ENGENHEIRO ERNESTO JORGE DREHER AND ENGENHEIRO HENRIQUE KOTZIAN SHPS VCS PROJECT (JUN1120)

Document Prepared by Carbotrader

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity consists in electricity generation by renewable source (hydro), through the construction of small hydropower plants (SHPs) located in the Júlio de Castilhos and Salto do Jacuí municipalities, both in Rio Grande do Sul state – south region of Brazil.

Since the project activity is made up of 2 grid-connected renewable power plants/units (Greenfield) the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants or by the addition of new generation sources (scenario existing prior to the implementation of the project.).

Estimated amount of annual average GHG emission reductions 37,732 tCO_2e for entire second credit period a total of 377,318 tCO_2e.

The Engenheiro Ernesto Jorge Dreher SHP has an installed capacity of 17.95 MW and a new reservoir which in its higher water level occupies an area of 0.83 km2.

The Engenheiro Henrique Kotzian SHP has an installed capacity of 13.230 MW and a new reservoir which in its higher water level occupies an area of 0.66 km2.

The project activity purpose is to provide electric power to the National Interconnected System - SIN (from Portuguese – *Sistema Interconectado Nacional*), displacing the thermal generation from fossil fuels presents in the system with the generation of renewable sources of energy. Moreover, the SHPs construction helps to meet the growing energy demand on Rio Grande do Sul state, to decrease the external energy dependency and contributes to the environmental sustainability, as it increases the share of renewable energy in relation to the total consumption of electricity of Brazil.

In regard to the contribution of project activity to reduce the global warming effects caused by greenhouse gas emissions, the project activity reduces these gas emissions, as well reduces the host country dependence of a matrix with large participation of thermoelectricity. As stated in the Generation Information Bank (from portuguese *Banco de Informações de Geração*-BIG) of National Electric Energy Agency, 25.24% of the generated energy in Brazil comes from thermoelectric plants (that uses fossil fuels as energy source) connected to the National Interconnected System.

The project activity is also aligned with the specific requirements of VCS, because:

- It contributes to environmental sustainability once it reduces the use of fossil energy (non-renewable sources). Thus, the project contributes to the best use of natural resources and makes use of clean and efficient technologies;

- It enlarges the opportunity for employment in areas where the project is located;
- It contributes to better conditions of the local economy, because the use of renewable energy reduces the dependence on fossil fuels, reduces the amount of pollution related to the fossil fuel emissions and the social costs related to it.

Furthermore, the project activity diversifies the electricity generation sources and decentralizes the energy generation, promoting advantages as:

- Increased reliability, less frequent and extensive interruptions;
- Lower requirements on the reserve margin;
- Power of better quality for the region;
- Reduced losses on the lines;
- Control of reactive power;
- Mitigation of the congestion in the transmission and distribution grid.

1.2 Sectoral Scope and Project Type

Sectoral scope: 1 - Energy industries (renewable - / non-renewable sources)

1.3 Project Eligibility

This is the second credit period renewal for a project activity already registered in the VCS program (Project 708).

1.4 Project Design

The Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs are ventures classified as Small Hydro Power Plants because, according to the Brazilian Resolution number 652, issued on 9th December 2003, from National Electric Energy Agency (ANEEL), to be considered a SHP the reservoir area of a hydropower plant must be lower than 3 Km^2 (300 ha) and its total installed capacity must be between 1 MW and 30 MW. The plants of the project activity are in agreement with this range as described on the tables 1 and 2.

The ventures are also called “run of river” plants which do not include significant water storage, and must therefore make complete use of the water flow. A typical run-of-river scheme involves a low-level diversion dam and is usually uses an unevenness accent on a river.

The project activity’s power plants will dispatch generated energy to the National Interconnected Grid through the connection bay located on 138kV Substation Salto do Jacuí (installed on the Salto do Jacuí city, Rio Grande do Sul state) that belongs to the State Company of Electric Energy - CEEE (from Portuguese *Companhia Estadual de Energia Elétrica*), which is

16.36 km far from the project activity (from the SHP Jorge Dreher are 5.25 Km until the SHP Engenheiro Henrique Kotzian substation and from this point the projects are interconnected for more 11.11 Km until substation Salto do Jacui). The RGE (from Portuguese Rio Grande Energia) is the local energy concessionary.

The monitoring equipments was installed on the SHPs Power House and in the substation Salto do Jacuí. Better explanation is provided in the B.7.2 Section.

The technology and equipment used in the project activity were developed and manufactured in Brazil and therefore was not expected transfer of know-how or technology to the host country. All equipments were new when the project was implemented with average lifetime of 30 years[1]. The emissions sources and GHGs involved are CO_2 emissions from electricity generation in fossil fuel fired power plants and emissions of CH_4 from the reservoir of new large hydropower plants that would be implanted to complement the availability of energy in the country in case of no additional energy input had occurred.

The technical characteristics of equipment installed in the SHPs can checked on Section 1.11 (tables 1 and 2).

Eligibility Criteria

Not applicable. Not grouped project.

1.5 Project Proponent

Organization name	BME Rincão do Ivaí Energia S.A.
Contact person	Mateus Stefanello
Title	Director
Address	Avenida Brasil, 2530, Sala H, Hermani, Ibirubá, Rio Grande do Sul State ZIP 98200-000
Telephone	+55 54 3324 1255
Email	mstefanello@coprel.com.br

Organization name	BME Capão da Convenção Energia S.A.
Contact person	Mateus Stefanello

[1] As per document "Study for Economic Lifetime and Rate Depreciation" vol. 1 and 2 from ANEEL, Nov/2000

Title	Director
Address	Avenida Brasil, 2530, Sala H, Hermani, Ibirubá, Rio Grande do Sul State ZIP 98200-000
Telephone	+55 54 3324 1255
Email	mstefanello@coprel.com.br

1.6 Other Entities Involved in the Project

Organization name	Carbotrader Assessoria e Consultoria em Energia Eireli
Role in the project	PD Consultant
Contact person	Arthur Moraes
Title	Director
Address	90, St. Maestro Manoel Antiqueira, Jundiaí, Sao Paulo State, Brazil
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1.7 Ownership

BME Rincão do Ivaí Energia S.A. is the owner of Engenheiro Ernesto Jorge Dreher SHP. This can be checked in the ANEEL documents (dispatches and authoritative resolutions) and in contracts of equipments acquisition.

BME Capão da Convenção Energia S.A. is the owner of Engenheiro Henrique Kotzian SHP. This can also be evidenced by its ANEEL documents (dispatches and authoritative resolutions) and in contracts of equipments acquisition.

All the evidence documentation will be provide to DOE during the site visit.

1.8 Project Start Date

Project starting date: 01/07/2009 – Date when the generating units number 1, 2 and 3 (UGs 1, 2 and 3) of Engenheiro Ernesto Jorge Dreher started inputting energy into the National grid.

1.9 Project Crediting Period

Crediting period starting date: The second monitoring period totalizes 10 years being: 01/07/2019 to 30/06/2029.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
2019 July	18,865
2020	37,732
2021	37,732
2022	37,732
2023	37,732
2024	37,732
2025	37,732
2026	37,732
2027	37,732
2028	37,732
2029 June	18,865
Total estimated ERs	377,318
Total number of crediting years	10
Average annual ERs	37,732

1.11 Description of the Project Activity

The Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs are ventures classified as Small Hydro Power Plants because, according to the Brazilian Resolution number 652, issued on 9th December 2003, from National Electric Energy Agency (ANEEL), to be considered a SHP the reservoir area of a hydropower plant must be lower than 3 Km^2 (300 ha) and its total installed capacity must be between 1 MW and 30 MW. The plants of the project activity are in agreement with this range as described on the tables 1 and 2.

The ventures are also called “**run of river**” plants which do not include significant water storage, and must therefore make complete use of the water flow. A typical run-of-river scheme involves a low-level diversion dam and is usually uses an unevenness accent on a river.

The project activity’s power plants dispatches generated energy to the National Interconnected Grid through the connection bay located on 138kV Substation Salto do Jacuí (installed on the Salto do Jacuí city, Rio Grande do Sul state) that belongs to the State Company of Electric Energy - CEEE (from Portuguese *Companhia Estadual de Energia Elétrica*), which is 16.36 km far from the project activity (from SHP Jorge Dreher are 5.25 Km until SHP Engenheiro Henrique Kotzian’substation and from this point the projects are interconnected for more 11.11 Km until substation Salto do Jacui). The RGE (from Portuguese *Rio Grande Energia*) is the local energy concessionary.

The monitoring equipments are installed on the SHPs Power House and in the substation Salto do Jacuí. Better explanation is provided in the B.7.2 Section.

The technology and equipment used in the project activity are developed and manufactured in Brazil and therefore was not expected transfer of know-how or technology to the host country. All equipments were new when the project was implemented with average lifetime of 30 years[2]. The emissions sources and GHGs involved are CO_2 emissions from electricity generation in fossil fuel fired power plants and emissions of CH4 from the reservoir of new large hydropower plants that would be implanted to complement the availability of energy in the country in case of no additional energy input had occurred.

The technical characteristics of equipment installed in the SHPs can be seen in tables below:

Table 1: Engenheiro Ernesto Jorge Dreher SHP technical characteristics

Generator	Characteristics	Source
Type	Synchronous	Equipment plaque data
Quantity	5	Equipment plaque data
Power (kW)	3 x 5,715 / 1 x 326.3 / 1 x 480	Equipment plaque data
Nominal Power (kVA)	3 x 6,350 / 1 x 375 / 1 x 592.6	Equipment plaque data
Voltage (kV)	3 x 6.9 / 1 x 0.38 / 1 x 0.38	Equipment plaque data
Frequency (Hz)	60	Equipment plaque data
Turbines	**Characteristics**	**Source**

[2] As per document “Study for Economic Lifetime and Rate Depreciation” vol. 1 and 2 from ANEEL, Nov/2000

Type	Francis / Kaplan	
Quantity	5	Equipment plaque data
Power (kW)	3 x 5,912 / 1 x 315.43 / 1 x 480	Equipment plaque data
Nominal Flow (m^3/s)	3 x 11.40 / 1 x 2.36 / 1 x 3.40	Equipment plaque data
Water head (m)	3 x 57.5 / 1 x 15 / 1 x 15.42	Equipment plaque data
Other Information	**Characteristics**	**Source**
Reservoir Area (Km^2)	0.83	LO_1058/2019-DL
Power Density (W/m^2)	21.63	Based on ACM0002
Assured Energy[3] (MWaverage) (PLF =68.18%)	12.24	ANEEL database

Table 2: Engenheiro Henrique Kotzian SHP technical characteristics

Generator	Characteristics	Source
Type	Synchronous	
Quantity	3	Equipment plaque data
Power (kW)	3 x 4,410	Equipment plaque data
Nominal Power (kVA)	3 x 4,900	Equipment plaque data
Voltage (kV)	3 x 6.9	Equipment plaque data
Frequency (Hz)	60	Equipment plaque data
Turbines	**Characteristics**	**Source**
Type	Francis	
Quantity	3	Equipment plaque data
Power (kW)	3 x 4,529	Equipment plaque data
Nominal Flow (m^3/s)	3 x 16.08	Equipment plaque data

[3] Assured energy is considered a long term average generation discounting programmed and unprogrammed stops for maintenance and other related parameters.

Water head (m)	31.21	Equipment plaque data

Other Information	Characteristics	Source
Reservoir Area (Km^2)	0.66	LO N° 206/2019-DL
Power Density (W/m^2)	20.05	Based on ACM0002
Assured Energy (MWaverage) (PLF = 65.53%)	8.67	ANEEL database

The baseline scenario to the project activity is the same as the scenario existing prior to the start of implementation of the project activity.

1.12 Project Location

At the pictures below is it possible to verify the regional position of both municipalities where the hydro plants are located in Rio Grande do Sul state, region South of Brazil. The municipalities are Júlio de Castilhos (figure 1) and Salto Jacuí (figure 2). The stretch of Ivaí river, where the power plants of the project activity are located on, flows between these two municipalities, being one of their geographical limits. The Engenheiro Ernesto Jorge Dreher SHP is located at 29º07’13”S and 53º22’04”W, and the Engenheiro Henrique Kotzian SHP is located at 29°07’34”S and 53°19’06”W.

