FOZ DO CHAPECÓ

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity consists on the supply of clean hydroelectric energy to the Brazilian National Interconnected System (SIN) through the implantation and operation of Hydro Power Plant (HPP) Foz do Chapecó, located in the Southern Region of Brazil, between the cities of Águas de Chapecó, state of Santa Catarina (SC) and Alpestre, state of Rio Grande do Sul (RS), with an installed capacity of 855 MW, using a small reservoir, with low environmental impact related to its installed capacity.

Foz do Chapecó Hydro Power Plant generates electricity through clean and renewable source and it contributes to attend the growing demand for electricity in Brazil, due to the country's economical and population growth, contributing, thus, to the environmental, social and economical sustainability, by increasing the participation of clean and renewable energy in relation to the country's total consumption of electricity.

Baseline scenario establishes that electricity delivered to the grid by the project activity would have been generated otherwise by the operation of a grid-connected power plant and by the addition of new generating sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" version 2.2.1. This Tool is from the Clean Development Mechanism (CDM).

The realistic alternatives to the project activity are (i) The project activity undertaken without being registered as a carbon credit project and the continuation of the current situation and (ii) the additional electricity generated by the project would be generated by existing or new power plants connected to the national electric system.

1.2 Sectoral Scope and Project Type

Foz do Chapecó Project fits in the category of sectoral scope 1 - Energy (renewable/non-renewable) and it is not a grouped project.

1.3 Project Proponent

Foz do Chapecó Project has two participants. Foz do Chapecó Energia S.A. and Enerbio Consultoria Ltda.

Foz do Chapecó Energia S.A. is the owner of Foz do Chapecó Hydro Electric Plant and it is responsible, in the condition of independent producer of energy, for implanting and operating the HPP Foz do Chapecó. Foz do Chapecó Energia has as shareholders the companies (1) CPFL Geração de Energia S.A., 51%; (2) Furnas Centrais Elétricas, 40%; (3) CEEE-GT Companhia Estadual de Geração e Transmissão de Energia Elétrica, 9%.

Enerbio Consultoria Ltda. advises Foz do Chapecó Energia to develop VCS Project and to monitor the VCUs to be generated from Foz do Chapecó Project.

1.4 Other Entities Involved in the Project

Not applicable.

1.5 Project Start Date

14/10/2010 (Operation Starting Date of the First Turbine)

1.6 Project Crediting Period

14/10/2010 to 14/10/2020 Project crediting period is 10 years renewed at most two times.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	X
Mega-project	

Years	**Estimated GHG emission reductions or removals (tCO_2e)**
2010	114,775
2011	981,352
2012	752,243
2013	752,243
2014	752,243
2015	752,243
2016	752,243
2017	752,243
2018	752,243
2019	752,243
2020	564,182
Total estimated ERs	7,678,253
Total number of crediting years	10
Average annual ERs	767,825

1.8 Description of the Project Activity

Foz do Chapecó Hydroelectric Project developed by Foz do Chapecó Energia S/A consists of the installation of a hydroelectric plant with an accumulation reservoir, located in the verge of Águas de Chapecó municipality, in Santa Catarina State, and Alpestre municipality, in Rio Grande do Sul State. Total installed capacity of the Project will be 855 MW, consisting of four sets of hydroelectric Francis type turbines with nominal capacity 217.14 MW and the electricity generator nominal power is 213.75, with a predicted electricity supply to the grid of 3,784,320 MWh per annum.

The purpose of the Project is to use the hydrological resources of the Uruguay River in order to generate low emissions electricity for the Brazilian Interconnected System (SIN – Sistema Interligado Nacional), hereafter referred as the SIN, thereby displacing electricity that is relatively carbon intensive, and reducing greenhouse gas (GHG) emissions. The baseline scenario is the same as the scenario existing prior to the start of the implementation of the project activity: Electricity delivered to the grid by the Project would have otherwise been generated by the operation of grid-connected power plants, and by the addition of new generation sources.

The participants of the project recognize that this Project activity is helping Brazil to fulfil its goals of promoting sustainable development due to the following reasons.

- Contributes to local environmental sustainability, since it decreases the dependence on fossil fuels, thus improving air quality.

- Contributes towards better working conditions and increases employment opportunities in the area where the project is located.

- Contributes towards better revenue distribution since it assists the regional/local economic development.

- Contributes to the development of technological capacity because most of the equipment of the project will be manufactured inside Brazil, consolidating the technology in the country.

The project lifetime for Foz do Chapecó Hydroelectric Project is 35 years, according to the contract concession.

1.9 Project Location

HPP Foz do Chapecó is located in Uruguay River, between the municipalities of Águas de Chapecó/SC and Alpestre/RS, in Brazil. The geographic coordinates are: Latitude 27° 08’ 24’ South and Longitude of 53° 02’ 36’ West[1].

The water barrier consists of a rock-filled embankment dam, build with asphalt concrete core. The total length is approximately 550 m and the average height 47m. A controlled spillway with water flow capacity of 61.190 m³/s. The project’s reservoir area with a maximum water level is 80.02 km^2 (included the passage way). The project power density is 10.68 W/m², in compliance with the applicability condition of the methodology.

