Voluntary Carbon Standard
Project Description Template

19 November 2007

[10 February 2011]

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1 Description of Project:

1.1 Project title

Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs VCS Project (JUN1120)

Date of VCS PD: April 2011

Version of this document: 03

1.2 Type/Category of the project

- *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"*

  Reference: CDM methodology ACM0002/Version 12.1.0, Sectoral Scope: 01, valid from 17th September 2010 onwards.

- *The project is not part of a Grouped project*

1.3 Estimated amount of emission reductions over the crediting period including project size:

The project is expected to reduce the average of 28,495 tCO_2/year, during the first crediting period, and therefore, cannot be considered a micro or mega project. Estimated emission reductions during the crediting period are presented in Table 1:

Table 1: Estimated emission reductions.

Year	Annual estimation of emission reduction in tonnes of CO_2e
Jul/2009	8,445
2010	22,219
2011	29,812
2012	29,930
2013	29,930
2014	29,930
2015	29,930
2016	29,930
2017	29,930
2018	29,930
Jun/2019	14,965
Total estimated over the first crediting period	**284,952**
Annual Average estimated reductions	**28,495**

1.4 A brief 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 Jacuí municipalities, both in Rio Grande do Sul state – south region of Brazil.

According to the dispatches 1,180 and 1,805 issued by National Electric Energy Agency – *ANEEL* (from portuguese *Agência Nacional de Energia Elétrica*) on 18th April 2007 and 18th May 2009 respectively, both the power plants of project activity are located on the Ivaí river, Atlantic Southeast Basin.

The Engenheiro Ernesto Jorge Dreher SHP has an installed power of 17.95 MW and a new reservoir which in its higher water level occupies an area of 0.83 km^2.

The Engenheiro Henrique Kotzian SHP has an installed power of 13.230 MW and a new reservoir which in its higher water level occupies an area of 0.66 km^2.

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, 26.2% of the generated energy in Brazil comes from thermoelectric plants (that uses fossil fuels as energy source)[1] 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.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

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.

[1] Information about the evolution of electric energy generation in Brazil
http://www.aneel.gov.br/aplicacoes/capacidadebrasil/EVOLUCAO_DA_CAPACIDADE_IN_TALADA_ANEEL_MME.PDF

Figure 1: Localization of Júlio de Castilhos city.

Figure 2: Localization of Salto do Jacuí city.

1.6 Duration of the project activity/crediting period:

- 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.

- *Crediting period starting date:* The first monitoring period started on 1st July 2009, when the generating units number 1, 2 and 3 (UGs 1, 2 and 3) of Engenheiro Ernesto Jorge Dreher initialized energy inputting into the grid on test operations.

  - VCS project crediting period: 10 years, renewable for more twice 10 years periods, totalizing 30 years.

1.7 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.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The project activity shall to achieve GHG emission reductions supplying the national interconnected grid with renewable energy generation, that otherwise would be generated by thermal power stations operated with fossil fuel, also reducing the installation necessity of new large hydropower plants to meet the national growing demand (common practice in the host country), and that emit huge methane volumes coming from anaerobic decomposition of organic matter in their reservoirs. The Methodology chosen for the emission reductions calculation are presented in section 4 - "GHG emission reductions" of this Project Description.

1.9 Project technologies, products, services and the expected level of activity:

The technology used in the enterprise is the Ivaí hydro energy potential for the electricity generation by the water gravitational energy, which is used to move the turbines and doing this, trigger generators that enable the generation of electricity. This is a clean and renewable energy source that presents minimal environmental impact.

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 2 and 3.

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 145kV Substation Salto do Jacuí of State Company of Electric Energy - CEEE (from Portuguese Companhia Estadual de Energia Elétrica), which is 16.65 km far from the project activity, also installed on the Salto do Jacuí city, Rio Grande do Sul state. The *RGE* (from Portuguese *Rio Grande Energia*) is the local energy concessionary.

Table 2: 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 551,72*	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**
Type	Francis	
Quantity	5	Equipment plaque data
Power (kW)	3 x 5,912 / 1 x 315.43 / 1 x 483*	Equipment plaque data
Nominal Flow (m^3/s)	3 x 11.40 / 1 x 2.36 / 1 x 3.60*	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 (Km²)	0.83	LO_2968/2009-DL
Power Density (W/m²)	21.63	Based on ACM0002 – v.12.1.0
Plant Load Factor	0.68	ANEEL database

* Data taken from the technical/commercial contracts to equipments acquiring (only to UG5).

Table 3: Engenheiro Henrique Kotzian SHP technical characteristics.

Generator	Characteristics	Source
Type	Synchronous	
Quantity	3	
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

Water head (m)	31.21	Equipment plaque data

Other Information	Characteristics	Source
Reservoir Area (Km²)	0.66	LO N° 2211/2011-DL
Power Density (W/m²)	20.05	Based on ACM0002 – v.12.1.0
Plant Load Factor	0.65	ANEEL database

1.10 Compliance with relevant local laws and regulations related to the project:

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;

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.

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.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

Following are the risks that may substantially affect the project's GHG emission reductions**:**

Climatic risk:

As a renewable source of electricity generation from water flow, the hydroelectricity is clearly dependent on the rainfall levels during the year. In south of Brazil the seasons has typical characteristics, the winter has a predominant low rainfall level and the summer has a high rainfall level. Thus, the reservoir level is filled during the summer and consumed during the winter. Even the reservoir has not a huge storage capacity, it helps the power plant to keep its generating levels higher over the dry season, when the river flow usually decreases.