Figure 1: Localization of Júlio de Castilhos city.

Figure 2: Localization of Salto do Jacuí city.

1.13 Conditions Prior to Project Initiation

Prior to the project activity implementation, there were no hydropower plants or other project activities implemented in the location of the Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian Small Hydropower Plants. The baseline scenario and the scenario without the project activity are the same, it means: the energy being generated by the Brazilian electrical grid which has high participation of thermo electrical power plants (based on fossil fuels) in its current composition (see also section 2.4).

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The following state and federal laws and resolutions regulate the project activities of electricity generation by hydropower plants to be implemented on Rio Grande do Sul state:

- Federal Law Nº 6938 issued on 31st august 1981 - "States about the National Environmental Policy, its goals, formulating mechanisms and applications";

- CONAMA Resolution Nº 06 issued on 16th September 1987 - "States about the environmental licensing of electric energy generation building sector";

- CONAMA Resolution Nº 237 issued on 22nd December 1997 - "Rules the licensing environmental aspects established on the National Environmental Policy";

- CONAMA Resolution Nº 279 issued on 27th June 2001 - "Establishes the procedures to simplified environmental licensing of small environmental potential impact ventures";

- CONSEMA Resolution Nº 38 issued on 18th July 2003 – "Establishes procedures, technical criteria and Grace periods to licensing activities promoted by FEPAM".

The project activity is in compliance with all the laws and regulations required. Thus, the permissions and licenses were issued by the regulatory agencies. The Environmental Protection Agency of Rio Grande do Sul state - FEPAM (from portuguese *Fundação Estadual de Proteção Ambiental*), on the basis of the environmental legislation and other pertinent norms, forwarded the following environmental licenses to the Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs:

Engenheiro Ernesto Jorge Dreher SHP

- LP N° 108/2004-DL – Previous Licence issued on 30th January 2004;
- LI Nº 372/2008-DL – Installation License issued on 22th April 2008;
- LO N° 2968/2009-DL – Operation License issued on 18th June 2009;
- LO N° 354/2014-DL – Operation License issued on 21st January 2014;
- LO N° 1058/2019-DL – Operation License issued on 19th February 2019.

Engenheiro Henrique Kotzian SHP

- LP N° 455/2005-DL – Previous License issued on 24th June 2005;
- LI N° 495/2010-DL – Installation License issued on 7th May 2010;
- LO N° 1122/2011-DL – Operation License issued on 2nd March 2011;
- LO N° 7989/2015-DL – Operation License issued on 25th March 2015;
- LO N° 206/2019-DL – Operation License issued on 2nd September 2019.

Moreover, the Electrical Regulatory Agency - ANEEL issued the relevant following documents which demonstrate that the regulations have been being obeyed, allowing the process progress of plants installation.

Engenheiro Ernesto Jorge Dreher SHP

- Dispatch no 1181 dated 17th April 2007 – Approves the SHP project design;
- Dispatch no 1805 dated 18th May 2009 – Ratifies basic design parameters of the plant.
- Dispatch no 2246 dated 19th June 2009 – Authorizes the test operations, the generating units number 1, 2 and 3.

- Dispatch no 2261 dated 22nd June 2009 – Authorizes the installed capacity enlargement for 17.725 MW.

- Dispatch no 3756 dated 2nd October 2009 – Authorizes the commercial operations for the generating unit number 1.

- Dispatch no 3757 dated 2nd October 2009 – Authorizes the test operations for the generating unit number 4.

- Dispatch no 4068 dated 30th October 2009 – Authorizes the commercial operations for the generating unit number 2.

- Dispatch no 4188 dated 11th November 2009 – Enlarges the installed capacity from 17.725 MW to 17.87 MW.

- Dispatch no 4189 dated 11th November 2009 – Authorizes the commercial operations for the generating unit number 4.

- Dispatch no 4383 dated 25th November 2009 – Authorizes the commercial operations for the generating unit number 3.

- Dispatch no 268 dated 3rd February 2010 – Authorizes the implantation of generation unit number 5.

- ANEEL Resolution no 407, dated 19th October 2000 - Establishes that if the present/real installed capacity is greater than +/- 5 % of the authorized (granted) installed capacity, a revision of the authorized installed capacity should be requested.

Engenheiro Henrique Kotzian SHP

- Dispatch no 6814 dated 24th April 2006 – Approves the project plant of Engenheiro Ernesto Jorge Dreher SHP.

- Dispatch no 1180 dated 18th April 2007 – Approves the SHP project design.

- Dispatch no 602 dated 16th February 2009 – Ratify parameters of the project design.

- Dispatch no 2311 dated 18th September 2010 – Authorizes test operations of the generating units number 1, 2 and 3.

- Dispatch no 1063 dated 4th March 2011 – Authorizes commercial operations of the generating units number 1, 2 and 3.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

Project activity registered on CDM (from UNFCCC) under the number 8018, link: https://cdm.unfccc.int/Projects/DB/RWTUV1351891991.08/view

1.15.2 Projects Rejected by Other GHG Programs

Not applicable. The project was not rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

If the GHG emissions reductions are issued on CDM program, the monitoring report with the credit period involved became public available in the link of the project activity, below:

Link: *https://cdm.unfccc.int/Projects/DB/RWTUV1351891991.08/view*

So, the credit period reported in this program cannot be the same for the VCS program.

1.16.2 Other Forms of Environmental Credit

This project activity has achieved carbon credits over CDM schemes for the period: 01/01/2013 to 31/12/2015. Not other.

1.17 Additional Information Relevant to the Project

Leakage Management

Not applicable. According to methodology ACM0002, no leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

Commercially Sensitive Information

Not applicable. There aren´t commercially sensitive information.

Sustainable Development

The project activity consists of two new renewable energy generators, SHP Engenheiro Ernesto Jorge Dreher (17.95 MW of installed power) and Engenheiro Henrique Kotzian (13.23 MW of installed power) with the purpose of supplying electricity generated by a renewable source for the National Interconnected System (SIN), offsetting the thermal generation by fossil fuels with the generation of renewable electricity, in order to supply part of the growing demand for electricity in Brazil.

A very advantageous attraction of SHPs is the fact that their installation and operation do not cause impacts as a large hydroelectric plant. Being considered **run-of-river** power plants, they preserve the flow upstream that is the same downstream, as happens in the river flow regime of historical flows. As the water used accumulates in an embedded place, having the shape of a full river, they do not need large reservoirs, which avoids damage to the soil, fauna, flora and water resources present there.

The whole project was conceived in terms of the Brazilian regulation for licensing hydroelectric projects, based on the National Environment Policy (PNMA), established by Federal Law 6,938 /81 and the Resolutions of the National Environment Council CONAMA #06 and #237, issued on September 16th, 1987 and December 22nd, 1997 respectively, which establish procedures for the environmental licensing of electrical projects in Brazil.

Throughout the process of implementing the project activity, it was necessary for the project proponents to prepare environmental studies and for some compensation measures to be adopted, so that all required environmental licenses were issued by FEPAM (competent state environmental agency).

To minimize the effects of the project activity on the local environment, the following programs were installed (among others): program to maintain the sanitary flow (ecological flow) of the river, to clean the reservoir (before filling it to prevent the proliferation of vectors), rescue of ichthyofauna and terrestrial fauna, program to recover degraded areas, riparian forests and legal reserve areas (including slope stabilization and erosion control), conservation and use of the reservoir surroundings and environmental education program .

Programs for monitoring water quality and monitoring the area (to avoid hunting and predatory fishing) also need to be maintained by project participants as part of the requirements for renewing the operating license.

An important part of the project, environmental education aims to pass on to the local communities the knowledge about the environment of the region, gathered during the performance of environmental studies, to inform the new relationships introduced in the daily lives of the populations with the implementation of the SHPs, encouraging positive changes in the way of relating to the region's environment and raising awareness among the internal public about the values of the environment and the local cultural tradition.

The elaboration of studies of this magnitude and compensatory measures are beneficial to the region affected by the project, as they enable projects of economic and social interest to be in line with the protection of natural resources and their efficient use.

Continuous reports (environmental assessment) are delivered to the Environmental agency responsible (shall be done during the project activity lifetime).

Further Information

Not applicable. No further information.

2 SAFEGUARDS

2.1 No Net Harm

Is described on Section 2.3 of this VCS PD. The environmental impact assessment is part of the environmental licensing, which is a legal obligation in Brazil. During construction phases, some impacts were identified, and monitoring programs were designed to mitigate these impacts. The programs focusing the impacts mitigation are being developed and is valid during all the project lifetime and are frequently reported (1 or 2 times per year) to environmental agency (FEPAM).

2.2 Local Stakeholder Consultation

Before the original first validation, in order to satisfy and comply with VCS requirements, the project proponents sent invitation letters describing the project and requesting commentaries by the following interested parties:

- Júlio de Castilhos City Hall;
- Júlio de Castilhos City Council;
- Júlio de Castilhos Environmental Secretary;
- Trade, Culture and Industry Association of Júlio de Castilhos;
- Salto do Jacuí City Hall;
- Salto do Jacuí City Council;
- Salto do Jacuí Agriculture Secretary;
- Trade and Industry Association of Salto do Jacuí;
- FEPAM – Environmental Protection Agency of Rio Grande do Sul state;
- FBOMS - Brazilian Forum of NGOs and social organizations;
- Rio Grande do Sul Prosecutors Office;
- National Prosecutors Office.

Attached to the letters, was sent an Executive Summary with information about project, also the web link were the stakeholders could accesses the Project Description (Portuguese version). The interested parties above were invited to present their concerns and provide comments on project activity during a period of 30 days after receipt of the invitation letter. The last letters were received on 01 February 2011. On 01 March 2011, only the Trade, Culture and Industry Association of Júlio de Castilhos City sent comments, approving and supporting the project activity.

Otherwise social programs involving the SHP´s employees, their families and local community are being developed during the project lifetime. A permanent channel to any stakeholder is available on: https://www.coprel.com.br/contato or through the phone number # 116.

The ultimate speeches were provided to the elementary schools below:

- "Municipal School João Gonçalves Vieira", located in Rincão do Ivaí city (12 km far from SHP Eng. Jorge Dreher);
- "Municipal Schoool Darcy Sampaio", located in Salto do Jacuí city, and "Municipal School Annes Dias", located in Fortaleza dos Valos bordering of Salto do Jacuí city.
- Other schools: "Colégio Sinodal, Escola Alfredo Brenner", "Municipal School for Child Education Floresta", Municipal School José de Anchieta, "Elementary Municipal School Santa Teresinha" and "Municipal School Edmundo Roewer" (all from Ibirubá city) and "State School Lucio Annes Dias" *(from Fortaleza dos Valos city).*

2.3 Environmental Impact

The Small Hydro Power plants (SHPs) are considered an alternative for the Brazilian electric matrix diversification. One of its characteristics is to present low negative impacts to the place of installation, when compared to the business as usual in Brazil (large hydro power plants), due mainly to the fact of it requires a small reservoir.

Studies related to the promoted impacts were carried out as part of the process of environmental licenses issuance. Its results are comprised in the Environmental Simplified Report - RAS (from portuguese *Relatório Ambiental Simplificado*). These studies comprehend the environmental assessment of the influenced area, moreover, it has contained a group of activities and programs which have as main goal to minimize the negative effects and to monitor the influences of the plant installation on local water resources.

As stated by the National Environmental Council - CONAMA (from Portuguese Conselho Nacional do Meio Ambiente) on its resolution number 279 dated of 27th June 2001, the RAS must be performed by ventures that present non significant environmental impacts. It is performed previously the issuance of the Previous License – LP, and only if the enterprise are in accordance to all legal and environmental requirements, the process of licensing carries on, proceeding the necessary steps to acquiring further licenses (Installation License – LI and Operation License – LO).

As both hydro plants Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian have all licenses required to work (LP, LI and LO), it is understood that all the constraints were met, and all the impacts caused by project activities were satisfactorily raised and treated, in order to minimize negative effects.

