Monitoring Report

CARBON OFFSET UNIT (CoU) PROJECT

Title: 52.5 MW BUNDLED SMALL HYDRO POWER PROJECT BY ATIAIA

Version 1.0

Date 14/06/2024

First CoU Issuance Period: 11 years

Date: 01/01/2013 to 31/12/2023

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

Monitoring Report	
Title of the project activity	52.5 MW Bundled Small Hydro Power
UCR Project Registration Number	417
Version	Version 1
Completion date of the MR	14/06/2024
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	ATIAIA ENERGIA S.A. / GRUPO CORNÉLIO BRENNAND (OWNER) EG S CONSULTORIA E NEGÓCIOS LTDA (AGGREGATOR)
Host Party	Brazil
Applied methodologies and standardized baselines	Applied Baseline Methodology: ACM0002: "Grid-connected electricity generation from renewable sources" Version 21.0
Sectoral scopes	01 Energy industries (Renewable/Non-Renewable Sources)
Amount of GHG emission reductions for this monitoring period in the registered PCN	2013: 8,867 CoUs (8,867 tCO2eq)
	2014: 10,903 CoUs (10,903 tCO2eq)
	2015: 8,648 CoUs (8,648 tCO2eq)
	2016: 7,525 CoUs (7,525 tCO2eq)
	2017: 8,775 CoUs (8,775 tCO2eq)
	2018: 10,040 CoUs (10,040 tCO2eq)
	2019: 30,246 CoUs (30,246 tCO2eq)
	2020: 66,501 CoUs (66,501 tCO2eq)
	2021: 76,645 CoUs (76,645 tCO2eq)
	2022: 24,325 CoUs (24,325 tCO2eq)
	2023: 58,480 CoUs (58,480 tCO2eq)
Total:	310,955 CoUs (310,955 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 "52.5 MW BUNDLED SMALL HYDRO POWER PROJECT BY ATIAIA", which are 3 Hydro Power projects located in the cities of Chapadão do Sul, state of Mato Grosso do Sul and Ribeirão, state of Pernambuco, Brazil. The projects are operational activities with continuous reduction of GHG, currently being applied under "Universal Carbon Registry" (UCR). These are run of the river projects:

Hydro Power	Installed Capacity	Location	River
SHP Areado	18 MW	Chapadão do Sul, MS	Indaiá Grande
SHP Bandeirante	28 MW	Chapadão do Sul, MS	Sucuriú
SHP Pedra Furada	6,5 MW	Ribeirão, PE	Sirinhaém

Table 1: SHPs capacity and location

Purpose of the project activity:

SHP Areado:

The project activity is a renewable power generation activity which incorporates installation and operation of 2 Horizontal Axis Kaplan S Turbines, having individual nominal capacity of 9 MW. The Project is connected to the city of Chapadão do Sul and supplies 18 MW of power to the national grid "SIN" (Sistema Interligado Nacional) through the local grid.

The SHP received environmental licensing approval in September 2019. The powerplant was commissioned in October 2019, when the National Electric Energy Agency (ANEEL), issued the Commercial License.

As per the ex-ante estimate, the project will generate approximately 100,000 MWh of electricity per annum and supply it to the national grid. The renewable power generated by the project activity would be displacing equivalent amount of grid electricity which has a relevant contribution of fossil-fuel based power plants, resulting in an estimated emission reduction of 35,929 tCO2 per annum.

Since the project activity generates electricity through a run-of-river hydroelectric, a clean renewable energy source, it does not cause any significant negative impact on the environment and thereby contributes to climate change mitigation efforts.

SHP Bandeirante:

The project activity is a renewable power generation activity which incorporates installation and operation of 3 Horizontal Axis Kaplan S Turbines, having individual nominal capacity of 9.604 MW. The Project is connected to the cities of Chapadão do Sul and Água Clara, supplying 28 MW of power to the national grid "SIN" (Sistema Interligado Nacional) through the local grid.

The SHP received environmental licensing approval in July 2019. The powerplant was commissioned in 2 phases on October 11th and 18th, 2019, when the National Electric Energy Agency (ANEEL), issued the Commercial License.

As per the ex-ante estimate, the project will generate approximately 174,000 MWh of electricity per annum and supply it to the national grid. The renewable power generated by the project activity would be displacing equivalent amount of grid electricity which has a relevant contribution of fossil-fuel based power plants, resulting in an estimated emission reduction of 62,516 tCO2 per annum.