Being a run-of-river power plant, it depends on the flow rate to achieve the reduction levels estimated for a crediting period, which would be achieved in a longer period in case of extremely dry events, which is not likely to happen. It is important to highlight that historical flow variation series were considerate to calculate the net power of the plants, and these were used to estimate the GHG reductions of the project, decreasing the climatic risk incidences.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

There were no GHG emissions at project activity site before its implementation, and after that, the emissions remain null as described on item 4.1. Also, the project activity does not intent to remove or to destroy GHG as part of it. Therefore, there was no creation of GHG emissions for subsequent removal or destruction.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The project has not been subscribed to any other programs able to generate environmental credits.

1.14 Project rejected under other GHG programs (if applicable):

The Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs project has not been rejected by any other GHG program. The VCS Program is the only GHG program that the project participates.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

All the issues related to the Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs, on their building and operating phases, also that related to trainings and relevant parameters monitoring to calculation of emission reductions, are under responsibility of Executive Management Sector of plants owners, listed on table 4.

Table 4: Contact information of project proponents.

SHPP Name:	Engenheiro Ernesto Jorge Dreher	Engenheiro Henrique Kotzian
Organization:	BME Rincão do Ivaí Energia S.A.	BME Capão da Convenção Energia S.A.
Street/P.O.Box:	Avenida Brasil, 2530, Sala H	Avenida Brasil, 2530, Sala I
Neigborhood:	Hermani	Hermani
City:	Ibirubá	Ibirubá
State/Region:	Rio Grande do Sul	Rio Grande do Sul
Postfix/ZIP:	98.200-000	98.200-000
Country:	Brazil	Brazil
Telephone:	(54) 3324 1255 / 5936	(54) 3324 1255 / 5936
FAX:	(54) 3324 1255	(54) 3324 1255
E-Mail:	ivo@rischbieter.com.br	ivo@rischbieter.com.br
URL:	----	----
Represented by:	Ivo Rischbieter	Ivo Rischbieter
Title:	Technical Director	Technical Director
Salutation:	Mr.	Mr.
Last Name:	Rischbieter	Rischbieter
Middle Name:	------	------
First Name:	Ivo	Ivo
Sector:	Technical	Technical
Mobile:	-----	-----
Direct FAX:	(47) 2102 3333	(47) 2102 3333
Direct tel:	(47) 2102 3333	(47) 2102 3333
Personal E-Mail:	ivo@rischbieter.com.br	ivo@rischbieter.com.br

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

The calculation of CO_2 emission factor of Brazilian Interconnected Grid (*SIN*) is made by the Brazilian DNA, using the latest version of "Tool to calculate the emission factor for an electricity system" published by the CDM Executive Board. The emission factors of operating and built margins are made available to Brazilian projects proponents through the website of the DNA[2], and are annually updated. The combined margin is calculated by project proponents through a weighted-average formula, considering the $EF_{grid,OM\text{-}DD,y}$ and the $EF_{grid,BM,y}$ and the weights w_{OM} and w_{BM} default 0.5, as per the "Tool to calculate the emission factor for an electricity system".

All relevant information related to eligibility of the project under the VCS and the quantification of emission reductions are provided in sections 2, 3 and 4 below.

1.17 List of commercially sensitive information:

The following spreadsheets (financial data and sensitivity analysis) provided by PPs describe commercially sensitive information and shall not be available to the public. The archives are available only to the ones involved with the VCS validation process.

SHP Eng. Ernesto Jorge Dreher

- Analise_JD_v1_2007_07_01_rev1;
- Analise_sens_JD_v1_2007_07_01_rev1_energy_price;
- Analise_sens_JD_v1_2007_07_01_rev1_investment;
- Analise_sens_JD_v1_2007_07_01_rev1_net_power;
- Analise_sens_JD_v1_2007_07_01_rev1_O&M.

SHP Eng. Henrique Kotzian

- Analise_HK_v1_2007_07_01_rev1;
- Analise_sens_HK_v1_2007_07_01_rev1_energy_price;
- Analise_sens_HK_v1_2007_07_01_rev1_investment;
- Analise_sens_HK_v1_2007_07_01_rev1_net_power;
- Analise_sens_HK_v1_2007_07_01_rev1_O&M.

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

The project make use of the Clean Development Mechanism (CDM) methodology: ACM0002 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.1.0), also approved by the VCS Program.

This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to

[2] http://www.mct.gov.br/index.php/content/view/74689.html

the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The ACM0002 also refers to the following tools:

 Tool to calculate the emission factor for an electricity system (version 2);

 Tool for the demonstration and assessment of additionality (version 5.2);

 Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 2);

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

As per UNFCCC`s (*United Nations Framework Convention on Climate Change*) definitions, the project activity is according the sectoral scope 1 that refers to energy industries (renewable or non renewable sources).

The ACM0002 methodology is applicable to grid-connected renewable power generation project activities under following conditions:

•The project activity is the installation of hydro power plants/units with run-of-river reservoirs;

• The project activity results in new reservoirs and the power densities of the power plants, as per definitions given in the Project Emissions section, are greater than 4 W/m^2.

The Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian Small Hydropower Plants are considered electric generation by renewable source with new reservoirs, which have power densities of 21.63 W/m^2 and 20.05 W/m^2 respectively.