1.10 Conditions Prior to Project Initiation

The scenario prior to the implantation of the project pointed to an important presence of thermoelectric power plants in the national energetic matrix (second greatest source of energy in the country), with total concentration of coal thermoelectric power plants (greatest contributors for the emission of CO_2 in the national energetic matrix) being in the Southern Region of the country, where Foz do Chapecó Project is located. Moreover, the projection of the Ministry of Mines and Energy (MME) pointed to a total growth in the offer of thermoelectric energy in the country of 10,486 MW in the period of 2006 - 2015[2], based mainly on natural gas, oil and mineral coal, sources with more potential to contribute to global warming than the generation provided by the technology implanted by Foz do Chapecó Project. It is important to highlight that all coal thermoelectric power plants projected by MME to start their operation in the period of 2006 - 2015 are located in the Southern region of the country, where Foz do Chapecó Project is located.

[1] Available at: http://www.aneel.gov.br/cedoc/dsp2007911.pdf

[2] Available at: http://www.epe.gov.br/PDEE/20060702_01.pdf Page 85.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project has all relevant environmental licenses and permissions issued and in compliance with Brazilian Regulation. The Preliminary License was issued by the Environmental Ministry (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA) environmental agency, on December 13th, 2002, PL number 147. The Installation License was issued on September 21st, 2004, IL number 284 and renewed on December 5th, 2006. The Operation License nº 949/2010 was issued on 25/08/2010 by IBAMA and it is valid until 25/08/2014.

The concession contract firmed with the Brazilian Government, through the National Agency of Electric Energy (ANEEL) is a proof that the project is in compliance with the Government requirements.

1.12 Ownership and Other Programs

1.12.1 Proof of Title

As an evidence of proof of title, the Project has the Concession Contract between Foz do Chapecó and ANEEL, National Agency of Electric Energy.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable, the project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions.

1.12.3 Participation under Other GHG Programs

Not applicable.

1.12.4 Other Forms of Environmental Credit

Not applicable because the project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals except under the VCS Program.

1.12.5 Projects Rejected by Other GHG Programs

Foz do Chapecó project was sent for validation by DNV Climate Change Services (DOE of the project) in the Clean Development Mechanism (CDM) at UNFCCC, but for strategic reasons the owner of the project decided to withdrawn the CDM project to develop a VCS project.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Not applicable.

Leakage Management

Not applicable.

Commercially Sensitive Information

Not applicable.

Further Information

Not applicable.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

- Version 13.0.0 of consolidated baseline and monitoring methodology ACM0002 - Methodology Consolidated for grid-connected electricity generation from renewable sources.
- Version 2.2.1 of "Tool to calculate the emission factor for an electricity system".
- Version 6.0.0 of the "Tool for demonstration and assessment of additionality"

For more information about the methodology consult the following website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

2.2 Applicability of Methodology

The consolidated methodology ACM0002, version 13.0.0, is applicable to Foz do Chapecó Hydro Power Plant VCS Project, because the project is a grid-connected renewable power plant that will consist of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity.

Furthermore, the project activity fulfills all the applicability conditions of ACM0002, Version 13.0.0 in the following ways:

- “The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit”.

Outcome: applicability condition is fulfilled, considering that the project activity is the installation of a “hydro power plant/unit”.

- “In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2 on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity”.

Outcome: since the proposed project does not involve capacity addition, retrofits or replacements, this applicability condition is not applied.

“In case of hydro power plants:

- One of the following conditions must apply:
  - The project activity is implemented in an existing single or multiple reservoir, with no change in the volume of reservoir; or
  - The project activity is implemented in an existing single or multiple reservoir, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2; or
  - The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2”.

Outcome: The project activity involves new reservoirs and the project activity of the power plant is greater than 4 W/m^2.

In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply:

- The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2;
- Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project1 that collectively constitute the generation capacity of the combined power plant;
- Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;
- Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15 MW;
- Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.

Outcome: The project activity of the power plant is greater than 4 W/m^2 and does not involve multiple reservoirs. This applicability condition is not applied.

The methodology is not applicable to the following:

- Project activity that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be continued use of fossil fuels at the site;
- Biomass fired power plants;
- A hydro power plants that results in the creation of a new single reservoirs or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m^2.

Outcome: applicability condition fulfilled. The project activity is a hydro power project. It does not involve fuel switch, biomass fired power plants.

In case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is the “continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.

Outcome: Since the proposed project does not involve retrofits, replacements or capacity addition, this applicability condition is not applied.

Thus, the ACM0002 methodology, version 13.0.0, is applicable to the Foz do Chapecó Hydro Power Plant Project.