Since the project activity generates electricity through a run-of-river hydroelectric, a clean renewable energy source, it does not cause any significant negative impact on the environment and thereby contributes to climate change mitigation efforts.

SHP Pedra Furada:

The project activity is a renewable power generation activity which incorporates installation and operation of 2 Horizontal Axis Francis Turbines, having individual nominal capacity of 3.43 MW. The Project is connected to the city of Ribeirão and supplies 6,5 MW of power to the national grid "SIN" (Sistema Interligado Nacional) through the local grid.

The SHP received its first environmental license in August 2011, which is currently renewed until March 2026. The powerplant was commissioned in March 2012, when the National Electric Energy Agency (ANEEL), issued the Commercial License.

As per the ex-ante estimate, the project will generate approximately 28,000 MWh of electricity per annum and supply it to the national grid. The renewable power generated by the project activity would be displacing equivalent amount of grid electricity which has a relevant contribution of fossil-fuel based power plants, resulting in an estimated emission reduction of 10,060 tCO2 per annum.

Since the project activity generates electricity through a run-of-river hydroelectric, a clean renewable energy source, it does not cause any significant negative impact on the environment and thereby contributes to climate change mitigation efforts.

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

SHP Areado

The proposed project activity is installation and operation of 2 Kaplan S Turbines, with horizontal axis, having individual capacity of 9 MW and with aggregated installed capacity of 18 MW.

The generators generate power at 13.8 kV and at a frequency of 60 Hz, which is Brazilian standard. The voltage is stepped up at the powerplant substation to 138 kV to supply the local grid, which is connected to the national grid.

SHP Bandeirante

The proposed project activity is installation and operation of 3 Kaplan S Turbines, with horizontal axis, having individual capacity of 9.6 MW and with aggregated installed capacity of 28 MW.

The generators generate power at 13.8 kV and at a frequency of 60 Hz, which is Brazilian standard. The voltage is stepped up at the powerplant substation to 138 kV to supply the local grid, which is connected to the national grid.

SHP Pedra Furada

The proposed project activity is installation and operation of 2 Francis Turbines, with horizontal axis, having individual capacity of 3.43 MW and with aggregated installed capacity of 6.5 MW.

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 69 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.)>>

Hydro Power	License Date	Commercial Operation Date
SHP Areado	September 3, 2019	October 11, 2019
SHP Bandeirante	July 31, 2019	October 11 and 18, 2019
SHP Pedra Furada	August 24, 2011	March 20, 2012

Table 2: Relevant Dates

Start Date of Crediting Period: 01/01/2013.
End Date of Crediting Period: 31/12/2023.
Monitoring Period: 01/01/2013 to 31/12/2023.

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	31/12/2023
Total ERs generated (tCO_{2eq})	310,955 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>>

SHP Areado
Country: Brazil
District: Chapadão do Sul
State: Mato Grosso do Sul
Code: 79560-000

Latitude: -19.544944°
Longitude: -52.504744°


(Source: Raphael Lorenzeto de Abreu/Wikipedia)

SHP Bandeirante
Country: Brazil
Districts: Chapadão do Sul and Água Clara
State: Mato Grosso do Sul
Code: 79560-000

Latitude: -19.528611°
Longitude: -52.519722°


(Source: Raphael Lorenzeto de Abreu/Wikipedia)

SHP Pedra Furada
Country: Brazil
District: Ribeirão
State: Pernambuco
Code: 55520-000

Latitude: -8.518053°
Longitude: -35.488714°


(Source: Raphael Lorenzeto de Abreu/Wikipedia)

(Source: Raphael Lorenzeto de Abreu/Wikipedia)

A.3. Parties and project participants >>

Party (Host)	Participants
Brazil	Owner: Atiaia Energia SA / Grupo Cornélio Brennand Rua João Francisco Lisboa, nº 385, Sala I Recife - PE 50741-100 Aggregator: EG S Consultoria e Negócios LTDA. Rua Tabapuã 245, conj. 31 Itaim Bibi São Paulo – SP 04533-010

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

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

TYPE:
I – Renewable Energy Projects

CATEGORY:
ACM0002. - “Grid-connected electricity generation from renewable sources”, Version 21.0. 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: 11 years – 01/01/2013-31/12/2023

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

Name: Guilherme Ferreira Mendes
Company (Aggregator): EG S Consultoria e Negócios LTDA.
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>>

SHP Areado:
This SHP is operational since October/2019 when it received the clearance (Operation License) from the Environmental Entity from the State of Mato Grosso do Sul – IMASUL (LO 237/2019), and the authorization for grid power injection from the National Electrical Energy Agency (ANEEL) on October 11, 2019 (dispatch 2.802). The SHP is connected to the national grid "SIN" (National Interconnect System) through the local grid.