Also, the Engenheiro Ernesto Jorge Dreher installed capacity is 17.95 MW, greater than 15 MW (as can be verified in tables 2 and 3), thus the project activity is included in the large scale project category considering the VCS standards.

Therefore, the methodology ACM0002 is applicable to the project activity.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

Table 5: Description of the sources and gases included in the project boundary.

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project activity	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	No	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/m^2 and, therefore, greater than 10 W/m^2.

		N_2O	No	Minor emission source.

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

According to the Version 12.1.0 of CDM methodology ACM0002, "*if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*"

"*Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants 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"*.

Moreover, the baseline emissions are the kWh produced by the renewable generating unit ($EG_{BL,y}$) multiplied by an emission coefficient (quantified in tCO_2e/MWh), calculated in a conservative and transparent manner.

The generation electricity potential of Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs shall provide the necessary data to estimate the GHG baseline emissions in kWh.

In the project activity absence (baseline scenario), the electricity would continue to be provided by other grid-connected power plants, included fossil fuel based power plants (more details about the Brazilian National Interconnected Grid in section 4.1).

Also, the project activity uses as data source for the Emission Factor calculation of National Interconnected System (SIN), the operating margin and the build margin coefficients provided by the Designated National Authority (DNA) of the host country, publicly available. The CO_2 Emission Factor resulting from the electric energy generation 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* from the Portuguese *Operador Nacional do Sistema*).

The method used to make this calculation is the dispatch analysis method. This information is needed for renewable energy projects connected to the electric grid and implanted in Brazil under the VCS.

The data resultant from the work of the ONS, of the Ministry of Mines and Energy (MME) and the Ministry of Science and Technology, are available to the VCS project proponents. 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: http://www.mct.gov.br/index.php/content/view/73318.html.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

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 – O*NS* (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 be overcome by the additional revenues associated with the generation of VCUs.

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

• **Institutional barriers** – Project faces financial, organizational, cultural or social barriers that the 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[3]. 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.

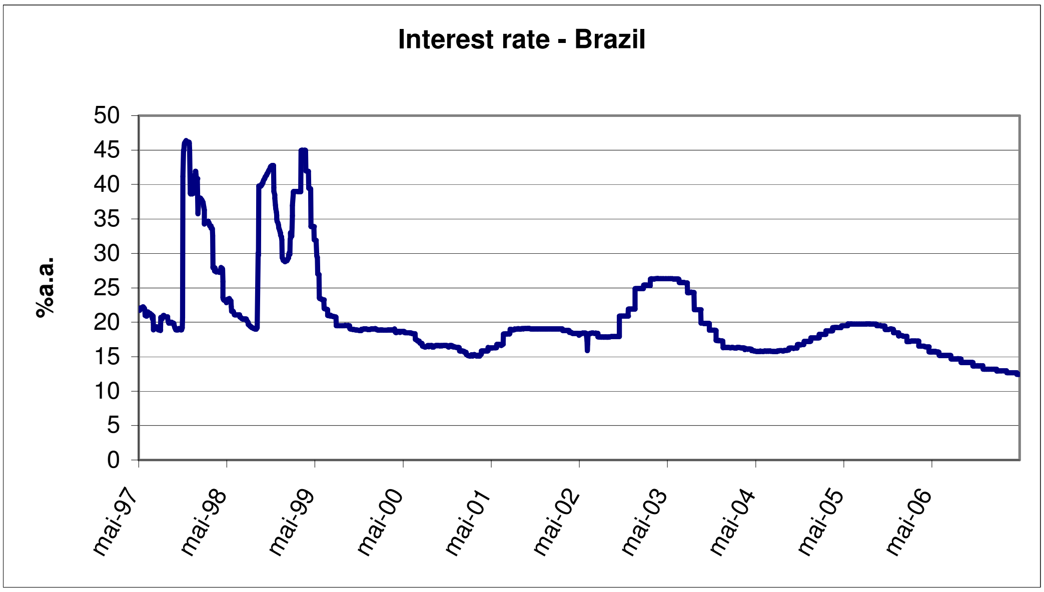
[3] http://www.bcb.gov.br/?COPOM

Federal public debt securities main purpose is to collect resources for the financing of the public debts, 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 external factors (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 Graph 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 a relatively 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:

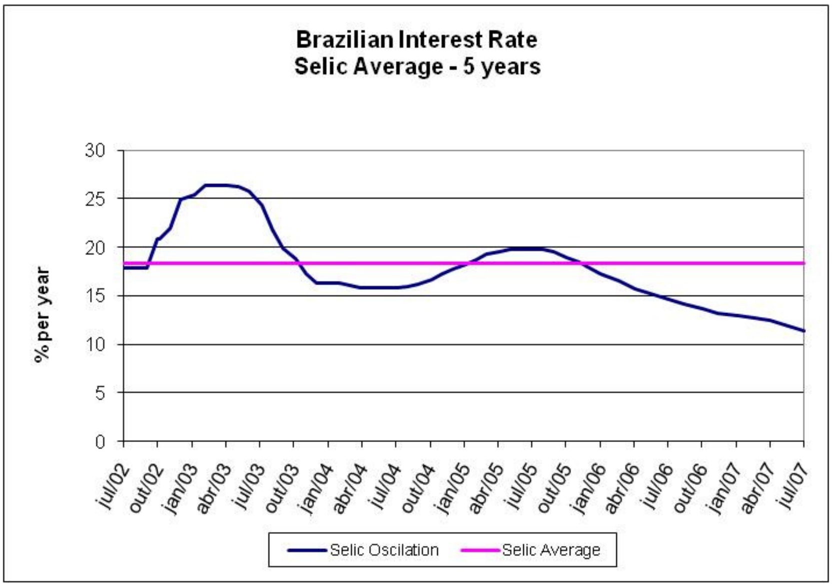
Table 6: Main Inputs Values of cash flow:

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 on both 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$/month) and	15,300.00	2,952.90	- 80.70%
Maintenance (R$/month)	165,900.00	32,018.70	- 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$/month) and	12,240.00	Not sensible enough to	- 100%
Maintenance (R$/month)	112.100,00	reach the benchmark	- 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_alternativas/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[4] – 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.

