de Energia Elétrica), a governmental agency that regulates over the energy sector, any hydroelectric with power capacity up to 30 MW, shall be considered as a Small Hydropower and should attend to specific conditions to reduce any environmental impact. Complementing these conditions, any hydropower project should be submitted to city, state or federal environmental agencies approval, and start commercial operations after it fulfills all conditioning to avoid any social, cultural and environmental harm. After the conditions are met, the agency issues an Operation License, for a determined period of duration, with the possibility of being renewed after the end of this period. In this case, the license was issued by IAT by the first time in November of 2010 under the number 22455, and was recently renewed in September 23rd of 2021 (link).

Environmental benefits:

- Use of hydro energy, which is a clean energy source.
- Power generation with zero emission of GHG gases or specific pollutants like SOx, NOx, and SPM .
- Effort to minimize the dependence of the Brazilian energy matrix on fossil fuels.
- Minimum impact on land, water and soil at project surroundings.
- Cooperation agreement between Gênesis Energética SA and the city of Ouro Verde do Oeste to provide financial resources for the installation of protection fences around the Permanent Preservation Areas of the tributaries of the São Francisco Verdadeiro river, in the influence area of the powerplant.
- Creation and preservation of a Private Natural Reserve (RPPN) with an area of 906,447 m² at powerplant surroundings. In accordance with Brazilian law, this nature reserve is permanently registered in the property registration, without the possibility of being subjected to any kind of depredation or deforestation. This is an initiative by Gênesis Energética SA, which would not have happened in the absence of the installation of the powerplant. (link)

Private Natural Reserve area (Source: Google Earth)

Economic benefits:

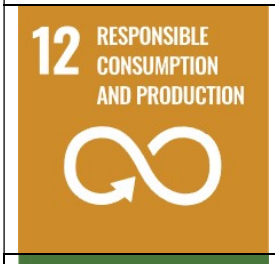
- Greater supply of energy, ensuring the development of the region.
- Ensure the growth of the agribusiness in the cities of Toledo and Ouro Verde do Oeste, providing clean and cheaper energy, ensuring the creation of jobs and business opportunities.
- Low-cost energy to consumers.

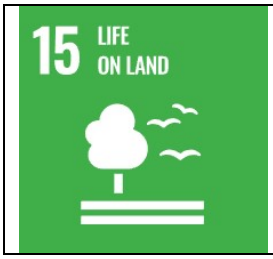
- Clean technology development in Brazil.

Social benefits:

- 322 employment opportunities created for the local workforce during project's construction.
- 11 permanent employment opportunities created for operation and maintenance of the powerplant.
- Development of the surroundings due to city, state and federal taxes collected during construction and operation of the powerplant.
- Cooperation agreement between Gênesis Energética SA and the city of Ouro Verde do Oeste for the supply of materials for the implementation of a recycling center near the municipal landfill and expansion of the city garage.

Sustainable Development Goals (SDG) Achieved with the project:

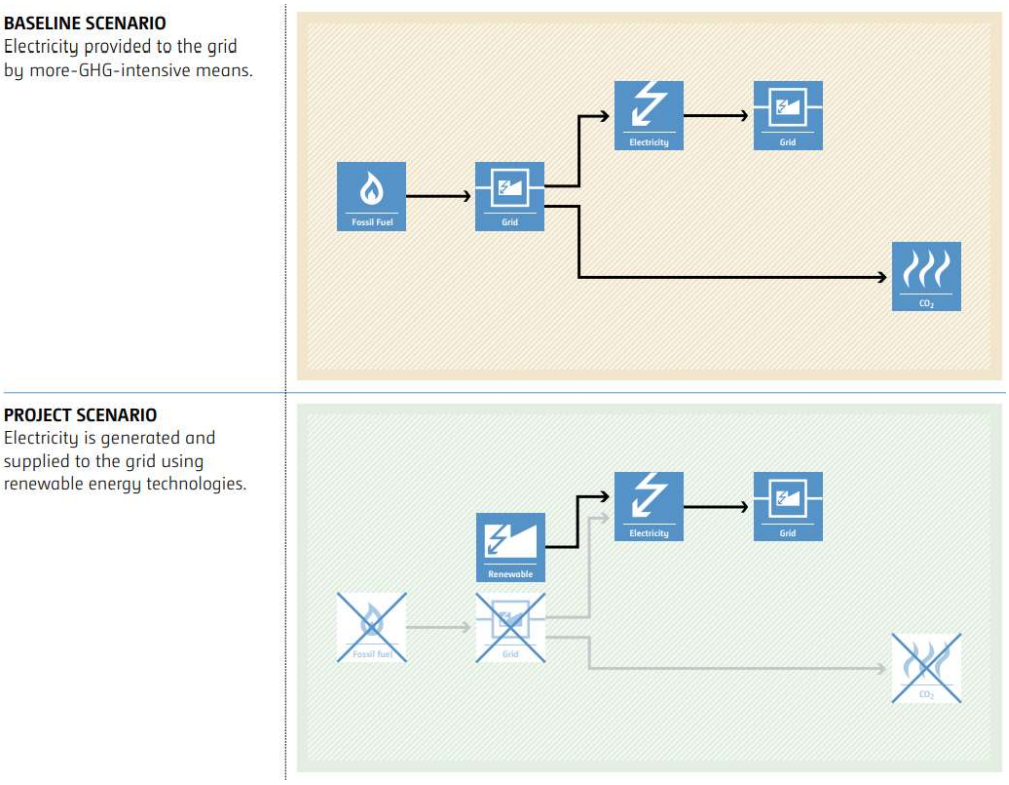
SDG	TARGET	ACHIEVED HOW?
	6.6 - By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	Supporting Permanent Preservation Areas at the surroundings of São Francisco Verdadeiro river tributaries.
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix.	Installed Greenfield Small Hydro Powerplant.
	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	322 jobs created during powerplant construction, and 11 permanent jobs created for SHP operations. Providing clean and cheaper energy to develop the region, aiding the creation of new businesses.
	12.5 - By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	Supported the construction of a recycling center.
	13.2 – Integrate climate change measures into national policies, strategies and planning.	Reduction of GHG emissions through renewable energy generation.

	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.	Creation and preservation of a Private Natural Reserve (RPPN). Supporting Permanent Preservation Areas

B.3. Baseline Emissions>>

The baseline scenario identified in this Monitoring Report of the project activity is:

- The project activity involves generating clean energy from hydro source and supply it to the national grid. In the absence of the project activity, the equivalent amount of power would have been supplied by national grid-connected power plants and by the addition of other-more-GHG-intensive generation sources.



B.4. Debundling>>

This 14 MW SHP São Francisco project is not a debundled component of a larger project activity.

SECTION C. Application of methodologies and standardized baselines

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

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

TYPE:
I – Renewable Energy Projects

CATEGORY:
AMS-I.D. - "Grid connected renewable electricity generation", Version 18.0. This methodology comprises of activities that include the construction and operation of a power plant that uses renewable energy sources and supplies electricity to the grid (Greenfield power plant).

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

	Applicability	Project
1.	This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	(a) Supplying electricity to a national or a regional grid.
2.	This methodology is applicable to project activities that: (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s).	(a) Install a Greenfield plant.
3.	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in existing reservoir, with no change in the volume of the reservoir; or (b) The project activity is implemented in existing reservoir, where the volume of the reservoir(s) is increased and the power density as per definitions given in the	It is run of river type of project; hence, this criterion is not applicable.

	project emissions section, is greater than 4 W/m2. The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	
4.	If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	There are no non-renewable components, thus this criterion is not applicable to this project activity.
5.	Combined heat and power (co-generation) systems are not eligible under this category.	The project is a hydroelectric and thus, the criterion is not applicable to this project activity.
6.	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	The proposed project is a greenfield hydroelectric, thus, this criterion is not applicable to this project activity.
7.	In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	The proposed project is a greenfield hydroelectric, thus, this criterion is not applicable to this project activity.
8.	In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid, then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as “AMS- I.C.: Thermal energy production with or without electricity” shall be explored.	The proposed project is a greenfield hydroelectric, thus, this criterion is not applicable to this project activity.

9.	In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	The proposed project is a greenfield hydroelectric, thus, this criterion is not applicable to this project activity.