As main negative impacts identified by the environmental studies, we can highlight the vegetation removal and riparian forest fragmentation, the local loss of threatened species, the temporary diversion of river flow, the inhabitants insecurity feelings promotion and routine alterations, and the reservoir filling associated risks (epidemic risks).

The environmental control plan is composed for several management programs and mitigation measures which target to reduce the impacts of plants installation and operation activities. As spoken above, the satisfactory implementation of all these measures are constraints to operation licenses issuance and renewal and must be in accordance with the state and federal legal requirements.

To minimize the effects of project activity on the local environment, the following programs were installed (among others): maintenance of minimal flow of river (ecologic flow), the clean of reservoir before its filling to avoid vector proliferation, the rescue of terestris and ichthyofaunal, the recuperation of areas degraded due project activities implantation also riparian and legal forest reservation (including slopes stabilization and erosion control), the conservation and use of reservoir surrounding areas and the environmental education program.

Also programs of water quality monitoring and area monitoring (to avoid the predatory hunting and fishing) must be kept by project owners as part of requirements to operation license renewal.

Regarding to the areas surrounding the plants, some of them were owned by government of Rio Grande do Sul state and others were private proprieties. The areas which had to be acquired by the project owners to plants implementation were those that cover the reservoir areas and the permanent preservation areas. Some of the government owned areas were already used as settlement areas at that time. To reallocate people who lived there to other areas, was made a permutation agreement between project owners and state. The people who lived there were reallocated to other areas bought by project owners and permutated with the government according to legal regulations. These areas are located on Cruz Alta, Carazinho and Salto do Jacuí municipalities. In the cases of private proprieties, project owner bought it or it was expropriated according to legal regulations.

The programs focusing the impacts mitigation above are being developed continuously and is valid during all the project lifetime and are frequently reported (1 or 2 times per year) to environmental agency (FEPAM).

The following licenses were issued by Henrique Luis Roessler Foundation - FEPAM (from Portugese Fundação Estadual de Proteção Ambiental Henrique Luis Roessler) the Rio Grande do Sul state environmental regulatory agency to Engenheiro Ernesto Jorge Dreher SHP:

- Previous License: LP N° 108/2004-DL;
- Installation License: LI Nº 372/2008-DL;
- Operation License: LO Nº 2968/2009-DL;

- Operation License: LO N° 354/2014-DL;
- Operation License: LO N° 1058/2019-DL.

The following licenses were issued by Henrique Luis Roessler Foundation – FEPAM to Engenheiro Henrique Kotzian SHP:

- Previous License: LP N° 455/2005-DL;
- Installation License: LI N° 190/2008-DL;
- Operation License: LO N° 1122/2011-DL.
- Operation License: LO N° 7989/2015-DL;
- Operation License: LO N° 206/2019-DL.

2.4 Public Comments

Mr. Marcelo Dornelles Helms, Attorney of General's Office for Institutional Affairs, as representative of the Rio Grande do Sul Prosecutors Office answered the query in a letter dated on 14 September 2011. After reviewing the documentation submitted and access documents and others information referred to the Project Activity, stated that their content is consistent with the environmental rules applicable to the SHPs involved in the project activity. And wasn´t has done any objection.

2.5 AFOLU-Specific Safeguards

Not applicable. Not AFOLU project activity.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

>> Approved baseline and monitoring methodology:

ACM0002 – "Grid-connected electricity generation from renewable sources" - Version 20.0

Link: https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

Furthermore, the following tools are also applied to the second crediting period of the project activity:

TOOL05: "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" – Version 03.0

Link: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

TOOL07: “Tool to calculate the emission factor for an electricity system”, version 07.0

Link: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

TOOL11: “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”, version 03.0.1

Link: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

3.2 Applicability of Methodology

The ACM0002 methodology is applicable to grid-connected renewable energy power generation project activities that:

(a) Install a Greenfield power plant – **applicable to this PA**;
(b) Involve a capacity addition to (an) existing plant(s) – **not applicable to this PA;**
(c) Involve a retrofit of (an) existing operating plants/units – **not applicable to this PA**.;
(d) Involve a rehabilitation of (an) existing plant(s)/unit(s) – **not applicable to this PA**.; or
(e) Involve a replacement of (an) existing plant(s)/unit(s) – **not applicable to this PA**.

Also the methodology is applicable under the following conditions:

(a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit – **applicable to this PA (hydro power plants with reservoirs).**
(b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, 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 – **not applicable to this PA (no capacity additions, retrofit, rehabilitations or replacement).**

In case of hydro power plants, **one** of the following conditions shall apply:

(a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or

(b) The project activity is implemented in 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, calculated using equation (7), is greater than 4 W/m^2; - **applicable to this PA**[4]

(d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m^2, 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 4 W/m^2;

(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/m^2 shall be:

a. Lower than or equal to 15 MW; and

b. Less than 10 per cent of the total installed capacity of integrated hydro power project.

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 VCS project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different 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 any), and rainfall for minimum of five years prior to the implementation of the VCS project activity.

Boths, (a) and (b) criteria, are not applicable to this PA since this is not an integrated hydro power project.

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 - **not applicable to this PA.**

[4] The SHPs Jorge Dreher and Henrique Kotzian grid-connected constructions are considered renewable power generation plants with new single reservoirs and Power Density greater than 4 W/m^2

(b) Biomass fired power plants/units - **not applicable to this PA.**

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" - **not applicable to this PA (Greenfields).**

In addition, the applicability conditions included in the tools referred to below apply:

(a) "TOOL01: Tool for the demonstration and assessment of additionality" **– not used (PD for 2nd credit period).**

(b) "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" – **not used (PDD for 2nd credit period).**

(c) "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" **– not used (no fossil fuel sources).**

(d) "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation";

(e) "TOOL07: Tool to calculate the emission factor for an electricity system";

(f) "TOOL10: Tool to determine the remaining lifetime of equipment" – **not used (PDD for 2nd credit period).**

(g) "TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period";

(h) "TOOL32: Positive lists of technologies" **– not used (PDD for 2nd credit period).**

So the ACM0002 methodology is applicable and has included the baseline scenario for Greenfield power plants.

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
		Other	NA	NA

Source		Gas	Included?	Justification/Explanation
	that is displaced due to the project activity.			
Project	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	Yes	Main emission source. The methane emission for the project activity is considered null once that the power densities of the plants are 21.63 and 20.05 W/m² and, therefore, greater than 10 W/m².
		N_2O	No	Minor emission source
		Other	NA	NA

The project boundary is the area where the project is located which includes the reservoir, dam, powerhouse included the turbines, generators, substation, metering systems and the National Interconnected Grid.

The diagram below shows the project boundary, main equipments, monitored parameters and included gases:

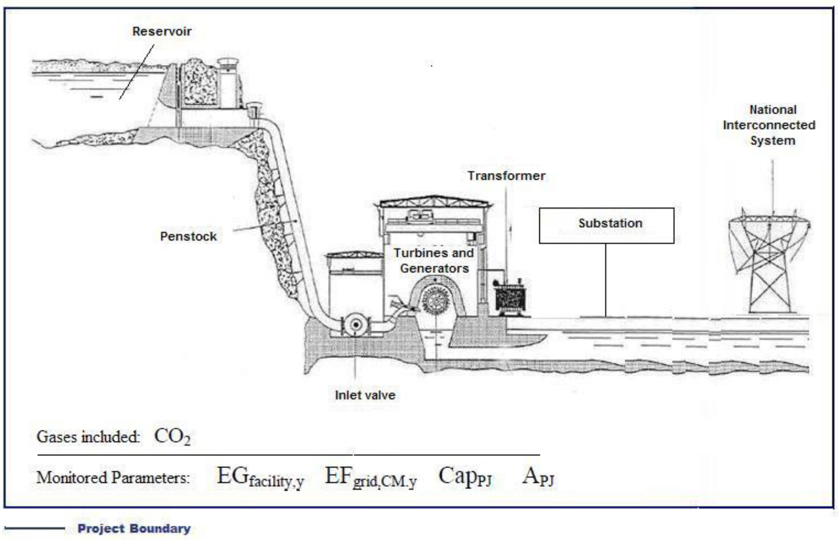


Figure 3: Diagram about project activity boundaries, monitored parameters and included gases

3.4 Baseline Scenario

According to the TOOL 11: “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period is necessary.

The tool consists of two steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.

Step 1: Assess the validity of the current baseline for the next crediting period

The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies If the current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period, go to Step 1.2.

If the current baseline does not comply with relevant mandatory national and/or sectoral policies, then assess based on the examination of current practice in the country or region in which the policies apply, whether those policies are systematically not enforced and that non-compliance with those requirements is widespread in the country or region.

If the current baseline is not in compliance with the relevant mandatory national and/or sectoral policies or if it cannot be shown that the policies are systematically not enforced and that non- compliance with those policies is widespread in the country or region, then the current baseline needs to be updated for the subsequent crediting period.

The validity of the current baseline doesn´t need to be updated since still valid and in compliance with relevant mandatory Brazilian policies. To summarize the SHP remains under the mandatory Brazilian policies below:

- Brazilian Resolution #652 of 09/12/2003 from National Electric Energy Agency (ANEEL), Small Hydro Power Plant;

- ONS (*Operador Nacional do Sistema Elétrico*) module 12;

- CCEE SINERCOM Databank (electricity dispatched to the Grid).

Step 1.2: Assess the impact of circumstances

Assess the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario.

In the situation where the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment, an assessment of the changes in market characteristics is required for the renewal of the crediting period.

Evaluate whether the conditions used to determine the baseline emissions in the previous crediting period are still valid. Assess the availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions;

If the new circumstances make a continued validity of the current baseline not plausible, then the current baseline needs to be updated for the subsequent crediting period.

The circumstances at the time of requesting renewal of the crediting period are the same described for the first crediting period as described just after the TOOL 11 evaluation on this section.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

This sub-step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

Assess whether the remaining technical lifetime of the equipment that would have continued to be used in the absence of the project activity, as determined in the CDM-PDD or CDM-PDD-REN, exceeds the crediting period for which renewal is requested.

Take into consideration the market penetration of different technologies. Evaluate the penetration rate of different technologies that are available in the market and evaluate how they could affect the baseline.

If the baseline scenario of the project activity is the continuation of use of the current equipment(s) without any investment and the projects proponents or third party(ies) will undertake an investment later, but before the end of a crediting period, then the current baseline needs to be updated for that crediting period or the crediting of emission reductions should be limited to the period before the baseline equipment would cease its operation.

Not applicable this is Greenfield project activity.

Step 1.4: Assessment of the validity of the data and parameters

Assess whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated.

Updates should be undertaken in the following cases:

• Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC;

• Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the VCS project activity.

The emission factors should be updated since there are new values available. For second credit period the build margin emission factor shall be fixed ex-ante.

Step 2: Update the current baseline and the data and parameters

This step is only applicable if any of the Steps 1.1, 1.2, 1.3 and/or 1.4 showed that the current baseline needs to be updated.

Step 2.1: Update the current baseline

Update the current baseline emissions for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology applicable to the project activity. The procedure should be applied in the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period.

Applicable, the current baseline emissions shall be updated for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology ACM0002.

Step 2.2: Update the data and parameters

If the application of Step 1.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4.

Applicable, the data and parameters shall be updated as described below and on Section B.7.1. The build margin emission factor shall be fixed ex-ante.

According to the methodology ACM0002, “if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

“The electricity delivered to the grid by the project would have otherwise been generated by the operation of a grid-connected power plant and by the addition of new generating sources, as reflected in the combined margin (CM) from “Tool to calculate the emission factor for an electricity system”, described in the item B.6.1.2.”

Also the baseline emissions are the kWh produced by the renewable generating unit multiplied by an emission coefficient, calculated in a conservative and transparent manner.

So in the Project activity absence, the electricity should be provided by the other grid-connected power plants included the fossil fuel based Power plants.

The project activity use as data source for National Interconnected System (SIN) Emission Factor calculation the operating margin and the build margin coefficients provided by the Designated National Authority (DNA) of the host country (public available).