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

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 employees salaries 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 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 with existing projects.
- demonstration that the project is not common practice shall be based on guidance in the GHG 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*)[5] 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 Brazilian energetic matrix.

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

The table 10 presents the number of operating enterprises by the type of generating technology related 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
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[6]

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.

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

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

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, distribution and 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 the Companies.	Coexistence between State-controlled and 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 generation and commercialization. In a regulated environment: auctions and 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 by the National Council for Energy Policy (CNPE)	Planning accomplished by the Energy Research Company (EPE)
Hiring: Market 100%	Hiring : Market 85% (until August/2003) and Market 95% (until December/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[7]

In the light of the information's 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 between July 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 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.

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

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 the light of the investment climate.

Investment Decision and Starting Date

The project activity investment decision (August 2007[8]) 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). From July 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

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

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

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 the year 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 energy purchased 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 financial incentive 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	SHP	State	Incentives
2004			
1	Rio Branco	RO	No incentives available
2005			
	Excluding the SHP under CDM incentive policy, none SHP became operational this year.	n/a	--------------
2006			
1	Carlos Gonzatto	RS	PROINFA
2	Esmeralda	RS	PROINFA
3	Piranhas	GO	PROINFA
4	São Bernardo	RS	PROINFA

[9] Decree 5,025 de 2004 that establishes the PROINFA http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2004/Decreto/D5025.htm

2007			
1	Flor do Sertão	SC	PROINFA
2	José Gelásio da Rocha	MT	PROINFA
3	Ponte Alta	MS	PROINFA
2008			
1	Boa Sorte	TO	PROINFA
2	Bonfante	MG/RJ	PROINFA
3	Caçador	RS	PROINFA
4	Cachoeira da Lixa	BA	PROINFA
5	Calheiros	RJ/ES	PROINFA
6	Carangola	MG	PROINFA
7	Colino I	BA	PROINFA
8	Colino II	BA	PROINFA
9	Cotiporã	RS	PROINFA
10	Da Ilha	RS	PROINFA
11	Funil	MG	PROINFA
12	Lagoa Grande	TO	PROINFA
13	Mambaí II	GO	PROINFA
14	Plano Alto	SC	PROINFA
15	Riacho Preto	TO	PROINFA
16	São Joaquim	ES	PROINFA
2009			
1	Cocais Grande	MG	PROINFA
2	Linha Emília	RS	PROINFA
3	Monte Serrat	RJ/MG	PROINFA
4	Retiro Velho	GO	PROINFA

Source: Supervision of generation services[10]

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 implantation of SHPs without financial incentives is not a common practice in Brazil, being therefore eligible to 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

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

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
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 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

The monitoring plan for the project activity is based on the CDM methodology ACM0002 - "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*", Version 12.1.0, and consists of the monitoring of the electricity generation from the proposed project activity, the surface area of the reservoirs at their full levels, the installed capacities of the plants and CO_2 emission factors of the Brazilian grid.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

1) Power generation and measurement system - $EG_{facility,y}$ (= $EG_{PJ,y}$):

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 Comércio 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*) develop 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 12.1 of Grid Procedures[11], 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 measure of energy effectively inputted into the grid are done at 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 meter will record the energy generated by both plants of project activity since the transmission lines which come from the plants are joined at some point before reach this meters. Using the data of meters installed at the power houses of the two plants, the regulatory agency can establish who much energy is generated by each plant.

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

To a easier understanding, see the figure 3 on page 34.

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

For this system is guaranteed the data inviolability. After the calibration, it is sealed for safety. The measurement system contains also a communication system that has the function of sending the dispatched electricity data to the CCEE (meter installed on Salto do Jacuí Hydropower).

[11] http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.1_Rev_1.0.pdf

"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."

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.

<u>Data monitoring:</u>

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 owner 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;

<u>Quality control:</u>

(1) Calibration of meters:

The calibration of meters shall be conducted at least every two 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 12, submodule12.2[12].

(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 item 14.3 of the Procedure of Energy Commercialization PdC ME.01[13].

<u>Data Management:</u>

All the project activity issues regarding the SHP 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.

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[12] http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.2_Rev_1.0.pdf

[13] http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=67778d3ef9a3c010VgnVCM1000005e01010aRCRD

All data gathered in the monitoring range will be electronically filed and kept for at least 2 years after the last crediting period. 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 equipments suppliers during the their installation and pre operational phases. After the engagement of COPREL 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.

2) **Total electricity produced by the project activity** – ***TEG:***

Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y. Applicable to hydro power project activities with a power density of the project activity (PD) greater than 4 W/m^2 and less than or equal to 10 W/m^2, thus not currently monitored.