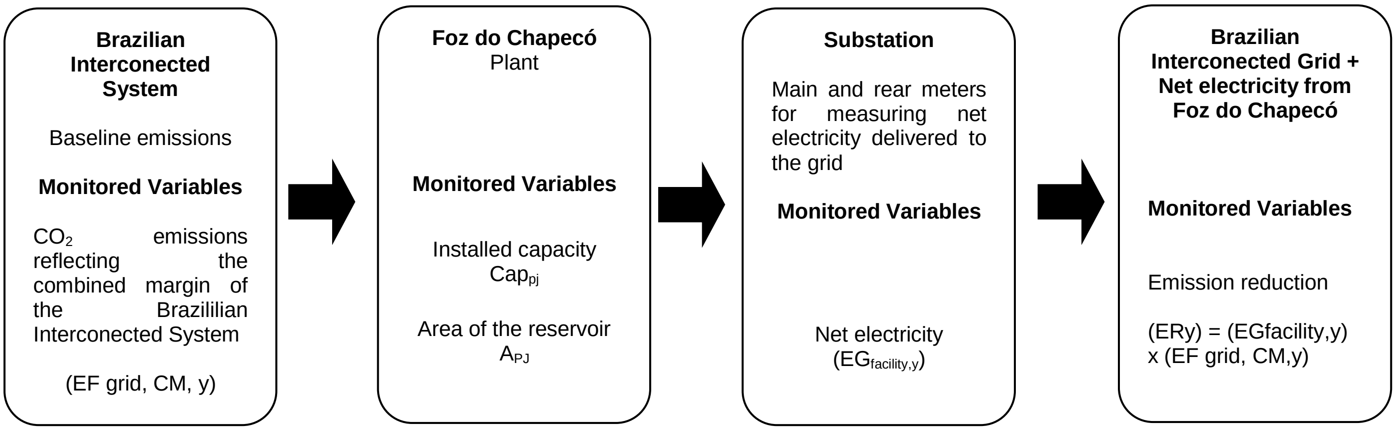
2.3 Project Boundary

The National Interconnected System is considered as the project boundary. The National Interconnected System (Sistema Interligado Nacional - SIN) is managed by the National Interconnected Power System Operator (from Operador Nacional do Sistema - ONS), which is responsible for all activities related to the planning and management of grid operation. The ONS traditionally subdivides the National Interconnected System into four interconnected Subsystems: the South; Southeast/Midwest; the North; and Northeast. These Subsystems are related to the respective Brazilian geographic regions.

Based on the effective power generation availability and consumption behavior and demand in each region, the ONS defines the dispatch of each individual power plant, as well as the inter-regional energy exchange and mid and long term operational policies to warrant reservoir management and energy security, i.e. the dispatch of thermal power units once reservoir levels fall below a certain security level. These operational conditions of the system are permanently monitored and data is available to the electricity industry agents.

According to ACM0002, version 13.0.0, the spatial extension of the project boundary includes the project power plant and all power plants physically connected to the electricity system that the VCS project power plant is connected to. The Foz do Chapecó Hydro Power Plant is connected to National Interconnected System (SIN).

The diagram of the project boundary is presented in the figure below:



Source		Gas	Included?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main Emission Source. In the absence of the project activity, the operation of other plants connected to the SIN would cause emission of GHGs.
		CH_4	No	Minor Emission Source.
		N_2O	No	Minor Emission Source.
Project	For geothermal power plants, fugitive emissions of CH4 and CO2 from non-condensable gases contained in geothermal steam	CO_2	No	This is not applicable, as the project activity is a hydro power plant and it is not a geothermal power plant.
		CH_4	No	
		N_2O	No	
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	This is not applicable, as the project activity is a hydro power plant and it is not a geothermal power plant or a solar thermal power plant.
		CH_4	No	
		N_2O	No	
	For hydro power plants, emissions of CH4 from the reservoir	CO_2	No	Minor Emission source, the power density of HPP Foz do Chapecó is greater than $10W/m^2$, so the GHGs` emissions from the project activities are zero (PEy = 0).
		CH_4	No	
		N_2O	No	

2.4 Baseline Scenario

In the absence of the project activity, the clean electricity supplied by Foz do Chapecó Hydro Power Plant to the Brazilian National Interconnected System (SIN) would have been generated by other existing or new power plants connected to the grid. Accordingly, the baseline scenario for new renewable grid-connected power generation plant defined by methodology ACM0002, version 13.0.0, 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 generation sources, as reflected in the combined margin calculations described in the "Tool to calculate the emission factor for an electricity system".

The baseline scenario presented by the ACM 0002, version 13.0.0, is perfectly applicable to Foz do Chapecó Hydro Power Plant. The combined margin emission factor of the National Interconnected System will be calculated, according to the methodological tool "*Tool to calculate the emission factor for an electricity system*", approved by the CDM Executive Board.

The Combined Margin (CM) emission factor is calculated from the generation record of all plants connected to the National Interconnected System (SIN) and centrally dispatched by the National Interconnected Power System Operator (Operador Nacional do Sistema - ONS). Based on this generation data as provided by the ONS, the Brazilian Designed National Authority (DNA) commonly calculates emission factors of the SIN according to the "*Tool to calculate the emission factor for an electricity system"* and makes them available to the public. In case in the future these data are no longer calculated and published by the DNA, they will be readily calculated by the project participants.

The combined margin emission factor for the National Interconnected System will be, therefore, used to determine the emission reductions generated as a result of project's implementation.

2.5 Additionality

This section is elaborated based on the "Tool for demonstration and assessment of additionality" (version 6.0.0)[3] of the CDM which defines a step-wise procedure to assess and demonstrate the additionality of the project.

To illustrate the context of the project development, the following table provides an overview of the project's development timeline.

Table 01: Project Timeline

Date	Type of evidence	Evidence/Reference
1966 to 1969	Project Milestone	Hydroelectric potential identification
07/11/2001	Project Milestone	Concession of the Plant.
21/09/2004	Project Milestone	Installation License
15/12/2006	Project Milestone	Start of minor/pre-project actions (Preliminary Contract)
01/08/2007	Project Milestone	Engineering, procurement and construction contract is signed
04/09/2007	Project Milestone	Financial Closure – contract with financial agents were

[3] Information available in http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

		signed
01/11/2007	Project Milestone	1st construction mark
25/08/2010	Project Milestone	Operation License is issued
14/10/2010	Project Milestone	The plant started commercial operation

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Define realistic and credible alternatives to the project activity(s) through the following Sub-steps:

Sub-step 1a. Define alternatives to the project activity:

The realistic alternatives to the project activity are:

- Alternative 1: The project activity undertaken without being registered as a VCS project;
- Alternative 2: The continuation of the current situation. The additional electricity generated by the project would be generated by existing or new power plants connected to the national electric system.