SHP Bandeirante:
This SHP is fully operational since October/2019 when it received the clearance (Operation License) from the Environmental Entity from the State of Mato Grosso do Sul – IMASUL (LO 190/2019), and the authorizations for grid power injection from the National Electrical Energy Agency (ANEEL) on October 11, 2019 (dispatch 2.803) and October 18, 2019 (dispatch 2.883). The SHP is connected to the national grid "SIN" (National Interconnect System) through the local grid.

SHP Pedra Furada
This SHP is operational since March/2012 when it received the clearance (Operation License) from the Environmental Entity from the State of Pernambuco – CPRH (LO 05.22.03.001293-3), and the authorization for grid power injection from the National Electrical Energy Agency (ANEEL) on March 20, 2012 (dispatch 931). The SHP is connected 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>>

SHP Areado

The proposed project activity is installation and operation of 2 Kaplan S Turbines, with horizontal axis, having individual capacity of 9 MW and with aggregated installed capacity of 18 MW.

The generators generate power at 13.8 kV and at a frequency of 60 Hz, which is Brazilian standard. The voltage is stepped up at the powerplant substation to 138 kV to supply the local grid, which is connected to the national grid.

Penstock

Power House

Power Subestation

Control Panel

SHP Bandeirante

The proposed project activity is installation and operation of 3 Kaplan S Turbines, with horizontal axis, having individual capacity of 9.6 MW and with aggregated installed capacity of 28 MW.

The generators generate power at 13.8 kV and at a frequency of 60 Hz, which is Brazilian standard. The voltage is stepped up at the powerplant substation to 138 kV to supply the local grid, which is connected to the national grid.

Penstock

Power House

Power Subestation

Control Panel

SHP Pedra Furada

The proposed project activity is installation and operation of 2 Francis Turbines, with horizontal axis, having individual capacity of 3.43 MW and with aggregated installed capacity of 6.5 MW.

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 69 kV to supply the local grid, which is connected to the national grid.

Penstock

Generator

Power Subestation

Turbine

Specification	SHP Areado	SHP Bandeirante	SHP Pedra Furada
	Value	Value	Value
Hydrology	Average water flow: 82.2 m³/s Firm water flow: 55.4 m³/s	Average water flow: 141.7 m³/s Firm water flow: 95.7 m³/s	Average water flow: 10.12 m³/s Firm water flow: 1.26 m³/s
Penstock	2 units Circular Steel Diameter: 5.00 m / 3.32 m	3 units Circular Steel Diameter: 5.00 m / 3.32 m	3 units Circular Steel Diameter: 1.45
Water Intake	Structural Type Length: 18 m	Structural Type Length: 21 m	Submerged Type Length: 4.40 m
Power House	Semi Sheltered type Width: 32.60 m Length: 32.00 m Installed Capacity: 18 MW	Semi Sheltered type Width: 18.50 m Length: 34.00 m Installed Capacity: 28 MW	Sheltered type Width: 33.80 m Length: 17.85 m Installed Capacity: 6.5 MW
Spillway Weir	Concrete Built Length: 78.6 m	Concrete Built Length: 78.6 m	Concrete Built Length: 60 m
Spillway	500.00 m³/s	963.00 m³/s	740.00 m³/s
Turbine	2 units Kaplan S - Horizontal Axis Unit Nominal Power: 9.00 MW Synchronous Rotation: 257 rpm	3 units Kaplan S - Horizontal Axis Unit Nominal Power: 9.60 MW Synchronous Rotation: 257 rpm	2 units Francis - Horizontal Axis Unit Nominal Power: 3.43 MW Synchronous Rotation: 514.3 rpm
Generator	2 units Unit Nominal Power: 10,000 kVA Nominal Voltage: 13.8 kV Power Factor: 0.9	3 units Unit Nominal Power: 10,370 kVA Nominal Voltage: 13.8 kV Power Factor: 0.9	2 units Unit Nominal Power: 3,611 kVA Nominal Voltage: 6.9 kV Power Factor: 0.9
Power Transformer	1 unit Unit Nominal Power: 20,000kVA 13.8 kV / 138 kV	1 unit Unit Nominal Power: 30,000kVA 13.8 kV / 138 kV	1 unit 6.9 kV / 69 kV
Transmission	Overhead Transmission Line 55.0 km 138 kV	Overhead Transmission Line 31.0 km 138 kV	Overhead Transmission Line 13.45 km 69 kV