3) **Emission Factors - $EF_{grid,CM,y}$, $EF_{grid,OM\text{-}DD,y}$ and $EF_{grid,BM,y}$:**

The CO_2 emission factors related to this project activity ($EF_{grid,CM,y}$, $EF_{grid,OM\text{-}DD,y}$ and $EF_{grid,BM,y}$) as mentioned previously, are the values correspondent to the year 2009 and are made available by the Brazilian DNA. It can be viewed at DNA website (www.mct.gov.br/clima). Thus, the monitoring of this data will be ex-post through periodic access to data provided by DNA.

4) **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 19^{th} 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 both Engenheiro Ernesto Jorge Dreher SHP and Engenheiro Henrique Kotzian SHP managers because the increment in their capacities were only 0.44% and 1,76% respectively, so no revision or comunication action should be done accord to the mentioned ANEEL resolution.

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

The area of the reservoir will be measured yearly in the surface of the water, after the implementation of the project activity, when the reservoir is full.

Measures from topographical surveys, maps, satellite pictures, etc. Also, the reservoir area can be determined depending on the reservoir level, because hydroelectric plants dispatched by ONS have to monitor their reservoir level. The data used for this purpose can be used to determine the reservoir area and will be also a measurement procedure to be considered to the project activity.

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 Assessoria e Consultoria em Energia Ltda which should report the results in a proper way to the entities related with the VCS process.

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Data / Parameter:	$EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the SHPP Engenheiro Ernesto Jorge Dreher to the grid in year y, recorded by two meters .
Source of data to be used:	Project owners
Measurement procedures (if any):	Electricity meters
Value of data applied for the purpose of calculating expected emission reductions	107,222
Monitoring frequency:	Continuous measurement and at least monthly recording
Description of measurement methods and procedures to be applied:	The net electricity delivered to the grid will be checked through the electricity unidirectional meters (one main and one back-up installed in Salto do Jacuí Hydropower Substation). The meters must comply with national standards stated by ONS module 12.2 (which can be viewed through the link http://www.ons.org.br/procedimentos/modulo_12.aspx), and industry regulation to ensure the accuracy (class 0.2). For safety, the meter will be sealed after calibration.
QA/QC procedures to be applied:	These data will be used to calculate the emission reductions. The data will be archived

	monthly (electronic) and kept 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.
Any comment:	$EG_{facilities,y} = EG_{PJ,y} = EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y} + EG_{Engenheiro\ Henrique\ Kotzian,y}$

Data / Parameter:	$EG_{Engenheiro\ Henrique\ Kotzian,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the SHPP Engenheiro Henrique Kotzian to the grid in year y, recorded by two meters .
Source of data to be used:	Project owners
Measurement procedures (if any):	Electricity meters
Value of data applied for the purpose of calculating expected emission reductions	75,949
Monitoring frequency:	Continuous measurement and at least monthly recording
Description of measurement methods and procedures to be applied:	The net electricity delivered to the grid will be checked through the electricity unidirectional meters (one main and one back-up installed in Salto do Jacuí Hydropower Substation). The meters must comply with national standards stated by ONS module 12.2 (which can be viewed through the link http://www.ons.org.br/procedimentos/modulo_12.aspx), and industry regulation to ensure the accuracy (class 0.2). For safety, the meter will be sealed after calibration.
QA/QC procedures to be applied:	These data will be used to calculate the emission reductions. The data will be archived monthly (electronic) and kept 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.
Any comment:	$EG_{facilities,y} = EG_{PJ,y} = EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y} + EG_{Engenheiro\ Henrique\ Kotzian,y}$

Data / Parameter:	$TEG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y}$
Data unit:	MWh/year
Description:	Total electricity produced by the SHPP Engenheiro Ernesto Jorge Dreher, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y.
Source of data to be used:	Project activity site.
Measurement procedures (if any):	Electricity meters
Value of data applied for the purpose of calculating expected emission reductions	Not currently applicable.
Monitoring frequency:	Continuous measurement and at least monthly recording.

Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	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.

Data / Parameter:	$TEG_{Engenheiro\ Henrique\ Kotzian,y}$
Data unit:	MWh/year
Description:	Total electricity produced by the SHPP Engenheiro Henrique Kotzian, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y.
Source of data to be used:	Project activity site.
Measurement procedures (if any):	Electricity meters
Value of data applied for the purpose of calculating expected emission reductions	Not currently applicable.
Monitoring frequency:	Continuous measurement and at least monthly recording.
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	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.

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 to be used:	Based on data provided by DNA (Designated National Authority).
Measurement procedures (if any):	According procedures established by “Tool to calculate the emission factor for an electricity system”, version 2.
Value of data applied for the purpose of calculating expected emission reductions	0.1634
Monitoring frequency:	Continuous measurement and annual update to recalculate ex-post project emission reductions.
Description of measurement methods and procedures to be applied:	The Combined Margin is calculated through a weighted-average formula, considering the $EF_{grid,OM\text{-}DD,y}$ and the $EF_{grid,BM,y}$ and the weights w_{OM} and w_{BM} default 0.5. As per the "Tool to calculate the emission factor for an electricity system".
QA/QC procedures to be applied:	This data will be applied in the project emission reductions calculation.
Any comment:	-

Data / Parameter:	$EF_{grid,OM-DD,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Operating Margin emission factor of the grid, in a year y
Source of data to be used:	Data provided by DNA (Designated National Authority) to the year y.
Measurement procedures (if any):	According procedures established by "Tool to calculate the emission factor for an electricity system", version 2.
Value of data applied for the purpose of calculating expected emission reductions	0.2476
Monitoring frequency:	Continuous measurement and annual update to recalculate ex-post project emission reductions.
Description of measurement methods and procedures to be applied:	The Operating Margin Emission Factor will be collected in the DNA website, which is responsible for this calculation.
QA/QC procedures to be applied:	This data, updated, will be applied in ex-post calculation of the Emission Factor.
Any comment:	-