Outcome of sub-step 1a: These are the identified realistic and credible alternative scenario(s) to the project activity

Sub-step 1b. Consistency with mandatory laws and regulations:

Regulatory Surplus

Environmental licenses

The project has all the required mandatory environmental licenses for a hydroelectric project, as following below:

In Brazil, it is used a three-stage process for project licensing (Preliminary License, Installation License and Operating License), with separate procedures for granting licenses at all three stages.

This administrative procedure allows or contributes to transferring, restarting or revisiting old disputes during the three phases. Such procedure has the important function of controlling the activities that uses environmental resources.

The National Environmental Policy stipulates the need for environmental licensing of potentially polluting activities. The Federal Constitution establishes at its article 225, 1º, inc. IV, that licensing must always be preceded by an Environmental Impact Assessment (EIA) and a corresponding Environmental Impact Report (RIMA) whenever works or activities can potentially cause significant environmental impact. Federal Decree No. 99274/90, complemented by CONAMA's

Resolutions nº 1/86 and n° 237/97, set forth the three-stage process for the issuing of licenses as follows:

a) A Preliminary License (LP) (in Portuguese Licença Prévia) is granted during the preliminary planning stage of a project for a maximum five-year term. The license signifies approval of the location and design of the project, certifies its environmental feasibility and establishes the basic requirements and conditions to be complied with during subsequent stages of implementation.

b) The Installation License (IL) (in Portuguese Licença de Instalação) authorizes the installation of the development in accordance with the specifications contained in the approved plans, programs and projects, including environmental mitigation provisions and other conditions.

c) The Operating License (OL) (in Portuguese Licença de Operação) authorizes operation of the development in accordance with environmental mitigation measures and operating requirements. The Operating License can vary from 4-10 years and is renewable within the legal timeframe established by the competent environment agency.

The project has the necessary environmental licenses. The Preliminary License was issued by the Environmental Ministry (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA) environmental agency, on December 13th, 2002, PL number 147. The Installation License was issued on September 21st, 2004, IL number 284 and renewed on December 5th, 2006. The Operation License nº 949/2010 was issued on 25/08/2010 by IBAMA and it is valid until 25/08/2014.

The Regulatory Environment

The Brazilian Regulatory Framework went through important structural and conceptual changes over the past 2 decades, resulting in three different electricity regulatory models: the state-based model (until 1995); the free market model (1995 to 2003) and the new model, implemented in 2004 and valid up to date. Under the state owned model, the energy sector was dominated by almost exclusively state-owned and verticalized companies that covered the segments of generation, transmission and distribution. During the period of state monopoly, the major part of the currently existing generation capacity has been built, mostly consisting of large hydropower plants with important energy reservation capacity.

From 1995 on, due to lack of capacity to further finance the necessary investments for the expansion in energy generation, transmission and distribution, the government initiated a partial privatization process, structured by four main pillars: i) creation of a competitive environment (free market), with a gradual elimination of the captive consumers; ii) partial dismantling of the state owned verticalized companies by dividing and privatizing the segments of generation, transmission and distribution; iii) allowing free access to the transmission lines for generators and consumers; and iv) placing the operation and planning responsibilities to the private sector.[4]

The adoption of the free market model allowed the participation of private entities and the implementation of the Concession Law (Law No 8,987 of February 13, 1995) and promoted the construction of some renewable plants in Brazil.

Unfortunately, the model did not provide the investment in generation capacity needed to satisfy the growing demand and it resulted in an energy crisis in 2001, when energy consumption of consumers and industry was rationed and Brazil's economic development was badly hit. As a response to this crisis, a new regulatory framework was put in place in 2004, resulting in a more active role of Brazil's government by virtually suspending the privatization process initiated in the 1990's and centralizing the functions of electricity planning at national government level,[5] while promoting private sector investments to fund the required expansion in generation capacity. This new regulatory model provided a more efficient mechanism of power procurement between generators and distributors, primarily by creating two parallel electricity trading environments: the Regulated Contracting Environment, referred to as ACR (*Ambiente de Contratação Regulada),* where energy is finally contracted based on the lowest tariffs defined by a regulated auctioning process, and the Free Contracting Environment, referred to as ACL, or *Ambiente de Contratação Livre*) (ACL).

When evaluating the initial effects of these regulatory changes since 2005 it must be observed that the immediate demand for energy and capacity has been satisfied mostly with the installation of thermal power plants. In fact, between 2005 and 2007, 63% of the new generation capacity added/contracted stems from fossil fuel burning plants, while non conventional resources like biomass, wind, and small hydro power plants accounted for only 3% of the new capacity under development, the rest being represented by the installation of large hydropower plants[6]. This situation only changed once additional policies and incentives for promotion of clean energies, as described below, were established.