The Emission Factor of CO_2 resulting from the generation of electric energy in the National Interconnected System (SIN) in Brazil is calculated based on generating records from plants centrally operated by the National Electric System Operator (ONS), which includes thermoelectric plants that use fossil fuels as energy.

The method used to make this calculation is the method of dispatch analysis, which is the most appropriate in determining the emission factor of the electrical grid.

This information is needed for renewable energy projects connected to the electric grid and implanted in Brazil under the Clean Development Mechanism (CDM) of the Kyoto Protocol or VCS program.

The data result from the work of the Electrical System Operator (ONS) of the Ministry of Mines and Energy (MME) and the Ministry of Science and Technology, which are available to proponents of CDM projects. Thus, they can be applied in calculating ex-ante emissions avoided by the project activity, where the emission reduction will be calculated ex-post.

Further details of the development of the project baseline can be viewed through the link:

https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html

3.5 Additionality

Obs.: This section is a copy of the first registered PD.

This item was elaborated based on the “Test 1 – project test” of VCS2007.1”.

Test 1 - The project test:

Step 1: Regulatory Surplus

In accordance with the VCS 2007.1 additionality step 1, the project shall not be mandated by any enforced law, statute or other regulatory framework.

The implantation of the SHPs is not being mandated by any enforced law, statute or other regulatory framework and it is in compliance with all regulations according the following entities: National Electric System Operator – *ONS* (from Portuguese *Operador Nacional do Sistema*), Electricity Regulatory Agency - *ANEEL* (from Portuguese *Agência Nacional de Energia Elétrica*), State Environmental Protection Foundation - *FEPAM* (from Portuguese *Fundação*

Estadual de Proteção Ambiental) which are the responsible for to analyze the projects and to issues the licenses when they are in accordance with the state and federal regulations.

Step 2: Implementation Barriers

The project shall face one (or more) distinct barrier(s) compared with barriers faced by alternative projects.

- **Investment Barrier** – Project faces capital or investment return constraints that can beovercome by the additional revenues associated with the generation of VCUs.

- **Technological Barrier** – Project faces technology-related barriers to its implementation.

- **Institutional Barrier** – Project faces financial, organizational, cultural or social barriers thatthe VCU revenue stream can help overcome.

According to the Options above the PPs chosen the Barriers below:

Investment Barrier:

To demonstrate the project activity investment barrier the key benchmark to be compared should be the **Internal Rate Returns (IRRs)** of the SHPs, considered adequate to this kind of Project as well decision context.

And to the Investment analysis was established as benchmark the **Basic Discount Rate set up by the Brazilian government (SELIC rate),** which is the main reference for Public Debt instruments traded in the market (this benchmark is the most common in Brazil in order to check the project viability).

The SELIC Rate

The *SELIC* rate is set up by the Special System for Settlement and Custody (from Portuguese *Sistema Especial de Liquidação e Custódia*). It is obtained by the calculation of the overnight average weighted rate for financing operations, secured by federal public debt instruments and traded in the same system and in clearing houses as committed operations[5]. The institution responsible for setting this rate is the Monetary Policy Committee (COPOM), whose main objective is to set up monetary policy and the underlying interest rate. The COPOM has been following adequate procedures mirroring the examples of the US Federal Reserve Board´s Federal Open Market Committee and (FOMC) and by Germany´s Central Bank Council.

The interest rate set when the COPOM meets is the goal for the SELIC rate (average rate for overnight financing secured by federal public debt securities), in force in the period between regular Committee meetings. Another COPOM function is to release the "Inflation Report" analyzing the country´s economic and financial outlook as well as inflation projections.

[5] http://www.bcb.gov.br/?COPOM

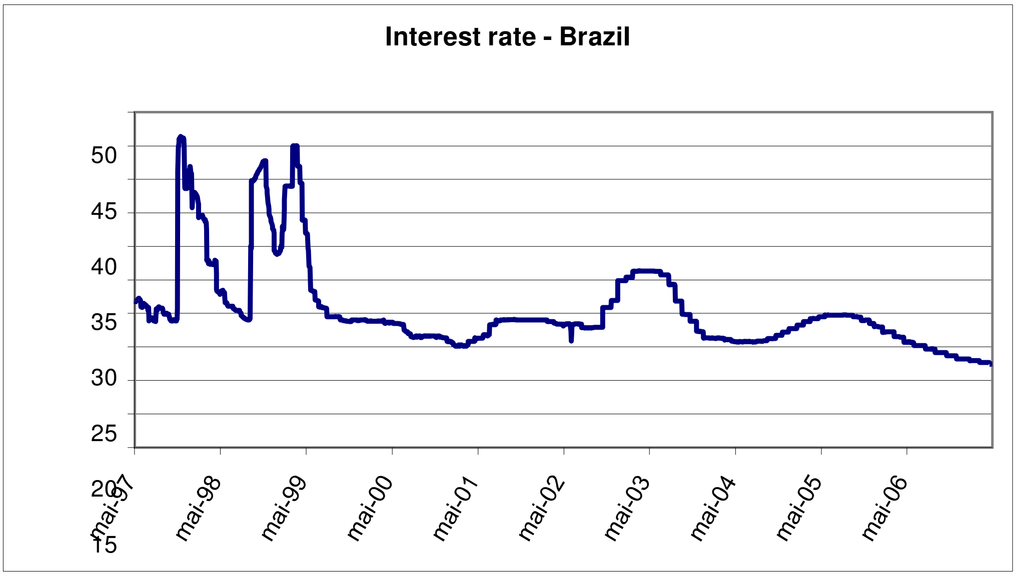
Federal public debt securities main purpose is to collect resources for the financing of the publicdebts, as well as finance the Federal Government´s activities, such as education, health and infra-structure. These fixed income assets are the main conservative investment options and are mostly indexed by the SELIC.

The Brazilian economy has withstood several phases of instability oftentimes caused by the international scenario. International economic uncertainties created severe fluctuations in Brazilian monetary policy, mainly in the setting of the Brazilian basic interest rate. The fluctuations at the end of the 1990´s and between 2000 and 2002 were caused by externalfactors (Asian crisis in 1999 and the presidential election in Brazil in 2002).

As an emerging country, Brazil has always had high interest rates, which from an investment point of view makes public debt securities quite attractive when compared with developed countries. At the present time the Brazilian economy has enjoyed economic growth, relative expansion, high level of international reserves, which has facilitated capturing foreign resources,resulting in smoothing SELIC rate fluctuations as shown in Graphic 1.

In the same graph we can see that in the last 6 years, the SELIC rate has been "stable" considering that the fluctuations have occurred at a high level.

Graphic 1: Selic rate historic.



Source: Central Bank of Brazil.

The Brazilian basic interest rate is used as a base for market financing as well as an index for public investment by government public debt securities.

In this scenario the SELIC rate makes Brazilian government public debt securities attractive as arelatively conservative or risk-free investment.

The cash-flow information will be presented integrally in a separated document (spreadsheet).

The cash-flow was elaborated for the operational life of the project activity (30 years), getting an Internal Return Rate (IRR) equal 15.30% per year for Eng. Ernesto Jorge Dreher, without revenues of the Voluntary Emission Reductions (VCUs) sales, and 15.70% per year with the sales of the VCUs.

To Eng. Henrique Kotzian SHP, the IRR is equal 9.80% per year, without prescriptions of the Voluntary Emission Reductions sales, and 10.10% per year with the sales of the VCUs.

The cash flow has as main Input Values the following:

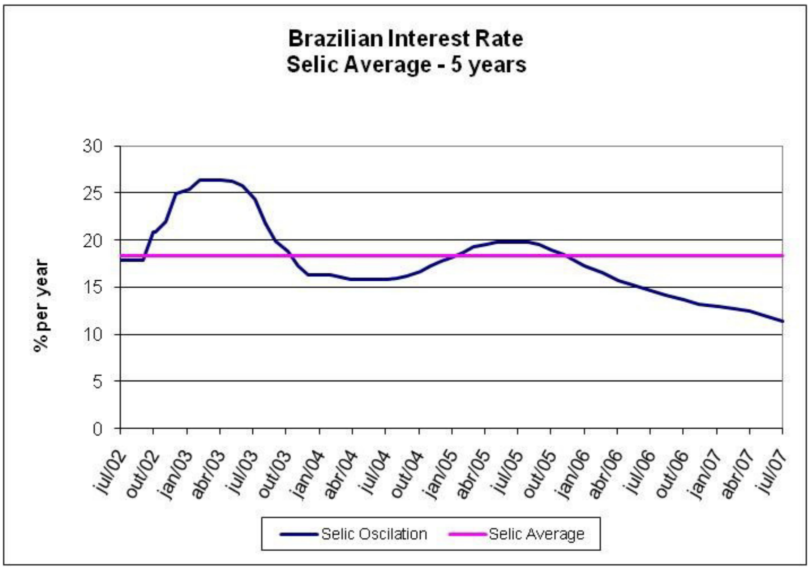
Table 6: Main Inputs Values of cash flow:

Parameter	Eng. Ernesto Jorge Dreher	Eng. Henrique Kotzian
Investment (R$)	55,275,144.46	54,633,910.20
Net Power (MW)	12.24	8.67
Energy Price (R$/MWh)	143.22	143.22
Operation (R$/month) and	15,300.00	12,240.00
Maintenance (R$/month)	165,900	112,100

The parameters Operation and Maintenance are listed as independent in the IRR spreadsheet, so the O&M (Operation and Maintenance) variation should be done onboth simultaneously. Also is important to highlight that the parameter "Operation" consists on the sum of salaries and charges involved to employment of operational team.

In order to have a non-point benchmark, was calculated the average values of benchmarks covering the range from July 2002 until July 2007, thus totalizing 5 whole years of observations before the investment decision date. The average value calculated can be found in graphic 2.

Graphic 2: SELIC Average Rate (July 2002 to July 2007).



Source: Brazilian Central Bank.

Below, the table 7 summarizes the calculated values:

Table 7: Comparative analysis between public and Project benchmark

SHPs	Benchmark (% year)	IRR Jorge Dreher (% year)	IRR Henrique Kotzian (% year)
	18.29	15.30	9.80

The project's IRRs have stayed below the average SELIC rate. The analysis shows that the project faces investment barriers because there are other more attractive alternatives.

The VCUs are highly significant instruments for entrepreneurs in overcoming barriers, improving investment quality and hence stimulating future investments in clean energy generation.

To better understand the investment barrier was also performed a **sensitivity analysis** in which were varied the following parameters (1) Energy Price, (2) Investment, (3) Net Power (Plant Load Factor) and (4) Annual operation cost, in order to check the financial impact of these on the project.

The analysis was performed separately to both plants of project activity in order to allow to analyze the different financial characteristics of each one.

The Breakeven point analyses were done in order to discuss the likelihood of occurrence of these scenarios.

The table 8 presents the main results to Eng. Ernesto Jorge Dreher SHP analysis, and the table 9 presents the main results to Eng. Henrique Kotzian SHP analysis:

Table 8: Engenheiro Ernesto Jorge Dreher SHP sensitivity analysis.

Parameter	Original Value	Breakeven point	% of deviation
Investment (R$)	55,275,144.46	47,315,523.66	- 14.40%
Net Power (MW)	12.24	13.89	13.48%
Energy Price (R$/MWh)	143.22	162.55	13.49%
Operation (R$/month) and Maintenance (R$/month)	15,300.00 165,900.00	2,952.90 32,018.70	- 80.70% - 80.70%

Table 9: Engenheiro Henrique Kotzian SHP sensitivity analysis.

Parameter	Original Value	Breakeven point	% of deviation
Investment (R$)	54,633,910.20	32,578,200.65	- 40.37%
Net Power (MW)	8.67	13.42	54.78%

Energy Price (R$/MWh)	143.22	221.65	54.76%
Operation (R$/month) and Maintenance (R$/month)	12,240.00 112.100,00	Not sensible enough to reach the benchmark	- 100% - 100%

As can be seen above, all variations performed overcome the range of +-10% recommended by version 03 of Annex 58 (EB51).