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. The following Licenses were issued for these powerplants:

Hydro Power	Environmental Entity	License ID	License Date
SHP Areado	IMASUL - MS	237/2019	September 3, 2019
SHP Bandeirante	IMASUL - MS	190/2019	July 31, 2019
SHP Pedra Furada	CPRH - PE	05.22.03.001293-3	August 24, 2011

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.
- Investments in conservation and maintenance of aquatic fauna in the areas influenced by the SHP's.
- Investments in monitoring water quality.
- Creation of a Permanent Preservation Area, including reforestation programs.

Economic benefits:

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

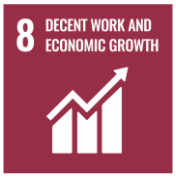
Social benefits:

- Hundreds of employment opportunities created for the local workforce during project's construction.
- Employment opportunities created for local workforce during project activity lifetime.
- Development of the surroundings due to cities, states and federal taxes collected during construction and operation of the powerplant.
- Investments in local rural communities.
- Investments in healthcare.
- Investments in socio-environmental education.
- Promote gender equality campaigns.
-

Sustainable Development Goals (SDG) Achieved with the project:

The SHPs in this project contribute significantly to economic, environmental and social matters, however, the SHP Bandeirante stands out as it contributed to all 17 SDG's. This achievement was already certified by REC Brazil when the SHP Bandeirante issued I-RECs.

SDG	Target	How was it achieved?
	1.1 - By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	Areado: Income generation through the creation of more than 400 jobs, hiring local small companies and training of workers to the job. Bandeirante: Income generation through the creation of more than 500 jobs and training of workers to the job. Pedra Furada: Income generation through the creation of more than 300 jobs and training of workers to the job.
	2.4 - By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	More than 1 million reais invested in plant nurseries in the local rural community and planting fruit trees
	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	Investments of around 180 thousand reais in health promotion and welfare actions
	4.7 - By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development	Carrying out Socio-Environmental Education Programs covering adults and children from the local community.
	5.1 - End all forms of discrimination against all women and girls everywhere	Implementation of the SOMOS Program with a focus on encouraging diversity, gender equality and female empowerment.
	6.3 - By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	Investments in monitoring water quality in the areas influenced by the SHP's.

	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix.	Clean Energy Generation
	8.3 - Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services. 8.8 - Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment	Certification of Occupational Health and Safety and Compliance of the principles of Human Rights. Atiaia Renováveis is ranked as a Great Place to Work (GPTW seal) in Brazil. Generation of 1,200 jobs during SHP's construction.
	9.1 - Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all 9.5 - Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.	Innovative practices for improving products, processes, and business models business. Investment in startups that work with causes with social and environmental impact.
	10.4 - Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality.	Investments in the municipalities where the hydro powers where installed, including through taxation, contributing to the positive increase of its economy.
	11.4 - Strengthen efforts to protect and safeguard the world's cultural and natural heritage	Nature conservation projects, social initiatives and investments in the protection of cultural and natural heritage.
	12.2 - By 2030, achieve the sustainable management and efficient use of natural resources 12.4 - By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to	Investment in responsible consumption and production actions. Implementation of waste monitoring programs in PCHs for correct destination, recycling or disposal of waste.