The table below summarizes the evolution of the regulatory framework for the Brazilian electric sector:

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[4] Aguiar F.L. *Modelo Institucional do Setor Elétrico Brasiliero*, 2007, available at http://www.realestate.br/images/File/arquivosPDF/DST_FernandoAguiar.pdf, last access on March 5, 2010

[5] For further information, please refer to *Moody's Global Infrastructure – Regulatory Environment Improves for Brazilian Electric Utilities*, August 2008

[6] *Novas Regras e Perspectivas para os Leilões de Energia*, Luiz Henrique Alves Pazzini, CCEE Technical Adviser, presentation at Energy Summit, Rio de Janeiro, Brazil, 12 August 2009

Table 02: Energy regulatory frameworks in Brazilian history

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	Free environment: Prices are freely negotiated for the generation and commercialization
Regulated Market	Free Market	Coexistence between Free and Regulated Market
Determinative Planning – Coordinator Group for the Planning of Electricity Systems (GCPS)	Indicative Planning coordinated by the National Council for Energy Policy (CNPE)	Indicative Planning coordinated by the Energy Research Company (EPE)

It is important to clarify that the Brazilian Institutional New Model of the Electric Sector allows the private and public agents to decide the amount of energy to be hired and the investments to be realized from the participation in auctions of power plants and systems of transmission.

According to MME[7], "it is the agents of distribution that decide and compromise themselves to pay, through contracts resulting from auctions, amounts of electrical energy coming from new installations of electric energy generation to be delivered (…). With the distributors' information, the generators may then decide which new entrepreneurships of generation they wish to build, presenting in the auctions proposals of selling prices of their electric energy, competing for contracts of energy purchase from distributors. Additionally, the generators may also hire direct and freely with free consumers".

It is further noticeable that the Brazilian Institutional New Model of the Electric Sector provides autonomy to the economic agents about the investments to be realized in the Brazilian electric sector, not existing, therefore, restrictions nor impositions to the project activity and to its alternatives.

Thus, the project activity fulfils all the Brazilian norms and regulations, being also plausible according to the tendencies in the country's electrical sector.

The alternative scenario also does not suffer any restrictions and is in full compliance with Brazil's laws and the mentioned norms and regulations.

Both the project activity and the alternative scenarios are in compliance to the applicable laws and regulations according the following entities:

- The Brazilian Electricity Regulatory Agency (Agência Nacional de Energia Elétrica - ANEEL[8]);
- The Ministry of Mines and Energy (Ministério de Minas e Energia - MME[9]);

The project has the Concession Contract signed with the ANEEL which ensures that the project is in compliance with the requirements of the agents of the Brazilian electricity sector.

Outcome of sub-step 1b: These are the identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Step 2. Investment analysis

Investment Barrier

[7] Ministério de Minas e Energia (MME) [Ministry of Mines and Energy] – Plano Decenal de Expansão de Energia Elétrica 2006-2015 [Decennial Plan for Energy Expansion 2006-2015].

[8] Available at: http://www.aneel.gov.br/?idiomaAtual=1, accessed on 16 January 2012.

[9] Available at: http://www.mme.gov.br/mme, accessed on 16 January 2012.

The project faces capital or investment return constraints that can be overcome by the additional revenues associated with the sale of GHG credits. Project IRR is below benchmark. The investment barrier is demonstrated using the principles of the tool for the demonstration and assessment of the additionality of the CDM.

The "Tool for the demonstration and assessment of additionality" (version 6.0.0) states that project participants may choose to apply Step 2 (Investment analysis) or Step 3 (Barrier analysis) to demonstrate the additionality of the project activity. Accordingly, the investment analysis shall determine whether the proposed project activity is not:

- The most economically attractive or financially;
- Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs);

Sub-step 2a. Determine appropriate analysis method

According to the "Tool for the demonstration and assessment of additionality" (version 6.0.0) three options can be applied to conduct the investment analysis. These are the simple cost analysis (Option I), the investment comparison analysis (Option II) and the benchmark analysis (Option III). Since this project will generate financial/economic benefits other than VCS-related income, through the sale of generated electricity, Option I (Simple Cost Analysis) is not applicable.

Both Option II and Option III are applicable for the project activity, however, as the option is to invest or not to invest, Option III – benchmark analysis is the most appropriate for assessing the financial attractiveness of the project activity.

Sub-step 2b – Option III. Apply benchmark analysis

Identification of the financial indicator

The identified financial indicator most suitable for the project type and decision context is the project Internal Rate of Return (IRR). The project IRR calculates a return based on project cash outflows and cash inflows, irrespective of the source of financing.

Benchmark - WACC (Weighted Average Capital Cost)

According to the guidance 12 of the "Guidelines on the Assessment of Investment Analysis" (version 5)[10] "local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR". The Weighted Average Cost of Capital (WACC) is the benchmark of the project. The WACC is calculated through the composition of costs and the participation percentage of each source of capital in the company's capital structure. The WACC was calculated according the equation below:

$WACC = K_e * W_e + K_d * W_d$ **Equation 1**

Where:

WACC = Weighted Average Cost of Capital (%)

Ke = Cost of equity (%)

We = Capital Percentage that is equity (%)

Kd = Cost of debt (%)

Wd = Capital Percentage that is equity (%)

<u>Cost of Equity</u>

For calculation of the cost of equity was used the CAPM Model (Capital Assets Price Model), which indicates the following equation:

$Ke = Rfr + \beta * Rp$ **Equation 2**

Where:

K_e = Cost of Equity;
R*f* = Rate of Return of a Risk Free Asset;
β = Beta Coefficient;
R_p = Market Risk Premium;

[10] Available at: http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf, accessed on 16 January 2012.

Project Developers defined the cost of equity using the Capital Asset Pricing Model (CAPM) and official and publicly available parameters that are standard in the market, while taking into account the specific provisions of the “Guidelines on the Assessment of Investment Analysis (version 05)”.

According to Guidance 15, “If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors.”