C.3 Applicability of double counting emission reductions >>

There is no double accounting of emission reductions in the project activity due to the following reasons:

- Project is uniquely identifiable based on its location coordinates,
- Project has dedicated commissioning certificate and connection point,
- Project is associated with energy meters which are dedicated to the consumption point for project developer.

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

As per applicable methodology AMS-I.D. Version 18.0, The project boundary is as follow:

"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the project power plant is connected to."

Thus, the project boundary includes the Hydro Power Plant and the respective Brazilian grid system, as per the following scenario:

Scenario	Source	GHG	Included?	Justification/Explanation
Baseline	Grid Connected Electricity Generation	CO2	Yes	Main emission source
		CH4	No	Not identified in the baseline methodology
		N2O	No	Not identified in the baseline methodology
Project	Greenfield Hydro Power Project Activity	CO2	No	Zero-emissions grid connected electricity generation from renewable energy
		CH4	No	Zero-emissions grid connected electricity generation from renewable energy
		N2O	No	Zero-emissions grid connected electricity generation from renewable energy

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

Baseline emissions include only CO2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

Emission Reductions are calculated as follows:

$ER_y = BE_y – PE_y – LE_y$ Where:
ER_y = Emission reductions in year y (tCO2/y)
BE_y = Baseline Emissions in year y (t CO2/y)
PE_y = Project emissions in year y (tCO2/y)
LE_y = Leakage emissions in year y (tCO2/y)

Estimated Annual Baseline Emission Reduction : $BEy=EGPJ,y\times EFgrid,y$

BE_y = Baseline emissions in year y (t CO2)

$EG_{PJ,y}$ = 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 CO2 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 CO2/MWh)

As determined by "Tool to calculate the emission factor for an electricity system – Version 07.0" for Brazil, the combined margin should be calculated using the "Weighted average CM", as it follows:

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

Where: $EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (t CO2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year y (t CO2/MWh)
w_{OM} = Weighting of operating margin emissions factor (per cent)
w_{BM} = Weighting of build margin emissions factor (per cent)

Since the project is a hydroelectric:
$w_{OM} = 0.5$
$w_{BM} = 0.5$

Since the project is a run of river hydro project:
$PE_y = 0$
$LE_y = 0$

So as result $ER_y = BE_y$

For the Build and Operation margin emission factor, was considered the public data for the years from 2013 to 2022 available in the Ministry of Science, Technology and Innovation website (link). The $EF_{grid,CM}$ for each month of each year is shown below:

EMISSION FACTOR OF THE MONITORING PERIOD - EFgrid,CM										
Month	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	tCO2/MWh	tCO2/MWh	tCO2/MWh	tCO2/MWh	tCO2/MWh	tCO2/MWh	tCO2/MWh	tCO2/MWh	tCO2/MWh	tCO2/MWh
January	0.44	0.46	0.43	0.38	0.27	0.35	0.23	0.33	0.33	0.27
February	0.43	0.45	0.42	0.38	0.26	0.35	0.33	0.31	0.33	0.26
March	0.43	0.43	0.42	0.39	0.29	0.36	0.30	0.24	0.31	0.22
April	0.44	0.44	0.40	0.39	0.30	0.32	0.31	0.20	0.30	0.12
May	0.43	0.43	0.40	0.40	0.31	0.34	0.29	0.23	0.32	0.15
June	0.44	0.43	0.42	0.40	0.29	0.40	0.26	0.29	0.32	0.23
July	0.42	0.43	0.41	0.39	0.30	0.37	0.35	0.25	0.32	0.03
August	0.41	0.44	0.40	0.40	0.31	0.37	0.32	0.25	0.34	0.24
September	0.43	0.45	0.39	0.40	0.30	0.35	0.33	0.21	0.34	0.26
October	0.43	0.44	0.40	0.39	0.30	0.36	0.32	0.34	0.34	0.25
November	0.44	0.44	0.40	0.39	0.30	0.25	0.34	0.32	0.34	0.22
December	0.44	0.44	0.40	0.38	0.31	0.24	0.35	0.35	0.32	0.16

The official power generation data of the SHP during the Monitoring Period, was informed by CCEE (Electric Energy Trading Chamber) digitally through their website/system:

ELECTRICITY GENERATED IN THE MONITORING PERIOD - EG										
Month	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	MWh	MWh	MWh	MWh	MWh	MWh	MWh	MWh	MWh	MWh
Jan	7,241	5,868	4,813	9,782	5,746	9,705	4,376	4,622	4,868	2,638
Feb	7,535	3,451	4,458	9,243	4,516	8,986	2,990	3,350	7,251	2,231
Mar	9,882	4,053	6,195	9,802	5,130	9,881	3,588	1,759	5,872	1,978
Apr	8,534	5,825	5,388	7,647	5,539	8,967	2,740	1,067	3,281	3,840
May	8,602	9,164	6,763	7,187	4,923	8,115	4,062	1,820	2,208	4,513
Jun	9,545	9,417	6,508	5,733	6,952	5,629	7,032	1,707	1,847	6,952
Jul	9,885	9,692	9,767	5,622	5,644	3,513	5,394	1,490	1,121	5,262
Aug	8,931	8,829	9,701	7,206	4,627	2,797	3,506	1,995	772	5,588
Sep	5,989	7,504	8,017	7,339	2,691	3,632	1,847	1,178	543	6,464
Oct	5,252	8,853	8,441	7,668	6,984	5,999	1,097	796	6,303	9,442
Nov	4,067	7,474	8,163	8,827	9,469	7,577	2,005	503	4,943	9,422
Dec	4,605	5,653	9,863	8,053	9,603	5,315	4,814	2,594	3,222	9,201
Total	90,069	85,784	88,078	94,109	71,826	80,116	43,452	22,882	42,230	67,531

Since ERy = BEy = EG x EFgrid, it is achieved the following results for the emissions reductions ERy:

EMISSION REDUCTION - ERy										
Month	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq
Jan	3,183	2,675	2,047	3,685	1,565	3,407	998	1,527	1,592	725
Feb	3,267	1,545	1,858	3,518	1,169	3,113	986	1,045	2,379	575
Mar	4,254	1,755	2,577	3,853	1,512	3,518	1,093	424	1,819	428
Apr	3,722	2,544	2,160	3,010	1,643	2,882	838	210	994	466
May	3,674	3,926	2,713	2,852	1,505	2,772	1,181	414	712	693
Jun	4,197	4,068	2,713	2,279	2,042	2,269	1,826	490	598	1,625
Jul	4,196	4,186	4,023	2,212	1,716	1,292	1,870	366	357	181
Aug	3,698	3,896	3,928	2,855	1,418	1,023	1,110	496	261	1,351
Sep	2,582	3,361	3,151	2,930	819	1,287	612	251	187	1,669
Oct	2,260	3,924	3,371	2,975	2,104	2,145	351	267	2,136	2,332
Nov	1,788	3,306	3,292	3,442	2,863	1,903	676	161	1,698	2,027
Dec	2,030	2,484	3,947	3,061	2,932	1,274	1,689	919	1,024	1,475
Total	38,850	37,670	35,780	36,672	21,287	26,886	13,229	6,569	13,757	13,548

Total amount of emission reductions was 244,248 tCO2eq for the monitoring period.

C.6. Prior History>>

The project activity has not applied to any other GHG program for generation or issuance of carbon

offsets or credits for the said crediting period.

C.7. Monitoring period number and duration>>

First Monitoring Period: 10 years – 01/01/2013 to 31/12/2022

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

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

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

As per PCN, the estimated emission reductions were 258,690 tCO2 for the period. The actual emission reductions for the period from 01/01/2013 to 31/12/2022 are 244,248 tCO2e.