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Build Margin emission factor of the grid, in a year *y*
Source of data to be used:	Data provided by DNA (Designated National Authority) to the year *y*.
Measurement procedures (if any):	According procedures established by "Tool to calculate the emission factor for an electricity system", version 2.
Value of data applied for the purpose of calculating expected emission reductions	0.0794
Monitoring frequency:	Continuous measurement and annual update to recalculate ex-post project emission reductions.
Description of measurement methods and procedures to be applied:	The Build Margin Emission Factor will be collected in the DNA website, which is responsible for this calculation.
QA/QC procedures to be applied:	This data, updated, will be applied in *ex-post* for the calculation of the Emission Factor.
Any comment:	-

Data / Parameter:	$Cap_{PJ – Ernesto\ Jorge\ Dreher\ SHP}$
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	Equipments plaques at project site.
Measurement procedures (if any):	Determined based on recognized standards.
Value of data applied for the purpose of calculating expected emission reductions	17,950,000
Monitoring frequency:	Continuous.
Description of measurement methods and procedures to be applied:	Technical specifications on the installed equipments.

QA/QC procedures to be applied:	This data will be applied for the Power Density calculation.
Any comment:	-

Data / Parameter:	$Cap_{PJ – Henrique\ Kotzian\ SHP}$
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	Equipments plaques at project site.
Measurement procedures (if any):	Determine the installed capacity based on recognized standards.
Value of data applied for the purpose of calculating expected emission reductions	13,230,000
Monitoring frequency:	Continuous.
Description of measurement methods and procedures to be applied:	Technical specifications on the installed equipments.
QA/QC procedures to be applied:	This data will be applied for the Power Density calculation.
Any comment:	-

Data / Parameter:	$A_{PJ – Ernesto\ Jorge\ Dreher\ SHP}$
Data unit:	m^2
Description:	Area of the reservoir measured in the water surface, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Operation Licence issued by FEPAM on 18th June 2009 - LO_2968/2009-DL.
Value of data applied for the purpose of calculating expected emission reductions	830,000
Monitoring frequency:	Annual.
Description of measurement methods and procedures to be applied:	Measured from topographical surveys or satellite pictures.
QA/QC procedures to be applied:	The preventive erosion environmental measures and the permanent preservation area (APP) recovering program will allow to monitor the slopes` and the reservoirs` margins stability, providing additional data about the reservoir area.
Any comment:	This data is applied for the Power Density calculation.

Data / Parameter:	$A_{PJ – Henrique\ Kotzian\ SHP}$
Data unit:	m^2
Description:	Area of the reservoir measured in the water surface, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Installation Licence issued by FEPAM on 7th May 2010 - LI_495/2010-DL.
Value of data applied for the purpose of calculating expected emission reductions	660,000
Monitoring frequency:	Annual.

Description of measurement methods and procedures to be applied:	Measured from topographical surveys or satellite pictures.
QA/QC procedures to be applied:	The preventive erosion environmental measures and the permanent preservation area (APP) recovering program will allow to monitor the slopes` and the reservoirs` margins stability, providing additional data about the reservoir area.
Any comment:	This data is applied for the Power Density calculation.

Fixed parameter:

Data / Parameter:	EF_{res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emission from reservoirs.
Source of data to be used:	Decision by EB 23, annex 5.
Measurement procedures (if any):	Standard value.
Value of data applied for the purpose of calculating expected emission reductions	90
Monitoring frequency:	-
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	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.

3.4 Description of the monitoring plan

As mentioned in item 3.2, project sponsor will proceed with the necessary measures and procedures for the project monitoring following national and local requirements and according to the ACM0002.

The following parameters will be monitored in accordance to the methodology ACM0002:

(i) Quantity of net electricity generation supplied by the project plant/unit to the grid, in MWh ($EG_{facility,y}$);

(ii) Installed capacity of the hydro power plant after the implementation of the project activity, in W (Cap_{PJ});

(iii) Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full, in m^2 (A_{PJ});

(iv) All parameters to calculate the combined margin CO_2 emission factor for grid connected power generation in year y, were calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”, in tCO_2/MWh ($EF_{grid.CM.y}$).