Based on provision (b) of this guidance, the project participants present a specific CAPM for the calculation of the cost of equity under the specific consideration of the third party financing and an industry beta which reflects the specific risk of investments in the power sector, as well as the impact of financial leverage on the equity investor’s risk.

Table below provides an overview about the calculation and the specific references that were used.

Table 03: CAPM and references for the calculation of the cost of equity for Brazilian Power investments

Variable	Value	Parameter / Formula / Comment	Reference
Rf - Risk-Free Rate	8.72%	Average of Long Term Brazilian Treasury Bond (type NTN-C) of years 2003, 2004, 2005 and 2006	Brazilian Treasury[11]
β	0.97	Calculated from the relation between Ibovespa Index and IEE Index (Index of Energy Sector Companies)	Calculated based on data provided by BM&F Bovespa[12]
Rp	24.92%	Average of the Real Expected Return on a Risky Asset (Market Return) – Average of the differences between Market return (IBOVESPA) and Risk Free Rate (NTN-C) of years 2003, 2004, 2005 and 2006.	Based on data supplied by Brazilian Treasury and BM&F Bovespa mentioned above.
Wd Debt / Total Capital	70.0%	Common practice of loans offered by BNDES at the time of the investment decision.	BNDES Letter
We Equity / Total Capital	30%%	Common practice of loans offered by BNDES at the time of the investment decision.	BNDES Letter
T Marginal Tax Rate	34%	Applicable Brazilian Law	
Ke Cost of Equity – real	32.88%	Ke = Rfr + β*Rm + Rc	Calculated

[11] http://www.tesouro.fazenda.gov.br/tesouro_direto/historico.asp

[12] http://www.bmfbovespa.com.br/shared/IframeHotSiteBarraCanal.aspx?altura=900&idioma=pt-br&url=www.bmfbovespa.com.br/informe/default.asp

terms			

Cost of Debt

The cost of debt is based on conditions offered by the banks in the loans contracts that were firmed for financing the project. The average cost of debt is 9.30% per year (TJLP – 6.5% + 2.8%-Spread +BNDES Remuneration). Considering a Brazilian Target Inflation of 4.5%[13], the cost of debt in real terms is 4.59%. Note: In order to obtain the cost of debt (Kd) in real terms, Fisher equation was used: Real Kd = [(1+Nominal Kd) / (1 + Inflation Rate)] –1.

Weighted Average Capital Cost

The WACC of the project is presented below:

Table 04: WACC

Variable	Value	Parameter / Formula / Comment	Reference
Ke	32.88%	Cost of Equity – real terms	Calculated
%Ke	30%	Capital Percentage that is equity (%)	BNDES
Kd	4.59%	Cost of Debt – real terms	BNDES
%Kd	70%	Capital Percentage that is Debt (%)	BNDES
WACC	11.99%	WACC	Calculated

The resulting benchmark is also obtained in real terms and therefore compatible with the investment analysis as presented below.

Compatibility of the benchmark with the financial indicator calculated

As the project Internal Rate of Return (IRR) will be used as the project indicator in the additionality discussion, the financial return will be calculated accordingly, in compliance with the criteria and provisions defined by the “Tool for the demonstration and assessment of additionality” (version 6.0.0).

Sub-step 2c. Calculation and comparison of financial indicators

The project cash flow analysis of Foz do Chapecó HPP in real terms and all underlying references and assumptions are made available to the DOE (Designated Operational Entity) that will perform validation. The assumptions are confidential and it will not be presented in the VCS PD. The effects of taxing on the cash flow were taken into consideration according to the applicable legislation. Following an overview and of the key assumptions and features of the

13 http://www.bcb.gov.br/pec/metas/InflationTargetingTable.pdf

investment analysis in response to the key criteria, requirements and orientations as provided by the guidance of the CDM Executive Board (CDM-EB) for investment analysis.

General Features of the Investment Analysis and Calculation of the Financial Indicator

- **Period of Assessment:** The cash flow considers an assessment period of 35 years which is in line with the concession period provided the concession contract 128/2011 signed with the Brazilian Government through the National Agency of Electric Energy (ANEEL) This is in agreement with the provisions of the Guidelines on the Assessment of Investment Analysis, version 06.0.0, item 03, which defines that the IRR calculation has to preferably reflect the expected operational lifetime of the project activity.

The value of the assets of the project activity at the end of the assessment period: the value of the assets was added as revenues in the last year of the concession period.

Depreciation: the annual depreciation tax is 2.19% over the assets value. This was defined by the Manual of Power Sector Asset Control (Manual de Controle Patrimonial do Setor Elétrico), page 209, published by the ANEEL[14]. Because it is an accounting item which does not involve disbursements, depreciation does not impact the project cash flow.

Project IRR Calculation: The project IRR calculation was conducted independently of the source of financing and the cost of financing expenditures (i.e. loan repayments and interest) were not included in the calculation of the project IRR.

Nature of the Cash Flow: The project cash flow has been performed in real terms, i.e. without considering the impact of inflation, and after payment of taxes. The resulting financial indicator therefore is a post-tax project IRR given in real terms and therefore compatible with the benchmark defined above.

The Project Internal Rate of Return, in real terms, resulting of the cash flow elaborated based on the assumptions is **9.87%**.

Investment analysis results

[14] ANEEL (2009). Manual de Controle Patrimonial do Setor Elétrico. Annex of Normative Resolution nº 367/2009, 02 June 2009. Available at: http://www.aneel.gov.br/cedoc/aren2009367_2_primeira_Ver.pdf. Last access on 04 January 2012.