To achieve the Breakeven point is not considered feasible, due to several factors which can be viewed below:

Energy Price (R$/MWh)

The energy price used in the financial calculations is considered adequate because is the value defined in the Power Purchase Agreement (PPA) and reflects the energy market in Brazil.

From the analysis provided above, to Eng. Ernesto Jorge Dreher SHP, the scenario which would make the project's IRRs overcome the benchmark was estimated as being R$162.55/MWh, i.e. 13.49% higher than the original energy price (R$143.22/MWh).

To Eng. Henrique Kotzian SHP, this same scenario was estimated as being R$221.65/MWh, i.e.54.76% higher than the original energy price (R$143.22/MWh).

Other important information that corroborates along the argumentation is that the validated energy price is above the average prices practiced in the first Auction of Alternative Sources of energy, which occurred in 18/06/2007. The auction promoted by entities from the Brazilian government aims to stimulate the development of generation projects based on renewable energy in Brazil. The results of the auction can be viewed in the following link:

http://www.ccee.org.br/StaticFile/Arquivo/biblioteca_virtual/Leiloes/1_leilao_fontes_alternativ as/Resultados/resumo_vendedor.pdf

As can be verified, the energy commercialized ranged from 134.97 to 135.00 (R$/MWh) for Small Hydro Power Plants. The energy prices in the same auction for other renewable sources (such as biomass cogeneration) ranged from 138.50 to 139.12 (R$/MWh).

So considering the information provided above, the energy price (input value) is considered adequate as well conservative.

Investment (R$)

Regarding the Investment costs, the input values come from the *Quadro de Usos e Fontes – QUF* (Uses and Sources Table in free translation), that can be cross checked with the financing contract with Caixa Econômica Federal which later became the financial agent of project activity. The Investment costs to implement the two SHPs were performed above than the one forecasted by project sponsors (R$ 65,652,224.46 to the SHP Engenheiro Ernesto Jorge Dreher and R$ 79,967,875.20 to the SHP Engenheiro Henrique Kotzian). So it´s no possible to be performed below than the investment value used in the project IRRs spreadsheet (R$ 55,275,144.46 to the SHP Engenheiro Ernesto Jorge Dreher and R$ 54,633,910.20 to the SHP Engenheiro Henrique Kotzian).

Nevertheless, the sensitivity analysis was carried out to this parameter and indicated that to reach the benchmark, the investment values should had been significantly lower than the previously forecasted to both plants. It should had been 14.40% lower to the SHP Ernesto Jorge Dreher and 40.37% lower to the SHP Henrique Kotzian.

Thus, the input values are adequate as well conservative.

Net Power or Plant Load Factor

The Net Power is considered adequate because the data comes from the Information Bank of Generation of ANEEL[6] – the Brazilian regulatory agency for the electric sector.

The ANEEL has a body of technical project reviewers who properly analyses generation projects in different sectors in Brazil. The main technical issues that influence the value of Net Power and consequently the Plant Load Factor are the series of hydrological data and flow that historic occurred, climate conditions, topography, regular flow of the river, among others. The ANEEL's technical body is capable to analyze those conditions and issue the plant load factor for the Brazilian SHP projects.

Is unlikely to occur an increase above the factor showed in the tables 2 and 3 (0.68 and 0.65), due to it's determination to be in accordance with historical inflow series including critical periods in hydrological terms.

To led the IRR of project activity to go beyond the applied benchmark, the net power of Eng. Ernesto Jorge Dreher should be 13.48% greater than the established by ANEEL considering all the studies above mentioned. To IRR of Eng. Henrique Kotzian SHP overcome the considered benchmark, its net power value should be greater than its installed capacity of 13.23 MW (54.78% greater than the current value). So it is not possible to occur.

Operational Costs - O&M

As demonstrated in the tables 8 and 9, this parameter (which comprehend the sum of employeessalaries and Maintenance costs) cannot affect the project feasibility. To led a IRR increase high enough to achieve the benchmark, the O&M costs should be reduced 80.70% to Eng. Ernesto Jorge Dreher SHP. To Eng. Henrique Kotzian SHP, even reducing the parameter to zero, the IRR of project activity (12.42%) would not achieve the benchmark.

The project of the SPEs BME Rincão do Ivaí Energia S/A and BME Capão da Convenção Energia S/A has taken in consideration the VCUs revenue for the implantation. These financial benefits generated in strong currency (euro or dollar) bring to the project a better security against monetary depreciations.

Considering the explanations, information and evidences provided by the PP, the IRR of the project activity without being registered as a VCS project is below than the

[6] http://www.aneel.gov.br/aplicacoes/capacidadebrasil/energiaassegurada.asp

established benchmark, evidencing that project activity is not the most financially attractive option of investment. The VCS benefits were the key point to go ahead and to implement the project activity.

Therefore, the project activity is financially additional.

Step 3: Common Practice

According to the VCS 2007.1, step 3:

- project type shall not be common practice in sector/region, compared with projects that have received no carbon finance.
- if it is common practice, the project proponents shall identify barriers faced compared withexisting projects.
- demonstration that the project is not common practice shall be based on guidance in theGHG Protocol for Project Accounting, Chapter 7.

So based on the above requirements the PPs provided the Common Practice analysis as below:

Geographical scope of common practice analysis

The analysis was performed considering the host country as it geographical scope.

Current Brazilian Energetic Matrix:

According to the Information Bank of Generation (*BIG*)[7] of the Electrical Energy National Agency (*ANEEL*), until the end of the year when the project activity started operating (December 2009) Brazil had a total of 2,180 operating enterprises, generating 106,569 MW of power. 2,953 MW were generated by small hydro power plants, representing 2.77% of Brazilianenergetic matrix.

The table 10 presents the number of operating enterprises by the type of generating technologyrelated to the national generation mix.

Table 10: Composition of Brazilian energetic matrix on December 2009.

Operating Enterprises			
Type	**Quantity**	**Power (MW)**	**%**
UHE	165	75,484	70.83
UTE	1,313	25,350	23.79
PCH	356	2,953	2.77
CGH	307	173	0.15

[7] Public data available in ANEEL´s website: http://www.aneel.gov.br/15.htm

UTN	2	2,007	1.99
EOL	36	602	0.39
SOL	1	0	0
Total	**2,180**	**106,569**	**100**

Source: BIG – Information Bank of Generation[8]

Legend:

UHE Large Hydroelectric Power Plants

UTE Thermoelectric Plants

PCH Small Hydroelectric Power Plants

CGH Hydro Central Generating Power Plants

UTN Thermonuclear Power Plants

EOL Wind Power Plants

SOL Solar Photovoltaic Power Plants

The table 10 analysis reveals that in Brazil, while 94.62% of the electric energy generated was provided by the large hydropower plants and thermoelectric power plants, only 2.77% had origin in Small Hydro Power plants.

History of the Brazilian Electric Sector

In recent decades, the Brazilian Electric Sector has undergone several changes until the current model. The energy sector was composed almost exclusively of government-owned companies, but since 1995, due to an increase in international interest rates and the incapacity of investment, the government was forced to seek for alternatives. The recommended solution was to begin a privatization process and deregulation of the market.

During the years 2003 and 2004 the Federal Government has issued the foundations for a new model of Brazilian Electric Sector, supported by Laws Nº 10,847 and Nº 10,848, of 15 March 2004, and the Decree Nº 5,163, of 30 July 2004.

The table 11 shows the summary of the main changes between the pre-existing models and the current model, which resulted in changes in the activities of some agents of the sector.

Table 11: Summary of the several changes in the Brazilian Electric Sector.

[8] http://www.aneel.gov.br/aplicacoes/capacidadebrasil/Evolucao.pdf

Former Model (until 1995)	Free Market Model (1995 to 2003)	New Model (2004)
Financing using public funds	Financing using public and private funds	Financing using private and public funds
Verticalized Companies	Companies classified by activity: generation, transmission, distributionand commercialization	Companies classified by activity: generation, transmission, distribution,commercialization, imports and exports.
Predominantly State-controlled companies	Opening up of the market and emphasis on the privatization of theCompanies.	Coexistence between State-controlledand Private Companies.
Monopolies – No competition	Competition in generation and commercialization.	Competition in generation and commercialization.
Captive Consumers	Both Free and Captive Consumers	Both Free and Captive Consumers
Tariffs regulated throughout all sectors	Prices are freely negotiated for the generation and commercialization.	In a free environment: Prices are freely negotiated for the generationand commercialization. In a regulated environment: auctionsand bids for the least tariffs.
Regulated Market	Free Market	Coexistence between Free and Regulated Markets.
Determinative Planning – Coordinator Group for the Planning of Eclectic Systems(GCPS)	Indicative Planning accomplished bythe National Council for Energy Policy (CNPE)	Planning accomplished by the EnergyResearch Company (EPE)
Hiring: Market 100%	Hiring : Market 85% (until August/2003) and Market 95% (untilDecember/2004)	Hiring: Market 100% + reserve
Energy Surplus/Deficit shared between the buyers.	Energy Surplus/Deficit sold in the Wholesaler Energy Market (MAE)	Energy Surplus/Deficit sold in the CCEE. Distributors Energy Surplus/Deficit compensation mechanism (MCSD).

Source: Electric Power Commercialization Chamber - CCEE[9]

In the light of the informations provided above, also considering the established in the ANEEL Resolution nº 652/2003 (that states about SHP definitions in Brazil) and the "GHG Protocol for Project Accounting", for the purposes of common practice analysis, was performed a clear and conservative survey of all SHPPs similar to the project activity that became operational betweenJuly 2004 and July 2009.

To be considered similar, they had to be implanted in the same country, using analogue technologies, to have similar scales, and had been implemented in a comparative basis

[9] Electrical Energy Trading Chamber - *CCEE* (form Portuguese *Câmara de Comercialização de EnergiaElétrica*), changes occurred in Brazilian electric system: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=3df6a5c1de88a010VgnVCM100000aa01a8c0RCRD

taken in consideration the regulations, investment climate, technology access, among other issues.

Until December 2009, 356 ventures became operational in the country according to the ANEEL database. Below, are identified those which are similar to the project activity due to characteristics that have in common to project activity plants.

Investment climate

Due the table 11, the currently energy model was implemented in 2004, having as legal milestone the Decree number 5,163 issued on 30 July 2004 that rules the energy commercialization and concession procedures to the electricity generation. Before the issuance of this Decree, the investment environment were different to the currently, so no similar to the proposed project activity.

So between July 2004 and December 2009 there were 110 SHPP implemented according to the currently energy market model that could be considered similar to the project activity in thelight of the investment climate.

Investment Decision and Starting Date

The project activity investment decision (August 2007[10]) could be considered another similarity filter to common practice analysis since the investment scenarios could be changed after this event (even though the investment decision already was taken).

But in a conservative approach, the analysis go through over the investment decision until the project activity starting date, on July 2009 (SHP Engenheiro Jorge Dreher operation start). FromJuly 2009 until December 2009, 10 SHPP became operational, so these were not considered similar according this criterion.

Similar scale

Were selected renewable energy generation projects, through Small Hydro Power Plants (SHPs) with installed capacity between 26.925 MW (50% above of Engenheiro Ernesto Jorge Dreher SHP capacity which is 17.95 MW) and 6.615MW (50% below the Engenheiro Henrique Kotzian SHP capacity which is 13.230 MW).

From 100 SHPPs that became operational during the period considered above (July 2004 to July 2009) 42 were inserted in the range of installed power relevant, being consequently considered similar.

Carbon finance incentives

[10] Date of the PPA signature between COPREL and project activity owners.

According the CDM guidelines, projects that have received carbon finance shall not be included in the common practice analysis. So 14 projects that have received carbon market finance incentives between July 2004 and July 2009 were excluded from the analysis.

Table 12 – Filters used in the common practice analysis.

Filters	Number of Ventures
SHPP operating in Brazil until December 2009	356
SHPP that became operational in Brazil between the implementation of the new model of energy market (July 2004) and December 2009.	110
SHPP that became operational in Brazil between the implantation of new market model and the starting date of project activity.	100
SHPP in the range of installed power similar to project activity.	42
Projects that have not received carbon market (CDM) finance incentives implemented between July 2004 and July 2009.	28

Financial incentives

In the light of incentive and investment matters, Brazil has two main incentive lines to renewable energy projects: the Clean Development Mechanism established by the Kyoto Protocol and the PROINFA (Alternative Electrical Energy Sources Incentive Program), established by the Decree nº 5,025/2004[9]. Both of them became available to investors in theyear of 2005.