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

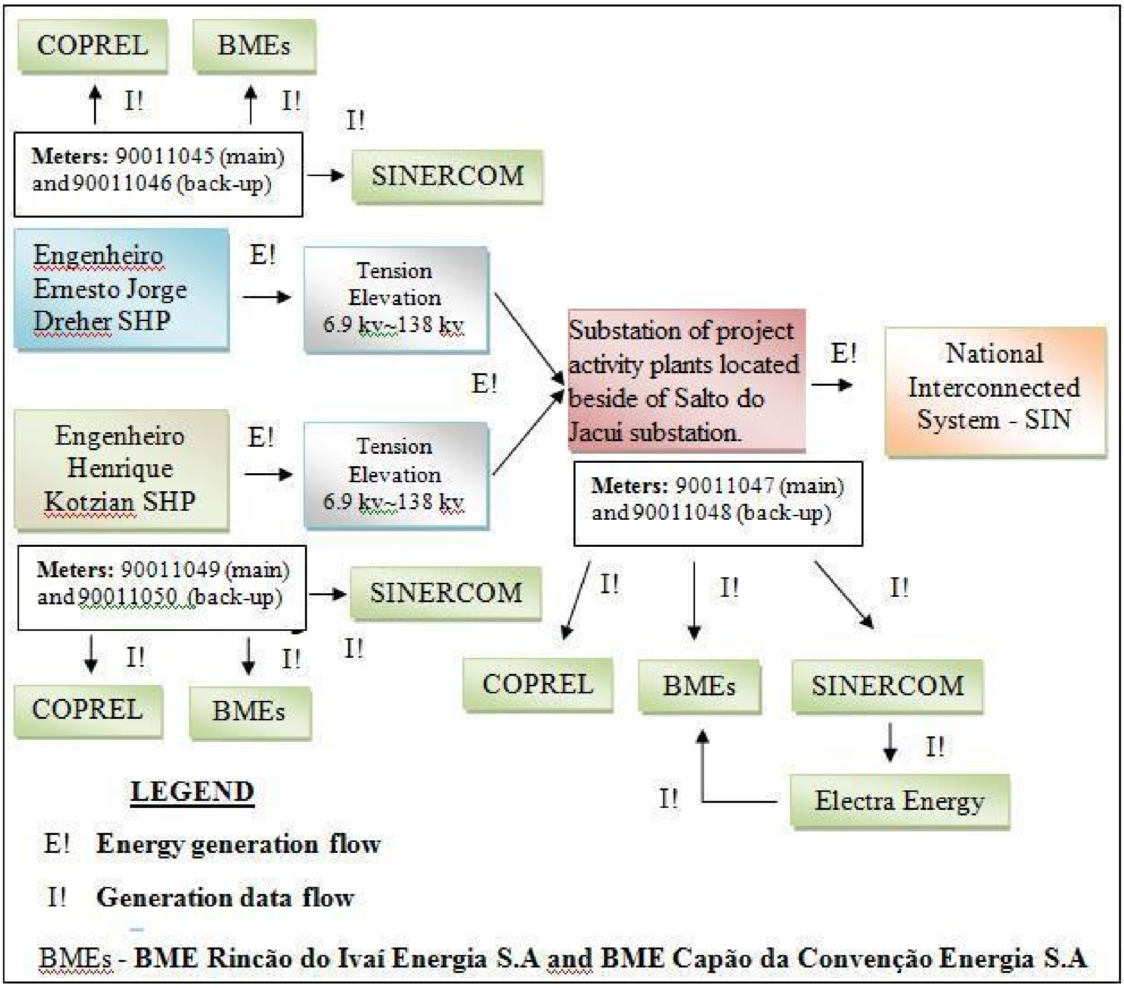

Figure 3 : Flow chart of energy and generation data.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

The emission reductions of project activity (ER_y) are quantified through the subtraction of project emissions ($PE_{HP,y}$) from baseline emissions (BE_y).

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

Where:
ER_y = Emission reduction in year y (tCO_2e/year);
BE_y = Baseline emissions in year y (tCO_2e/year);
$PE_{HP,y}$ = Project emission from water reservoirs for hydro power plants in year y (tCO_2e/year)

Project emissions ($PE_{HP,y}$)

According to the methodology ACM0002 Version 12.1.0, 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 project (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 reservoir as tCO_2e/year;
EF_{Res} is the default emission factor for emissions from reservoirs.
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).

b) If power density of project is greater than 10W/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 reservoir 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 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.

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 are zero to both hydropower plants of project activity because their Power Densities are higher than 10 W/m^2.

Baseline Emissions *(BE_y)*

Baseline emissions (BE_y 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 ($EG_{PJ,y}$ in MWh), as follows:

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

Where:
BE_y Baseline emissions in year y (tCO_2e/year);
$EG_{PJ,y}$ Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/year);
$EF_{grid,CM,y}$ 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).

Calculation of $EG_{PJ,y}$

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

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 above mentioned, 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 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 (data from year which the project started operating)[14].

Table 16: Emission Factor of Operating Margin for year 2009.

OPERATING MARGIN												
Average Emission Factor (tCO_2 / MWh)												
	MONTH											
	January	February	March	April	May	June	July	August	September	October	November	December
2009	0.2813	0.2531	0.2639	0.2451	0.4051	0.3664	0.2407	0.1988	0.1622	0.1792	0.1810	0.1940

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

$$EF_{grid,OM-DD,y} = 0.2476$$

"Build Margin Emission Factor BM" calculation ($EF_{grid,BM,y}$)

STEP 5. Identify the group of power units to be included in the build margin (BM).

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.

STEP 6. Calculate the build margin emission factor.

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 2009 year values published by the DNA (ultimate data available)[15].

[14] http://www.mct.gov.br/index.php/content/view/303076.html#ancora

[15] http://www.mct.gov.br/index.php/content/view/303076.html#ancora

Table 17: Emission Factor of Build Margin for year 2009.

BUILD MARGIN	
Average Emission Factor (tCO_2 /MWh) – **ANUAL**	
2009	0.0794

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

$$EF_{grid,BM,y} = 0.0794$$

STEP 7. Calculate the combined margin (CM) emissions factor.