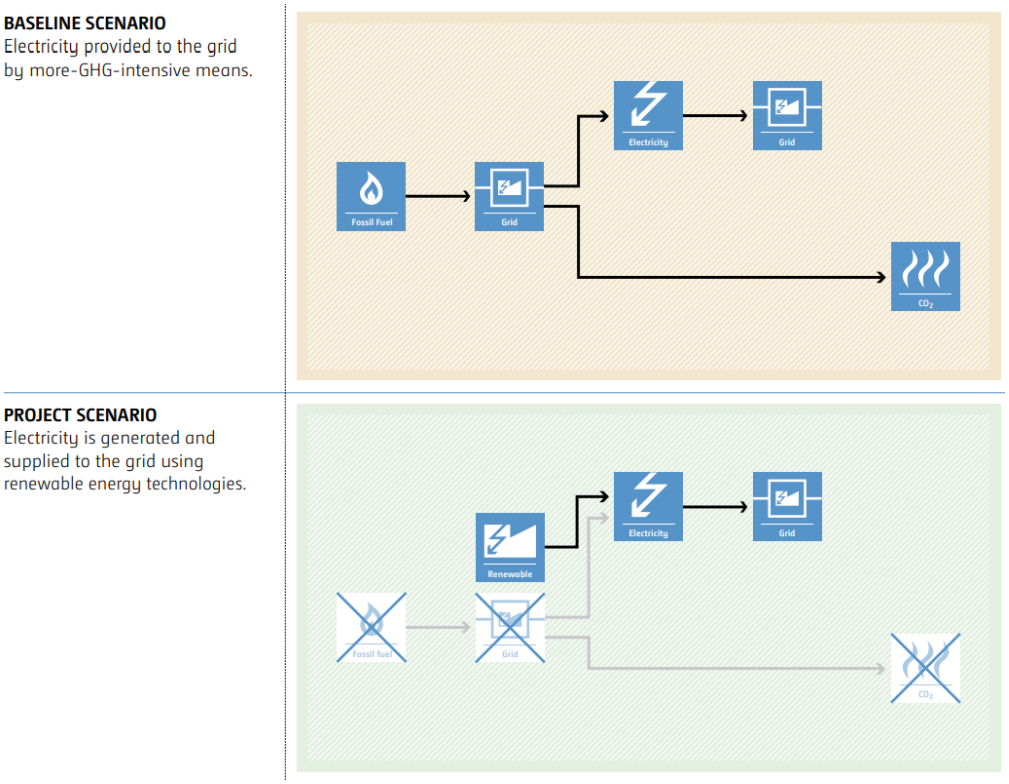
	minimize their adverse impacts on human health and the environment 12.5 - By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse 12.6 - Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle	
	13.2 – Integrate climate change measures into national policies, strategies and planning.	Reduction of GHG emissions through renewable energy generation.
	14.4 - By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.	Investments in conservation and maintenance of aquatic fauna in the areas influenced by the SHP's.
	15.1 - By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. 15.2 - By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. 15.5 - Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.	Areado: Creation of a Permanent Preservation Area of 181.06 hectares conserving native fauna and flora, including reforestation programs. Bandeirante: Creation of a Permanent Preservation Area of 250 hectares conserving native fauna and flora, including reforestation programs. Pedra Furada: Creation of a Permanent Preservation Area of 30.4 hectares conserving native fauna and flora, including reforestation programs.
	16.7 - Ensure responsive, inclusive, participatory and representative decision making at all levels. 16.b - Promote and enforce non discriminatory laws and policies for sustainable development.	Carrying out voluntary initiatives to promote sustainable growth and citizenship, through corporate leaders.

	17.16 - Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries	Participant in the UN Global Compact since 2021.

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 project activity 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:
ACM0002. - "Grid-connected electricity generation from renewable sources", Version 21.0. 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
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install Greenfield power plant; (b) involve a capacity addition to (an) existing plant(s); (c) involve a retrofit of (an) existing plant(s)/unit(s); (d) involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) involve a replacement of (an) existing plant(s)/unit(s).	(a) install Greenfield power plant.
In case the project activity involves the integration of a BESS, the methodology is applicable to grid-connected renewable energy power generation project activities that: (a)Integrate BESS with a Greenfield power plant; (b) Integrate a BESS together with implementing a capacity addition to (an) existing solar photovoltaic1 or solar power plant(s)/unit(s); (c) Integrate a BESS to (an) existing solar photovoltaic or solar power plant(s)/unit(s) without implementing any other changes to the existing plant(s); (d) Integrate a BESS together with implementing a retrofit of (an) existing solar photovoltaic or solar power plant(s)/unit(s).	N/A. This project does not involve BESS.