The table below shows a summary comparison between the project financial indicator and the benchmark:

Project Internal Rate of Return of 9.87% < Benchmark of 11.99%

The investment analysis was conducted according to option III of the “Tool for the demonstration and assessment of additionality” and the result shows that project’s financial indicator is less favourable than the benchmark. Consequently it can be concluded, that the project activity without VCS revenues cannot be considered as financially attractive.

Sub-step 2d. Sensitivity analysis

The main variables that can affect the project's finances are (i) revenues of the project; (ii) the CAPEX and (iii) the Operational Costs (OPEX).

The sensitivity analysis is conducted to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis. The objective is to confirm how solid the financial analysis is.

Project Revenues:

The project’s revenue depends solely on two factors: the electricity generated and the electricity sales price. Variations in the result just occur if the electricity price is higher or the amount of electricity generated is higher that the assured energy. All electricity to be generated by the project is sold through long-term power purchase agreements already firmed by the project owner. At the time of the investment decision, the price of 40% of the electricity amount that could be sold was already established and the price firmed in the Power Purchase Agreement was considered for this electricity amount. The remaining amount of electricity (60% of the whole amount) would be sold in the auction that occurred after the investment decision. The price estimated for this amount was R$ 125.00/MWh and the project owners sold electricity for the remaining amount at R$ 131.49/MWh (5.19% higher). This scenario is covered by the sensitivity analysis.

The amount of electricity expected to be sold considered in the cash flow is assured energy. This amount of electricity considers a long term historical series of the river’s flow (since 1931) and the rainfall regime of the region. Electricity generation variability is normal once it is highly associated to rainfall regime. But, in the long-term and during all the concession period, electricity generation should be closed to the assured electricity.

ANEEL regulates that the project owners can just sold the assured energy through long term power purchase agreements. Therefore, high variability is not expected during all concession period. Sensitivity analysis shows that to reach the benchmark, the amount of electricity should be 18.6% higher that the assured energy during all concession period. This is impossible considering the historical series of the river's flow and the rainfall regime of the region.

CAPEX

Infrastructure investments are prone to cost overruns due to unforeseen events, while significant cost savings are not very common. The CAPEX presented was based on contracts already established and proposal. Also, as the plant is already in operation, the CAPEX is already performed. No reduction was observed. Consequently, a sensitivity of 10% reduction in capital expenditure is a reasonably conservative assumption in the context of the VCS. Under such a scenario, the project IRR would increase, but not reach the benchmark. This would only occur if the CAPEX was 16.40% below the original projections, which is not a realistic scenario due to the fact that construction and equipment supplying contracts were already been established and performed. On the other hand, an increase in 10% in the capital invested, which is a much more probable scenario, would further deteriorate the Project's IRR as expected in the base case.

Operational Costs

The operational costs include Transmission Costs, sectoral taxes, costs for Operation & Maintenance, regular overhaul and land lease expenses. The result of the sensitivity analysis shows that a 10% reduction in all these costs when compared to the base case assumption would not materially affect the Project's return. One of the Operational cost is a tax named CPMF. At the time of the investment decision, this tax existed. However, ate the time of the PD elaboration, CPMF was finished by Brazilian Government. Therefore, one scenario without CPMF cost is presented in the sensitivity analysis.

Thus, it is unlikely that these items may undergo changes that contribute with an increase in the economic and financial attractiveness that is not covered by the variation range between 0 and 10%. Therefore the variation range between 0 and 10% cover more than the probable scenarios.

The following tables represent the results for the main parameters variations that can affect the project cash flow of the Plans.

Table 05: Sensitivity Analysis of the Project

REVENUES VARIATION	
Projected Situation	**Project IRR**
0%	**9.87%**
+10%	11.03%
18.6%	11.99%
CAPEX VARIATION	

Projected Situation	Project IRR
0%	**9.87%**
-10%	11.09%
-16.40%	11.99%
OPEX VARIATION	
Projected Situation	**Project IRR**
0%	**9.87%**
-10%	10.17%
-72.70%	11.99%
CPMF Exclusion	
Projected Situation	**Project IRR**
0%	**9.87%**
-100%	9.92%

The sensitivity analysis shows that the Foz do Chapecó is unlikely to be the most financially attractive once the project internal rate of return (IRR) is lower than the benchmark in all scenarios analyzed.

The tool for demonstration and assessment of additionality indicates that: If after the sensitivity analysis it is concluded that the proposed VCS project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive, then proceed to the Common practice analysis.
This way, as the sensitivity analysis showed that the proposed activity is not attractive from a financial point of view, a common practice analysis must be carried out.

Outcome of step 2: If after the sensitivity analysis it is concluded that: (1) the proposed CDM project activity is unlikely to be the most financially/economically attractive or is unlikely to be financially/economically attractive, then proceed to Step 4 (Common practice analysis). This is the case of this project activity.

Step 3. Barrier Analysis

Not applicable.

Step 4. Common practice analysis

The common practice analysis was performed using the guidance of the “Tool for the demonstration and assessment of additionality” (version 6.0.0). The following sub-steps were performed.

Analyze other activities similar to the proposed project activity:

According to the “Tool for the demonstration and assessment of additionality” (version 06.0.0), for CDM, projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

Considering the concept above and the “Tool for the demonstration and assessment of additionality” (version 6.0.0), a stepwise approach for demonstrating if the project activity represents a commonly adopted practice in the country is presented below:

The “Tool for the demonstration and assessment of additionality”, version 06.0.0, paragraph 47 step 01 defines that project participants must calculate applicable output range as +/-50% of the design or capacity of the proposed project activity. Therefore, the applicable output range for this project activity is 427.5 MW to 1,282.5 MW. Based on this recommendation 39 energy generation plants have been identified, among small hydropower plants, wind power plants, thermal plants, biomass and large hydropower plants[15].