The PROINFA is a governmental program of incentives which was implemented with the main goal of to increase the participation of renewable energy in the National Interconnected System. Its target is to diversify the Brazilian Electrical Matrix, creating alternatives to improve the security of the energy supply, allows the appreciation of local and regional characteristics and potentialities, also to stimulate the development of entrepreneurships of energy generation and renewable technologies, providing financial sources incentives.

In PROINFA, the financial incentive provided by the Federal Government is based on differentiated lines of finance, guarantees of minimal revenues through the compromise of establishing Power Purchase Agreements (PPAs) to be firmed with Eletrobrás, a mixed economy society, which will secure to the entrepreneur a minimal revenue of 70% of the energypurchased during the financing period and complete protection against the risks of exposure in the short-term market. The SHPs projects are one of the eligible types to participate in PROINFA.

Projects qualified by the PROINFA are eligible to participate in the CDM, agreeing to the decision of the UNFCCC regarding project eligibility for project activities derived from public policies. The legislation which had created the PROINFA considered the carbon financialincentive programs revenues to belong and implement the program.

About the remaining similar options:

Considering the explanation above and the guidelines presented in the VCS 2007.1 which states that project type shall not be common practice in sector/region, compared with projects that have received no carbon finance, from July 2004 to July 2009, 28 similar projects became operational, as listed in the table 13.

Also in this table, there is a column highlighting the ventures that made use of the PROINFA incentive to their implementation.

Table 13: Similar Brazilian SHPs that became operational from July 2004 to July 2009.

Year	Venture	State	Technology	Incetives
2004				
1	Campo Florido	MG	Thermal	
2	Coinbra-Frutesp	SP	Thermal	
3	Miguel Forte	PR	Thermal	
4	Corn Mogi	SP	Thermal	
5	Iguatemi Bahia	BA	Thermal	
2005				
6	Caeté	AL	Thermal	
7	Vertente	SP	Thermal	
2006				
8	Carlos Gonzatto	RS	Hydro	PROINFA
9	Esmeralda	RS	Hydro	PROINFA
10	Piranhas	GO	Hydro	PROINFA
11	São Bernardo	RS	Hydro	PROINFA
12	Contagem	MG	Thermal	
13	Agrovale	BA	Thermal	
14	Goianésia	GO	Thermal	
15	Piraí	PR	Thermal	
16	Água Bonita	SP	Thermal	
17	Coruripe	AL	Thermal	
18	Fartura	SP	Thermal	
19	Giasa II	PB	Thermal	
20	Jalles Machado	GO	Thermal	
21	Mandu	SP	Thermal	
22	Winimport	PR	Thermal	
23	Água Doce	SC	Wind	
2007				
24	Flor do Sertão	SC	Hydro	PROINFA
25	José Gelásio da Rocha	MT	Hydro	PROINFA
26	Ponte Alta	MS	Hydro	PROINFA
27	Rondonópolis	MT	Hydro	PROINFA
28	Santa Laura	SC	Hydro	PROINFA
29	Bunge Araxá	MG	Thermal	
30	Itaenga	PE	Thermal	
31	Fartura	SP	Thermal	
32	Usaciga	PR	Thermal	
33	Jitituba Santo Antônio	AL	Thermal	
34	Millennium	PB	Wind	

Source: Supervision of generation services[11]

Among the SHPs that became operational in this period, only Rio Branco SHP was implemented without PROINFA incentive.

However it was implemented on December 2004 in an isolated system (not linked to the National Interconnected System – *SIN*). And also when no financial incentives mentioned were available (CDM or PROINFA).

In the light of all the explanation provided above by project participants about the similar SHPs that became operational on the considered period, it is possible to conclude that the implantationof SHPs without financial incentives is not a common practice in Brazil, being therefore eligibleto the VCS according its requirements.

Therefore, the project is additional.

Table 14: Timeline of Engenheiro Ernesto Jorge Dreher SHP.

Date	Event	Evidence
30/01/2004	Previous License Issuance	LP_108/2004-DL
10/11/2006	Foundation of BME Rincão do Ivaí Energia S.A	Foundation record
17/04/2007	Approval of Basic Project of the plant - 17MW	JD_dsp20071181
20/08/2007	Signature of PPA with Coprel - Investment decision	PPA Nº 001/2007
02/12/2007	Begin of main civil works (structure works)	ANEEL Monitoring Schedule – set/2009 pag.90
04/12/2007	Signature of contract to generators and turbines supply	Supply contract
19/12/2007	Signature of financing contract with State Owned Federal Bank	Contract 0215.684-14
22/04/2008	Instalation License Issuance	LI_372/2008-DL
25/03/2009	Allowance of reservoir filling	AG_189/2009-DL
18/06/2009	Operation License Issuance	LO_2968/2009-DL
19/06/2009	Allowance of generating units 1, 2 and 3 for tests	JD_dsp20092246
02/10/2009	Allowance of generating unit 1 for commercial operations	JD_dsp20093756
02/10/2009	Allowance of generating unit 4 for tests	JD_dsp20093757
30/10/2009	Allowance of generating unit 2 for commercial operations	JD_desp20094068
11/11/2009	Enlargement of installed capacity from 17,725MW to 17,87MW	JD_dsp20094188
11/11/2009	Allowance of generating unit 4 for commercial operations	JD_dsp20094189
25/11/2009	Allowance of generating unit 3 for commercial operations	JD_dsp20094383
03/2/2010	Allowance of installation of generating unit 5	JD_dsp2010268

Table 15: Timeline of Engenheiro Henrique Kotzian SHP.

Date	Event	Evidence
24/06/2005	Previous License issuance	LP_455/2005-DL
24/04/2006	Approval of project of the plant	HK_dsp2006814

[11] http://www.aneel.gov.br/area.cfm?idArea=37&idPerfil=2

17/11/2006	Foundation of BME Capão da Convenção Energia S.A	Foundation record
18/04/2007	Approval of basic Project of the plant	HK_dsp20071180
20/08/2007	Signature of PPA with Coprel - Investment decision	PPA Nº 001/2007
06/12/2007	Signature of contract to generators and turbines supply	Supply contract
19/12/2007	Signature of financing contract with State Owned Federal Bank	Contract 0215.685-29
15/03/2008	Begin of main civil works (structure works)	ANEEL Monitoring Schedule – set/2009 pag.91
16/02/2009	Ratification of basic Project parameters	HK_dsp2009602
07/05/2010	Instalation License issuance	LI_495/2010-DL
01/07/2010	Allowance of reservoir filling	AG_371_2010-DL
12/08/2010	Allowance of generating units 1, 2 and 3 for tests	HK_dsp20102311
02/03/2011	Operation License issuance	LO_1122/2011-DL
04/03/2011	Allowance of generating units 1, 2 and 3 for commercial operations	HK_dsp20111063

3.6 Methodology Deviations

Not applicable. There aren't any deviation.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions (BEy in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) multiplied by the electricity supplied by the project activity to the grid (EGPJ,y in MWh), as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where:

BEy Baseline emissions in year y (tCO_2e/yr);

EGPJ,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/yr);

$EF_{grid,CM,y}$ 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" (tCO_2/MWh).

Energy Generated ($EG_{PJ,y}$)

The project activity is the installation of two new grid-connected renewable power plants/units at sites where no renewable power plants were operated prior to the implementation of the project activity, thus classified as a Greenfield renewable energy power plants.

The $EG_{PJ,y}$ is based on the estimative of energy to be inputted annually into the grid by the Project activity, which considers the net Power of the plants, information provided by ANEEL and the Brazilian Mines and Energy Ministry. Then:

$$EG_{PJ,y} = EG_{facilities,y}$$

Where:

$EG_{PJ,y}$ 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);

$EG_{facilitiy,y}$ Quantity of net electricity generation supplied by the project plants/units to the grid in year y (MWh).

$$EG_{facilities,y} = EG_{PJ,y} = EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y} + EG_{Engenheiro\ Henrique\ Kotzian,y}$$

$$EG_{PJ,y} = 107{,}222 + 75{,}949 = 183{,}172 \text{ MWh/year}$$

Emission Factor calculation *($EF_{grid,CM,y}$)*

For baseline emission factor calculation, the six steps below should be followed:

STEP 1. Identify the relevant electricity systems;

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional);

STEP 3. Select a method to determine the operating margin (OM);

STEP 4. Calculate the operating margin emission factor according to the selected method;

STEP 5. Calculate the build margin (BM) emission factor;

STEP 6. Calculate the combined margin (CM) emissions factor

Step 1: Identify the relevant electricity systems

Considering the stated in the "Tool to calculate the emission factor for an electricity system[12]" and the fact that Brazilian DNA has published the Resolution nº 8 issued on May 26th, 2008, which defines the **Brazilian Interconnected Grid** as a single system that covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest), the boundaries of Brazilian electricity system are clearly defined.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Since the Brazilian DNA has made available the emission factor calculation based on information of the grid power plants only, the off-grid power plants are not considered (Option I).

Step 3: Select a method to determine the operating margin (OM)

The method adopted to calculate the operating margin is "Dispatch data analysis OM" (Option c). The calculation is performed by the Brazilian DNA and made publicly available.

Step 4: Calculate the operating margin emission factor according to the selected method

The selected method is the "*Dispatch data analysis OM*".

The Dispatch Data emission factor (OM), is calculated as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

Where:

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year y (tCO_2/MWh);

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour h of year y (MWh);

$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO_2/MWh);

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year y (MWh).

h = Hours in year *y* in which the project activity is displacing grid electricity

y = Year in which the project activity is displacing grid electricity

[12] "*If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used*"

$EF_{EL,DD,h}$ approach is defined by the Brazilian DNA who is the responsible for the calculation.

Step 5: Calculate the build margin (BM) emission factor

For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE.

According to the tool, the build margin emission factor (BM) is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} . EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	= Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	= Power units included in the build margin
y	= Most recent historical year for which electricity generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the tool in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which electricity generation data is available, and using for *m* the power units included in the build margin.

The power units included in the build margin are defined by the Brazilian DNA who is responsible for the operating margin and build margin calculations. The results of these are made publicly available in its web site for consultation. For the second crediting period, the build margin emissions factor shall be calculated ex ante.

Step 6 : Calculate the combined margin emissions factor (CM)

For calculation of combined margin emission factor the weighted average CM method (Option a) should be used as the preferred option.

$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$

Where:

$EF_{grid,BM,y}$	= Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (per cent)

w_{BM} = Weighting of build margin emissions factor (per cent)

Considering that the project activity is SHP based, the calculation of the combined margin emissions factor shall use the following default values for w_{OM} and w_{BM}:

w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period.

Calculations available on Section 4.4.

4.2 Project Emissions

According to the methodology ACM0002, for hydro power project activities that result in new reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, estimated as follows:

a) If the power density of the single or multiple reservoirs (PD) is higher than $4W/m^2$ and lower than or equal to $10W/m^2$:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:

$PE_{HP,y}$ Emission from water reservoirs (tCO_2e/yr);

EF_{Res} Default emission factor for emissions from reservoirs of hydro power plants in year y (kgCO2e/MWh).

TEG_y Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

a. If power density of project is greater than 10 W/m^2:

$PE_{HP,y} = 0$

The power densities of the project activity are calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD Power density of the project activity, in W/m^2.

Cap_{PJ} Installed capacity of the hydro power plant after the implementation of the project activity (W).

Cap_{BL} Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

A_{PJ} Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2).

A_{BL} Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

For Engenheiro Ernesto Jorge Dreher SHP, the *PD* value is:

$$PD = \frac{17{,}950{,}000 - 0}{830{,}000 - 0} = 21.63 \text{ W/m}^2$$

For Engenheiro Henrique Kotzian SHP, the *PD* value is:

$$PD = \frac{13{,}230{,}000 - 0}{660{,}000 - 0} = 20.05 \text{ W/m}^2$$

Therefore, the reservoir project emissions ($PE_{HP,y}$) are zero to both hydropower plants of project activity because their Power Densities are higher than 10 W/m^2.