The methodology is applicable under the following conditions: (a) Hydro power plant/unit with or without reservoir, solar power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for solar, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity; (c) In case of Greenfield project activities applicable under paragraph 5 (a) above, the project participants shall demonstrate that the BESS was an integral part of the design of the renewable energy project activity (e.g., by referring to feasibility studies or investment decision documents); (d) The BESS should be charged with electricity generated from the associated renewable energy power plant(s). Only during exigencies 2 may the BESS be charged with electricity from the grid or a fossil fuel electricity generator. In such cases, the corresponding GHG emissions shall be accounted for as project emissions following the requirements under section 5.4.4 below. The charging using the grid or using fossil fuel electricity generator should not amount to more than 2 per cent of the electricity generated by the project renewable energy plant during a monitoring period. During the time periods (e.g., week(s), months(s)) when the BESS consumes more than 2 per cent of the electricity for charging, the project participant shall not be entitled to issuance of the certified emission reductions for the concerned periods of the monitoring period.	(a) Hydro power plant/unit with or without reservoir

In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or (b) The project activity is implemented in an existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (7) is greater than 4 W/m²; or (c) The project activity results in new single or multiple reservoirs and the power density calculate equation (7), is greater than 4 W/m². (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density of any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m², all of the following conditions shall apply. (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8) is greater than 4W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be: (a) Lower than or equal to 15 MW; and Less than 10% of the total installed capacity of integrated hydro power project.	The Hydro Power Plants in this project are Run-of-River type.
In the case of integrated hydro power projects, project proponent shall: (a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability indifferent seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if	N/A. This project does not involve integrated hydro power.

any), and rainfall for minimum five years prior to implementation of CDM project activity.	
The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site. (b) Biomass fired power plants;	N/A. This project is the installation of greenfield Small Hydro Power.
In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	N/A. This project is the installation of greenfield Small Hydro Power.

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.
- SHP Bandeirante issued I-RECs. Reference: PCHBHYDR001
    - 2022: 141,404 MWh, resulting in a reduction of 30,754 CoUs

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

As per applicable methodology ACM0002 - Version 21.0, 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 2023 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	2023
	tCO2/MWh	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	0,17
February	0,43	0,45	0,42	0,38	0,26	0,35	0,33	0,31	0,33	0,26	0,14
March	0,43	0,43	0,42	0,39	0,29	0,36	0,30	0,24	0,31	0,22	0,17
April	0,44	0,44	0,40	0,39	0,30	0,32	0,31	0,20	0,30	0,12	0,19
May	0,43	0,43	0,40	0,40	0,31	0,34	0,29	0,23	0,32	0,15	0,17
June	0,44	0,43	0,42	0,40	0,29	0,40	0,26	0,29	0,32	0,23	0,28
July	0,42	0,43	0,41	0,39	0,30	0,37	0,35	0,25	0,32	0,22	0,27
August	0,41	0,44	0,40	0,40	0,31	0,37	0,32	0,25	0,34	0,24	0,23
September	0,43	0,45	0,39	0,40	0,30	0,35	0,33	0,21	0,34	0,26	0,20
October	0,43	0,44	0,40	0,39	0,30	0,36	0,32	0,34	0,34	0,25	0,22
November	0,44	0,44	0,40	0,39	0,30	0,25	0,34	0,32	0,34	0,22	0,27
December	0,44	0,44	0,40	0,38	0,31	0,24	0,35	0,35	0,32	0,16	0,24

The official power generation data of the SHPs during the Monitoring Period, was informed by CCEE (Electric Energy Trading Chamber) digitally through their website/system, already considering the subtraction of the MWh that were converted into I-REC