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

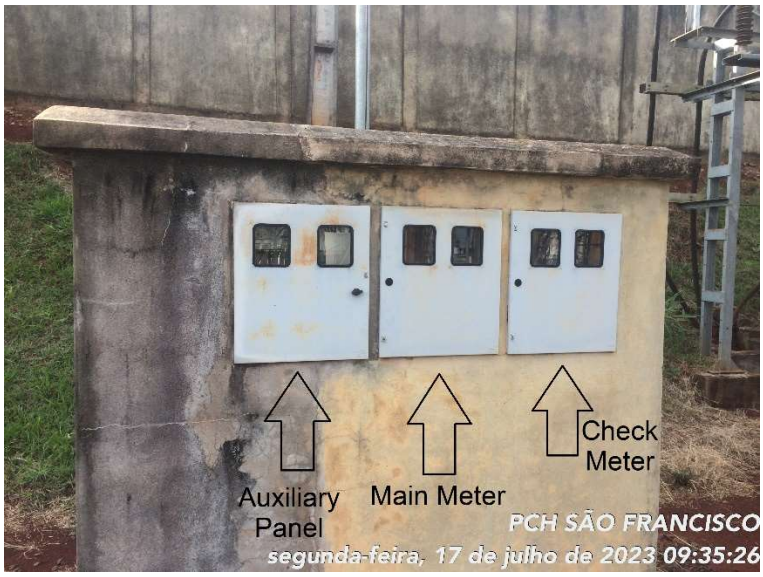
C.10. Monitoring plan>>

All energy generation data is acquired through CCEE meters installed in Toledo Substation.

Meter	Serial Number	Specification
Main	462302	Landis + Gyr SAGA 1000 3 Phases 120/240 V 2.5 (10 A) 60 Hz Class D kh 0.6 Wh-Varh/impulse CCEE/ONS PRTDO-USFCO01P
Check	462303	Landis + Gyr SAGA 1000 3 Phases 120/240 V 2.5 (10 A) 60 Hz Class D kh 0.6 Wh-Varh/impulse CCEE/ONS PRTDO-USFCO01R

Main Meter

Check Meter



Meters

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 SHP personnel through CCEE system at CCEE website.

Data/Parameter	$EF_{grid,y}$
Data unit	tCO2e/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 Values: As presented in ANNEX I.
Measurement methods and procedures	As per the requirements in "Tool to calculate the emission factor for an electricity system"

Monitoring frequency	Annually
Purpose of data	To calculate baseline emissions.

Data / Parameter:	$EG_{pj,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation 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 should be either monitored using bidirectional energy meter or calculated as difference between (a) the quantity of electricity supplied by the project plant/unit to the grid; and (b) the quantity of electricity the project plant/unit from the grid. In case it is calculated then the following parameters shall be measured: (a) The quantity of electricity supplied by the project plant/unit to the grid; and (b) The quantity of electricity delivered to the project plant/unit from the grid
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. The last calibration of the meters was performed in May/2022.

ANNEX I – Emission Factor

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2013	0.2713

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2013	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.6079	0.5958	0.5896	0.6010	0.5830	0.6080	0.5777	0.5568	0.5910	0.5891	0.6082	0.6102

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2014	0.2963

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2014	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.6155	0.5989	0.5699	0.5772	0.5605	0.5678	0.5674	0.5862	0.5994	0.5901	0.5885	0.5825

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2015	0.2553

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2015	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.5953	0.5784	0.5767	0.5465	0.5469	0.5785	0.5686	0.5545	0.5308	0.5434	0.5513	0.5450

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2016	0.1581

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2016	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.5953	0.6032	0.6281	0.6291	0.6356	0.6368	0.6288	0.6344	0.6402	0.6180	0.6217	0.6022

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2017	0.0028

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2017	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.5419	0.5148	0.5867	0.5905	0.6086	0.5846	0.6052	0.6102	0.6060	0.5997	0.6019	0.6078

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2018	0.1370

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2018	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.5652	0.5559	0.5750	0.5058	0.5461	0.6691	0.5989	0.5948	0.5718	0.5782	0.3654	0.3423

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2019	0.1020

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2019	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.3540	0.5573	0.5075	0.5095	0.4794	0.4175	0.5914	0.5312	0.5606	0.5370	0.5720	0.5997

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2020	0.0979

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2020	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.5627	0.5258	0.3843	0.2964	0.3575	0.4758	0.3932	0.3994	0.3287	0.5723	0.5401	0.6106

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2021	0.0540

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2021	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.6001	0.6023	0.5657	0.5522	0.5909	0.5940	0.5824	0.6214	0.6351	0.6236	0.6331	0.5815

CONSTRUCTION MARGIN

Average Emission Factor (tCO_2/MWh) - **ANNUAL**	
2022	**0.0270**

OPERATION MARGIN

Average Emission Factor (tCO_2/MWh) - **MONTHLY**												
2022	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.5226	0.4883	0.4060	0.2159	0.2803	0.4404	0.0419	0.4566	0.4894	0.4670	0.4034	0.2937