4.3 Leakage

No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

4.4 Net GHG Emission Reductions and Removals

The baseline methodology considers the determination of emission factor of the grid which the project activity is connected to as the core data to be determined in the baseline scenario. In Brazil, the grid is interconnected by the National Interconnected System (SIN) in a single system

Emission Factor calculation ($EF_{grid,CM,y}$)

For calculation of the baseline emission factor, the seven steps below should be followed:

STEP 1. Identify the relevant electricity system.

Considering the stated by the “Tool to calculate the emission factor for an electricity system” (tCO_2/MWh) and the fact that the Brazilian DNA has published the Resolution nº 8 issued on May 26th, 2008, which defines the Brazilian Interconnected Grid as a single system that covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest), the boundaries of Brazilian electricity system are clearly defined.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).

Since the Brazilian DNA has made available the emission factor calculation based on information of the grid power plants only, the off-grid power plants are not considered.

STEP 3. Select a method to determine the operating margin (OM).

The method adopted to calculate the operating margin is "Dispatch data analysis OM". The calculation is performed by the Brazilian DNA and made publicly available.

The Dispatch Data emission factor (OM), is summarized as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_{h} EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

Where:

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year y (tCO_2/MWh);

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour h of year y (MWh);

$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO_2/MWh);

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year y (MWh).

STEP 4. Calculate the operating margin emission factor according to the selected method.

For effect of a good ex-ante estimation to $EF_{grid,OM-DD,y}$ value, was calculated the arithmetic average of the 12 months emission factors of operating margin, published by the DNA (latest data available).

Table 14: Emission Factor of Operating Margin for year 2019

OPERATING MARGIN												
Average Emission Factor (tCO_2 / MWh)												
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

Thus, we have that the Emission Factor of Operating Margin is:

$$EF_{grid,OM\text{-}DD,y} = 0.5181$$

STEP 5. Calculate the build margin (BM) emission factor.

The power units included in the build margin are defined by the Brazilian DNA who is responsible for the operating margin and build margin calculations. The results of these are made publicly available in its web site to consultation.

According to the used methodology, the build margin emission factor (BM) is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{i,m} EG_{m,y} . EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

For the build margin emission factor $EF_{grid,BM,y}$ also will be adopted the 2019 year values published by the DNA (latest data available).

Table 15: Latest data from Brazilian DNA to Emission Factor Build Margin (2019)

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

So, we have that the Build Margin Emission Factor is:

$$EF_{grid,BM,y} = 0.1020$$

STEP 6. Calculate the combined margin (CM) emissions factor.

To calculation of combined margin emission factor (combination of operation and build margins) is used a weighted-average formula, considering w_{OM} = 0. 25 and w_{BM} = 0.75 (second credit period). As a conservative approach, below is presented the emission factor calculated using four decimal places, rounded down. Thus, the result is:

$\underline{EF_{grid,CM,y}}$ = 0.25 x 5181 + 0.75 x 0.1020 = 0.2060 (tCO_2/MWh)

The baseline emissions would be then proportional to the electricity delivered to the grid throughout the project's lifetime. Are calculated multiplying the electricity baseline emissions factor ($EF_{grid,CM,y}$) by the electricity generation of the project activity.

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

$$BE_y = 183{,}172 * 0.2060 = 37{,}732 \ tCO_2/yr$$

Moving back to the emission reductions of project activity (*ER*), we have the annual ex-ante estimated CO_2 reductions as:

$$ER_y = BE_y - PE_{HP,y}$$

Where:

ER = Emission reductions in year y (tCO_{2e}/yr)

BE = Baseline emissions in year y (tCO_2/yr)

PE = Project emissions in year y (tCO_{2e}/yr)

Considerening the emissions related to the SHP reservoirs are zero, the Project activity emissions reductions are calculated as below:

$$ER_y = 37{,}732 - 0 = 37{,}732 \ (tCO_2/yr)$$

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2019 July	18,865	0	0	18,865
2020	37,732	0	0	37,732
2021	37,732	0	0	37,732
2022	37,732	0	0	37,732
2023	37,732	0	0	37,732
2024	37,732	0	0	37,732
2025	37,732	0	0	37,732
2026	37,732	0	0	37,732
2027	37,732	0	0	37,732
2028	37,732	0	0	37,732

2029 June	18,865	0	0	18,865
Total	**377,318**	0	0	**377,318**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	CO_2 Build Margin emission factor of the grid, in a year *y*
Source of data	Based on data provided by DNA (Designated National Authority).
Value applied	0.1020
Justification of choice of data or description of measurement methods and procedures applied	According procedures established by the most recent version of "Tool to calculate the emission factor for an electricity system".
Purpose of Data	Calculation of baseline emissions.
Comments	2019 value. Based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE.

Data / Parameter	Cap_{BL}
Data unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data	Project site.
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	The methodology for which this value is applied in new hydroelectric plants.

Purpose of Data	Calculation of project emissions.
Comments	-

Data / Parameter	A_{BL}
Data unit	m^2
Description	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.
Source of data	Project site.
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	Not applicable.
Purpose of Data	Calculation of project emissions.
Comments	-

Data / Parameter	EF_{res}
Data unit	$kgCO_2e/MWh$
Description	Default emission factor for emission from reservoirs
Source of data	Decision at EB 23
Value applied	90
Justification of choice of data or description of measurement methods and procedures applied	Standard Value
Purpose of Data	Calculation of project emissions.
Comments	Applicable if the power densities of project activity become greater than 4 W/m^2 and less than or equal to 10 W/m^2.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y}$
Data unit	MWh/year
Description	Quantity of electricity generation supplied by the SHPP Engenheiro Ernesto Jorge Dreher to the grid in year y.
Source of data	Project activity site (Metering Panel inside the SHP Power House
Description of measurement methods and procedures to be applied	Meters shall be calibrated in accordance with standards for electricity generation.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording.
Value applied	107,222
Monitoring equipment	Meters located in Jacuí Substation
QA/QC procedures to be applied	The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The electricity generated by SHP Engenheiro Ernesto Jorge Dreher shall be delivered to Salto do Jacuí Hydropower substation and totalized with SHP Engenheiro Henrique Kotzian generation. So, Salto do Jacuí Hydropower substation has an independent panel with 2 other meters that totalizes the net electricity from the 2 SHPs.
Purpose of data	Calculation of baseline emissions.
Calculation method	-
Comments	-

Data / Parameter	$EG_{Engenheiro\ Henrique\ Kotzian,y}$
Data unit	MWh/year
Description	Quantity of electricity generation supplied by the SHPP Engenheiro Henrique Kotzian to the grid in year y.

Source of data	Project activity site (Metering Panel inside the SHP Power House)
Description of measurement methods and procedures to be applied	Meters shall be calibrated in accordance with standards for electricity generation.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording.
Value applied	75,949
Monitoring equipment	Meters located in Jacuí Substation
QA/QC procedures to be applied	The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The electricity generated by SHP Engenheiro Henrique Kotzian shall be delivered to Salto do Jacuí Hydropower substation and totalized with SHP Engenheiro Ernesto Jorge Dreher generation. So, Salto do Jacuí Hydropower substation has an independent panel with 2 other meters that totalizes the net electricity from the 2 SHPs.
Purpose of data	Calculation of baseline emissions.
Calculation method	-
Comments	-

Data / Parameter	$EG_{Total\ (Engenheiro\ Ernesto\ Jorge\ Dreher/Henrique\ Kotzian),y}$
Data unit	MWh/year
Description	Quantity of net electricity generation supplied by both SHPPs (Engenheiro Ernesto Jorge Dreher and Henrique Kotzian) to the grid in year y. This is the point where both SHPs generations are totalized (in the *Salto do Jacuí* Hydropower Substation). Also this is the quantity of electricity that shall be used to calculate the Emission Reductions since take in account the

	transmission losses. Be informed that the meters located in the SHPs Power House shall provide the individual participation on the total generation ($EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y}$ and $EG_{Engenheiro\ Henrique\ Kotzian,y}$).
Source of data	Metering Panel from the PPs that is located in the Salto do Jacuí Substation (physically distinct from another equipments that don´t belong to this project activity).
Description of measurement methods and procedures to be applied	Meters shall be calibrated in accordance with standards for electricity generation.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording.
Value applied	183,172
Monitoring equipment	Meters located in Jacuí Substation
QA/QC procedures to be applied	These data will be used for calculate the emission reductions. The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The data from the energy meters will be cross checked with the CCEE databank in order to verify the coherency of the data.
Purpose of data	Calculation of baseline emissions.
Calculation method	-
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2e/MWh
Description	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”.
Source of data	Based on data provided by DNA (Designated National Authority).

Description of measurement methods and procedures to be applied	The Combined Margin is calculated through a weighted-average formula, considering the EFgrid,OM-DD,y and the EFgrid,BM,y and the default weights are wOM = 0.25 and wBM = 0.75. As per the "Tool to calculate the emission factor for an electricity system".
Frequency of monitoring/recording	Annually.
Value applied	0.2060
Monitoring equipment	-
QA/QC procedures to be applied	As per the "Tool to calculate the emission factor for an electricity system".
Purpose of data	Calculation of baseline emissions.
Calculation method	-
Comments	-

Data / Parameter	$EF_{grid,OM\text{-}DD,y}$
Data unit	tCO_2/MWh
Description	CO_2 Operating Margin emission factor of the grid, in a year *y*
Source of data	Data provided by DNA (Designated National Authority) to the year *y*.
Description of measurement methods and procedures to be applied	According procedures established by the most recent version of "Tool to calculate the emission factor for an electricity system".
Frequency of monitoring/recording	Annually.
Value applied	0.5181
Monitoring equipment	
QA/QC procedures to be applied	This data will be annually updated to be applied in ex-post calculation of the Emission Factor of Combined Margin

Purpose of data	Calculation of baseline emissions.
Calculation method	-
Comments	-

Data / Parameter	Cap_{PJ} – *Ernesto Jorge Dreher SHP*
Data unit	W
Description	Installed capacity of the SHHP Ernesto Jorge Dreher after the implementation of the project activity.
Source of data	Plaques of equipments installed at project site.
Description of measurement methods and procedures to be applied	Check on equipments plaques or datasheets.
Frequency of monitoring/recording	Once at the start of crediting period
Value applied	17,950,000
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	Cap_{PJ} – *Henrique Kotzian SHP*
Data unit	W

Description	Installed capacity of the SHPP Henrique Kotzian after the implementation of the project activity.
Source of data	Plaques of equipments installed at project site.
Description of measurement methods and procedures to be applied	Check on equipments plaques or datasheets.
Frequency of monitoring/recording	Once at the start of crediting period
Value applied	13,230,000
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	A_{PJ} – *Ernesto Jorge Dreher SHP*
Data unit	m^2
Description	Area of the SHHP Ernesto Jorge Dreher single or multiple reservoirs measured in the water surface, after the implementation of the project activity, when the reservoir is full.
Source of data	Operation Licence issued by FEPAM: LO N° 1058/2019-DL.
Description of measurement methods and procedures to be applied	Check on environmental license or new documents issued by ANEEL authorizing changes over reservoir area.
Frequency of monitoring/recording	Once at the beginning of each crediting period
Value applied	830,000

Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of the project emissions
Calculation method	-
Comments	-

Data / Parameter	A_{PJ} – Henrique Kotzian SHP
Data unit	m^2
Description	Area of the SHPP Henrique Kotzian single or multiple reservoirs measured in the water surface, after the implementation of the project activity, when the reservoir is full.
Source of data	Operation License issued by FEPAM: LO N° 206/2019-DL.
Description of measurement methods and procedures to be applied	Check on environmental license or new documents issued by ANEEL authorizing changes over reservoir area.
Frequency of monitoring/recording	Once at the start of crediting period
Value applied	660,000
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of the project emissions
Calculation method	-
Comments	-

5.3 Monitoring Plan

The monitoring plan for the project activity is based on the methodology ACM0002 and consist of the monitoring of the electricity generation from the proposed project activity, the surface area of reservoir at the full reservoir level, the installed capacity of the plant after project implementation and emission factors.