ELECTRICITY GENERATED IN THE MONITORING PERIOD - EG											
Month	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	MWh	MWh	MWh	MWh	MWh	MWh	MWh	MWh	MWh	MWh	MWh
Jan	359	751	1.277	1.296	168	2.190	1.421	21.813	24.178	8.718	21.362
Feb	178	1.306	926	1.070	112	2.136	1.196	27.073	19.518	9.068	22.102
Mar	236	1.191	1.398	1.284	75	2.180	696	25.840	20.426	10.458	24.070
Apr	838	928	690	2.704	819	3.875	1.325	21.853	17.008	9.153	26.878
May	1.486	2.495	927	2.973	1.886	4.174	1.062	20.900	19.121	9.221	23.865
Jun	2.576	2.271	2.488	2.645	4.311	3.400	2.366	18.580	17.721	10.531	23.664
Jul	4.157	2.595	4.300	2.312	4.600	3.459	3.657	18.808	17.277	9.945	22.581
Aug	3.677	2.036	3.691	1.677	4.790	2.495	4.787	17.795	18.857	10.357	21.402
Sep	2.775	3.466	2.195	1.725	4.589	1.989	12.313	16.118	16.298	9.386	20.007
Oct	1.977	3.552	1.396	779	3.650	1.128	18.236	17.866	19.952	9.569	19.192
Nov	1.465	2.276	803	469	2.214	863	19.725	16.887	20.048	8.216	17.871
Dec	954	1.939	1.105	215	1.838	852	24.656	17.988	24.591	11.021	20.309

SHP BANDEIRANTE - I-RECs	
Month	2022
	MWh
Jan	15.337
Feb	14.529
Mar	15.510
Apr	13.634
May	11.076
Jun	11.199
Jul	10.087
Aug	10.142
Sep	9.609
Oct	10.384
Nov	9.627
Dec	10.270
Total	141.404

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	2023
	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq	tCO2eq
Jan	158	343	543	488	46	769	324	7.205	7.907	2.396	4.596
Feb	77	584	386	407	29	740	394	8.443	6.405	2.208	3.995
Mar	102	516	582	505	22	776	212	6.230	6.329	2.193	5.123
Apr	365	405	277	1.064	243	1.245	405	4.308	5.155	1.109	5.201
May	635	1.069	372	1.180	577	1.426	309	4.759	6.165	1.411	4.079
Jun	1.132	981	1.037	1.051	1.266	1.370	614	5.330	5.742	2.459	6.741
Jul	1.764	1.121	1.771	910	1.398	1.273	1.268	4.618	5.497	2.195	6.103
Aug	1.522	898	1.495	664	1.468	913	1.516	4.425	6.368	2.504	4.983
Sep	1.196	1.552	863	688	1.397	705	4.079	3.438	5.616	2.415	3.902
Oct	851	1.574	557	302	1.100	403	5.826	5.987	6.760	2.290	4.165
Nov	644	1.007	324	183	669	217	6.647	5.387	6.888	1.724	4.780
Dec	421	852	442	82	561	204	8.650	6.372	7.814	1.421	4.813
Total	8.867	10.903	8.648	7.525	8.775	10.040	30.246	66.501	76.645	24.325	58.480

Total amount of emission reductions was 310,955 tCO2eq for the monitoring period, **already considering the deduction of MWh that were converted into I-RECs.**

C.6. Prior History>>

The SHP Bandeirante, part of this project, issued I-RECs from January/2022 to December/2022

C.7. Monitoring period number and duration>>

First Monitoring Period: 11 years – 01/01/2013 to 31/12/20223

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 >>

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 the Power Substations.

SHP AREADO		
Meter	**Serial Number**	**Model**
Main	MW-1707A824-02	SCHNEIDER ELECTRIC ION 8650
Check	MW-1707A212-02	SCHNEIDER ELECTRIC ION 8650

SHP BANDEIRANTE		
Meter	**Serial Number**	**Modelo**
Main	PT-1205A292-01	SCHNEIDER ELECTRIC ION 8650
Check	MW-1707A224-02	SCHNEIDER ELECTRIC ION 8650

SHP PEDRA FURADA		
Meter	**Serial Number**	**Specification**
Main	PT-1201A492-01	SCHNEIDER ELECTRIC ION 8600
Check	MW-2302B626-02	SCHNEIDER ELECTRIC ION 8650

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 calibrations of the meters were performed: SHP Areado – 20/06/2022 SHP Bandeirante – 26/11/2020 SHP Pedra Furada – 18/12/2020

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

CONTRUCTION MARGIN

Average Emission Factor (tCO2/MWh) - ANNUAL	
2023	**0,0467**

OPERATION MARGIN

Average Emission Factor (tCO2/MWh) - MONTHLY												
2023												
	January	February	March	April	May	June	July	August	September	October	November	December
	0,2917	0,2377	0,2957	0,3403	0,2951	0,5231	0,4939	0,4190	0,3433	0,3873	0,4882	0,4273