To the calculation of combined margin emission factor (combination of operation and build margins) is used a weighted-average formula, considering both w_{OM} and w_{BM} = 0.5. As a conservative approach, is presented below the emission factor calculated using four decimal places, rounded down. Thus, the result is:

$$EF_{grid,CM,y} = 0.2476 \cdot 0.5 + 0.0794 \cdot 0.5 = 0.1634 \text{ (tCO}_2\text{/MWh)}$$

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

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

$$\boldsymbol{BE_y} = 0.1634 \, . \, 183{,}172 = \mathbf{29{,}930 \ (tCO_2)}$$

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

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

$$ER_y = 29{,}930 - 0 = 29{,}930 \text{ (tCO}_2\text{e)}$$

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

As described above, the baseline emissions are product of the grid emission factor times the energy generated by the plants activities, times the number of operational hours in a year.

Note in table 18 that from first to third years of project activity, the set of operating equipments was still incomplete, promoting a lower energy generation if compared to the other years. The operational timeline of equipments can be viewed on 2.5 section, step 4.

Table 18: Estimated baseline emissions of project activity.

Year	Operational hours / year	Net Power (MWaverage)	Emission Factor (tCO_2e)	Baseline Emissions (tCO_2e)
Jul/2009	4,380	11.689*	0.1634	8,445
2010	8,760	20.68**	0.1634	22,219
2011	8,760	20.91***	0.1634	29,812
2012	8,760	20.91	0.1634	29,930
2013	8,760	20.91	0.1634	29,930
2014	8,760	20.91	0.1634	29,930
2015	8,760	20.91	0.1634	29,930
2016	8,760	20.91	0.1634	29,930
2017	8,760	20.91	0.1634	29,930
2018	8,760	20.91	0.1634	29,930
Jun/2019	4,380	20.91	0.1634	14,965
Total				**284,952**

*from July to September (11.74MW from UGs 1, 2 and 3). From October to December (11.91MW from UGs 1, 2, 3 and 4). All of these of Eng. Ernesto Jorge Dreher SHP.
* *from August onwards when the generating units of Engenheiro Henrique Kotzian SHP started their operations.
*** from April onwards when the generating unit 5 of Engenheiro Ernesto Jorge Dreher SHP started its operations (forecasted).

4.3 Quantifying GHG emissions and/or removals for the project:

Project emissions (PEy)

As mentioned in section 4.1, the only GHG emissions applicable to project activity come from water reservoirs of hydro power plants. However, considering that both plants of the project have power density above 10 W/m^2, there are no project emissions involved in the project.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

As there are no emissions from the project activity, its reductions are directly proportional to the energy generated by the plants. They are quantified below in table 19.

Table 19: Estimated CO_2 reductions of project activity.

Year	Energy Generated (MWh)	Emission Factor (tCO_2e/MW)	Emission Reductions (tCO_2e)
Jul/2009	51,682	0.1634	8,445
2010	135,977	0.1634	22,219
2011	182,449	0.1634	29,812
2012	183,172	0.1634	29,930
2013	183,172	0.1634	29,930
2014	183,172	0.1634	29,930
2015	183,172	0.1634	29,930
2016	183,172	0.1634	29,930
2017	183,172	0.1634	29,930
2018	183,172	0.1634	29,930
Jun/2019	91,586	0.1634	14,965
Total			**284,952**

5 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 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.

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.

6 Stakeholders comments:

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.

7 Schedule:

The first commissioning period of project activity starts on 01 July 2009 with the start of test operations of generating units 1, 2, 3 of Engenheiro Ernesto Jorge Dreher SHP. The project intend to keep its activities for 30 years (three periods of ten years each), with its last commissioning period ending on June 2039.

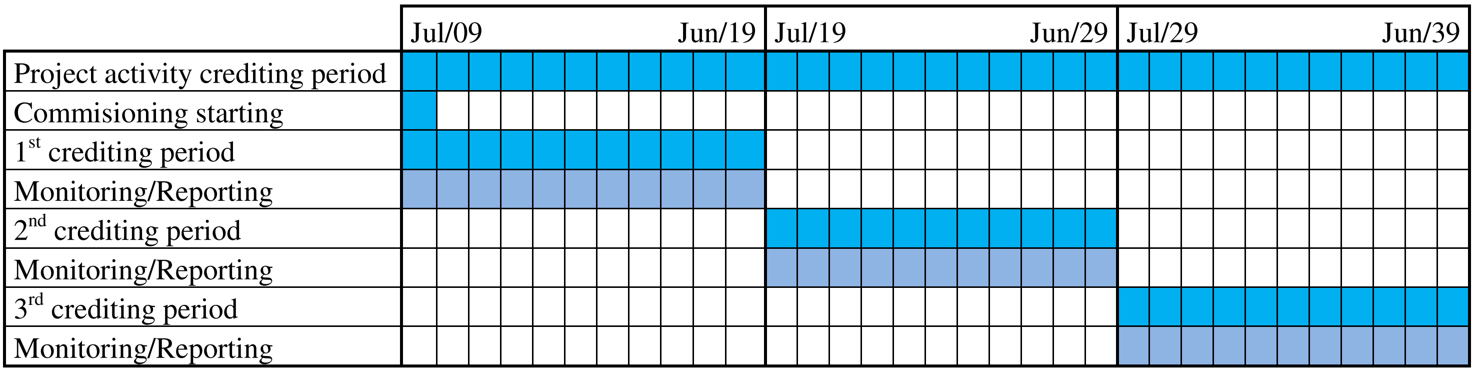

Figure 4: Estimated schedule for Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs VCS project.

8 Ownership:

8.1 Proof of Title:

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.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not applicable.