1) Power generation and measurement system:

General Characteristics of the Measurement System

The procedures designed for monitoring electricity generation by the project activity follows the parameters and regulations of the Brazilian energy sector. The National Grid Operator (ONS) and the Electric Power Commercialization Chamber (*CCEE* from portuguese *Câmara de Comercialização de Energia Elétrica*) are the organs responsible for specification of technical requirements of energy measurement system for billing, i.e, those bodies monitor and approve projects for accurate accounting of energy.

The agent responsible for the measurement system for billing (*SMF* from the Portuguese *Sistema de Medição para Faturamento*) develops the project in accordance with the technical specifications of the measurements for billing, which should include the location of measurement points, panels of measurement, meters and systems for local and remote measurement.

As stated by the sub-module 2.14 of Grid Procedures[13], the SMF is a system composed of main and back-up meters, instrument transformers, communication channels between the agents and CCEE; and data collecting systems to billing measures.

The measurement system measures and records the energy. There are six meters to register the energy generation of project activity (three main meters and three back up). There are one main and one back up meter installed in panels located at the power houses of each plant of project activity. Those meters send generation information to project owners (BMEs), to the operational team (COPREL) and to SINERCOM/CCEE (generation monitoring system of Electric Power Commercialization Chamber). Those information are used by CCEE to establish how much each plant generate (before transmission losses). The measures of energy effectively inputted into the grid are done by the third pair of meters (main and back up) installed at the substation of Salto do Jacuí Hydropower, point where the energy generated by project activity is inputted into the grid. This third pair of meters will record the energy generated by both plants of project activity since the transmission lines which come from the plants are joined at some

[13] http://www.ons.org.br/paginas/sobre-o-ons/procedimentos-de-rede/vigentes

point before reach this meters. Using the data of meters installed at the power houses of the two plants, the regulatory agency can establish the volume of energy generated by each plant.

Despite being located inside the substation of Salto do Jacuí Hydropower, the pair of meters above referred is independent from the energy generated by the plant. It measures exclusively the energy generated by project activity plants.

For this system is guaranteed the data inviolability. After the calibration, it is sealed for safety.

To an easier understanding, see the figure 4.

The data stored in the meters are collected by the Energy Data Collecting System – SCDE (from Portuguese *Sistema de Coleta de Dados de Energia Elétrica*) of the CCEE, remotely and automatically, through direct access to the agent meters or intermediated for the agent through its Meter Collecting Unit – UCM.

Using the information collected with the three pairs of meters, CCEE provides the generation reports correspondent to each plant, used to energy trading.

Therefore, CCEE is responsible for the monthly readings and keeping the records of the energy dispatched. If any problem happens at the local meter level, the reading lecture corresponding to the amount of energy during the time of the problem will not be lost because of the online reading performed by CCEE.

All information related to the project monitoring will be made available by project proponents at the time of the carbon credits verification and will be archived at least for 2 years after the end of the last crediting period.

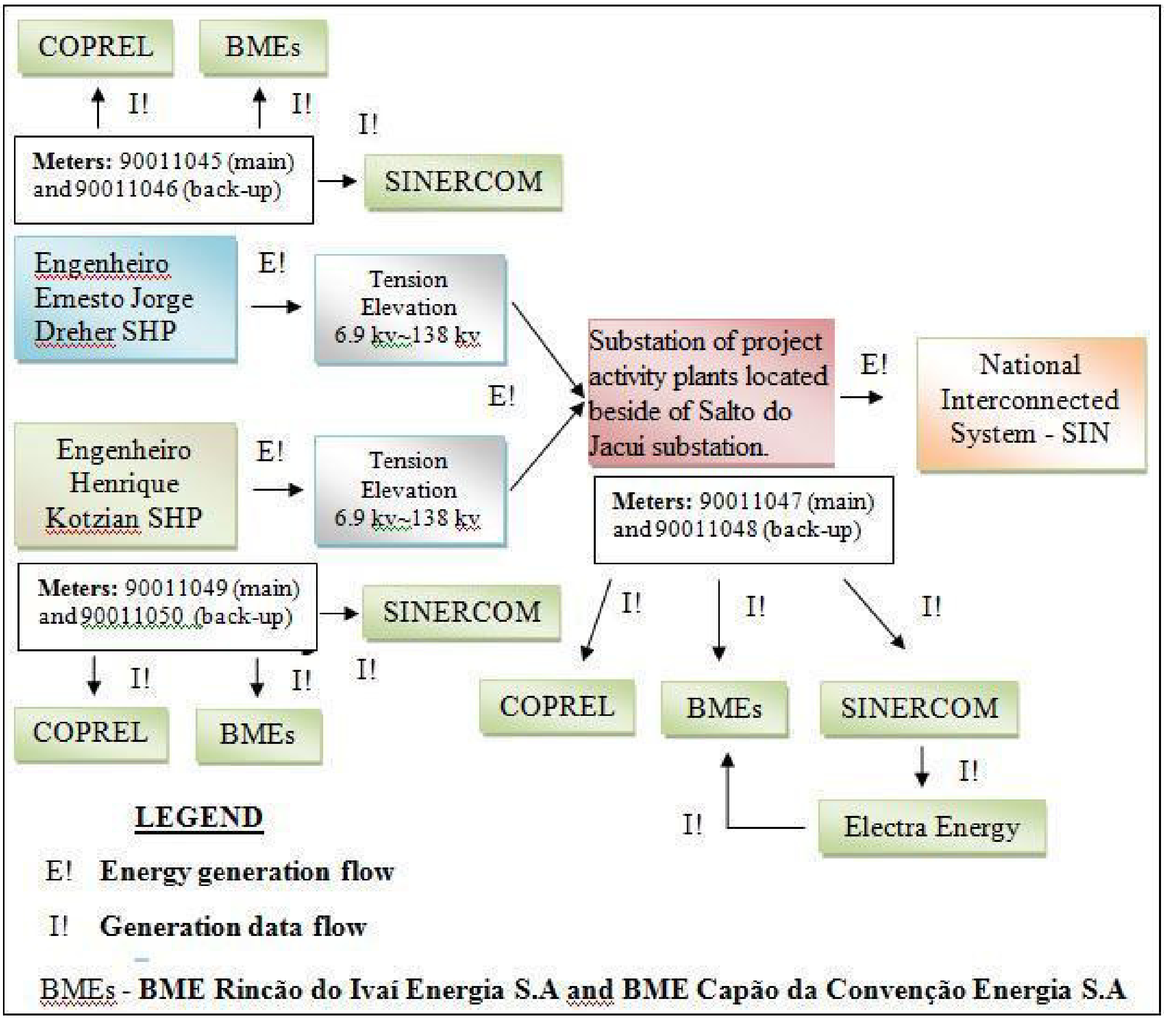


Figure 4: Flow chart of energy and generation data (**meters installed can be changed during the project lifetime, so the serial number can be changed also**).

Data monitoring:

The readings of meters are used to calculate emission reductions. The monitoring steps are as follow:

(1) The data will be measured continuously and recorded monthly;

(2) Spreadsheets containing the electricity dispatched to the grid will be generated; CCEE data measured (from CCEE databank – SINERCOM - third part) will be used to cross check the monitored data;

(3) The project participants will provide the generation measurement data and the SINERCOM (restricted access website) generation spreadsheets to the DOE, so it can check the authenticity of declared information.

(4) The emission reductions, and any project emissions (if applicable), should be managed by the project manager responsible at Carbotrader.

Quality control:

(1) Calibration of meters:

The calibration of meters shall be conducted at least every five years by a qualified organization that must comply with national standards and industrial regulations to ensure the system accuracy. After calibration, the meters are sealed for safety and the calibration certificates are archived with other monitoring records. The class of accuracy of the equipment that will be used in the project activity is under the national standards (class 0.2) stated in "*Grid Procedures*" from the National Grid Operator: Module 2, submodule 2.14[14].

(2) Emergency treatment

In case of unavailability of measures from any point of measurement, due to maintenance, commissioning or for any other reason, will be used the methodology to estimate data as the ONS submodule 2[15].

Data Management:

All the project activity issues regarding the SHPs construction will be treated by the responsible Managers / Directors from BME Rincão do Ivaí and BME Capão da Convenção.

The monitoring data will be stored during the project's duration. In this case this means 10 years (one period duration) plus 2 years after it ends according to the methodology. If the project is renewed for another two periods, the data will be stored for 30 years plus 2 years, making up a total of 32 monitoring years.

All data gathered in the monitoring range will be electronically filed and kept for the period above mentioned.

The emission reductions to be generated will be calculated regularly by the project proponents and kept for the verification phase.

Training Procedures:

All training necessary for the plants operational team were provided by equipment suppliers during the installation and pre operational phases. After the engagement of COPREL

[14] http://www.ons.org.br/%2FProcedimentosDeRede%2FM%C3%B3dulo%2012%2FSubm%C3%B3dulo%2012.3%2FSubm%C3%B3dulo%2012.3%202016.12.pdf (Procedures from the ONS – Module 12)

[15] http://www.ons.org.br/paginas/sobre-o-ons/procedimentos-de-rede/vigentes

Cooperativa de Energia as the third party which assumed the operations and maintenance activities of the plants, all the training activities are being undertaken by the engaged company to itself team.

The emergency procedures related to the project activity operation (for instance: workers' safety and health, dam safety related emergency drills/exercises, etc, according to the Brazilian legislation), are included in the training courses that the third party company is supposed to offer.

Furthermore, operation, maintenance and calibration procedures will follow the national guidelines set by the National Grid Operator.

1) **Emission Factors:**

The Emission Factor related to this project activity ($EF_{grid,CM,y}$ and $EF_{grid,OM\text{-}DD,y}$) as mentioned previously, are available by the brazilian DNA and it can be viewed at its website (http://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/index.html). Thus, the monitoring of this data will be ex-post through periodic access to data provided by DNA. For ($EF_{grid,BM,y}$) parameter, this one is already defined ex-ante (see Section 5.1).

2) **Installed capacity – Cap_{PJ}:**

The installed capacity of the hydro power plant after the implementation of the project activity will be monitored yearly through one of the following options:

- Technical specifications on the installed equipments;

- Installed plaques in the equipments;

- Factsheets.

In Brazil, the installed capacity of hydropower plants is determined and authorized by the competent regulatory agency. Furthermore, any modification must also be authorized and made available to the public. Thus, any new authorization to increase the installed capacity of the plants will be monitored. It will be used to installed capacity, which is also a recognized standard, to assure the project technical characteristics.

It is also important to highlight that according the ANEEL resolution number 407, issued on 19th October 2000, if the present/real installed capacity is greater than +/- 5 % of the authorized (granted) installed capacity, a revision of the authorized installed capacity should be requested. This revision must not be requested by the responsible for both Engenheiro Ernesto Jorge Dreher SHP and Engenheiro Henrique Kotzian SHPs because the increment in their capacities overwhelm the ANEEL granted values in only 0.44% and 1,76% respectively, so no revision or comunication action should be done accord to the mentioned ANEEL resolution.

3) **Area of the reservoir – A_{PJ}:**

The area of the reservoir will be checked once in the credit period renewal taking in consideration the surface of the water, after the implementation of the project activity, when the reservoir is full. To this purpose will be used topographic surveys, satellite pictures or environmental licenses.

Authority and Responsibility:

The BME Rincão do Ivaí Energia S.A. and BME Capão da Convenção Energia S.A. are responsible for the maintenance and calibration of the monitoring equipments, compliance to operational requirements and corrective actions related to the functionality of Engenheiro Ernesto Jorge Dreher SHP and Engenheiro Henrique Kotzian SHP respectively. Moreover, the companies have authority and responsibility for registration, monitoring, and measurements as well as managing all the issues related to the project activity and to organize staff training to use appropriated techniques in those procedures.

The baseline project emissions and Emissions Reductions calculations will be performed by Carbotrader which should report the results in a proper way to the entities related with the VCS process.