The Step 02 of the paragraph 47 of the Tool requires project participants to identify in the applicable geographical area (the country where the project is located - Brazil) and within the applicable output range calculated in Step 1 the plants that started commercial operation before the start date of the project activity, excluding the project activities registered as CDM projects or undergoing validation. We considered in this step, plants that are registered as VCS Project too.

Among the 39 operational plants identified in Step 1, one plant is being developed as VCS project activities (Barra Grande HPP is registered as a VCS project activity) and, according to ANEEL, one plant have started commercial operation after the start date of the project activity. Thus, Nall = 37.

The table below presents the amount of plants within the applicable capacity range and excluded as per Step 2**:**

Table 06: Operational plants within the applicable output range according to ANEEL[16]

Energy source/ Fuel	Quantity within the range	CDM Plants/ VCS Plants	Plants with commercial operation after the start date of the project	N_{all}
HCG	0	0	0	**0**
WPP	0	0	0	**0**
SHP	0	0	0	**0**

[15] A full list of the plants is presented in the Excel spreadsheet “Common Practice Analysis” provided to the auditors.

[16] Source: Agência Nacional de Energia Elétrica. Available at: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp. Last access in January 09,2012

SPP	0	0	0	**0**
HPP	**26**	**1**	**1**	**24**
TPP	12	0	0	**12**
TNPP	1	0	0	**1**
Total	**39**	**0**	**0**	**37**

- *HCG: Hydropower Plant Central Generation (Installed Capacity smaller than 1 MW)*
- *SHP: Small Hydropower Plant (Installed Capacity Greater than 1 MW and Smaller than 30 MW)*
- *HPP: Hydropower Plant (Installed Capacity Greater than 30 MW)*
- *TPP: Thermal Power Plant*
- *WPP: Wind Power Plant*
- *SPP: Solar Power Plant*
- *TNPP: Thermonuclear Power Plant*

The “Tool for the demonstration and assessment of additionality”, version 06.0.0, paragraph 47 step 03, establishes that project participants must identify those plants that apply different technologies from the technology applied to the project activity. The Tool acknowledges that different technologies are technologies that deliver the same output and differ by at least one of the following:

(a) **Energy Source/fuel**;
(b) Feed Stock;
(c) Size of installation (…);
(iv) Investment climate in the time of the investment decision, inter alia:
i) access to technology;
ii) subsidies or other financial flows;
iii) promotional policies;
iv) legal Regulation.
v) Other features, inter alia:
- Unit cost of output (unit costs are considered different if they differ by at least 20%).

According to the Step 3 of the Tool, different technologies are also identified as the ones implemented in a different investment climate in the date of investment decision when compared to the project activity. As demonstrated in the table 06, 13 plants of the range have different energy sources/fuel (12 are thermal plants and 1 is nuclear plant).

Also 22 plants started operation before 2004, which means that they started before the new Electric Model Regulatory Framework, in a different institutional framework from Foz do Chapecó HPP. The new Regulatory framework is described in item 2.5 of this VCS PD.

Table 07: Plants started operation before the new Electric Model Regulatory Framework

Plants	Evidence

Cachoeira Dourada	Started operation before 2004 – year of the new electric model
Cana Brava	Started operation before 2004 – year of the new electric model
Capivara	Started operation before 2004 – year of the new electric model
Estreito (Luiz Carlos)	Started operation before 2004 – year of the new electric model
Furnas	Started operation before 2004 – year of the new electric model
Henry Borden	Started operation before 2004 – year of the new electric model
Itapebi	Started operation before 2004 – year of the new electric model
Luis Eduardo Magalhaes	Started operation before 2004 – year of the new electric model
Machadinho	Started operation before 2004 – year of the new electric model
Nova Ponte	Started operation before 2004 – year of the new electric model
Marechal Mascarenhas de Moraes	Started operation before 2004 – year of the new electric model
Governador José Richa	Started operation before 2004 – year of the new electric model
Salto Osório	Started operation before 2004 – year of the new electric model
Goverandor Ney Aminthas	Started operation before 2004 – year of the new electric model
Serra da Mesa	Started operation before 2004 – year of the new electric model
Sobradinho	Started operation before 2004 – year of the new electric model
Taquaraçu	Started operation before 2004 – year of the new electric model
Três Irmãos	Started operation before 2004 – year of the new electric model
Itaúba	Started operation before 2004 – year of the new electric model
Paulo Afonso II	Started operation before 2004 – year of the new electric model
Paulo Afonso III	Started operation before 2004 – year of the new electric model
Emborcação	Started operation before 2004 – year of the new electric model

There are just two HPPs in operation which are similar to Foz do Chapecó and that are not CDM/VCS project activity nor have started commercial operation after the starting date. They are Campos Novos HPP and Peixe Angical HPP.

According to the paragraph 47, step 04 of "Tool for the demonstration and assessment of additionality", version 06.0.0, the proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled: (a) the factor F is greater than 0.2 and (b) Nall-Ndiff is greater than 3. The table below shows that no condition is fulfilled.

Table 08: Parameters and values applied in the common practice analysis

Parameters	Values/Results
N_{all}	37
N_{dif}	35
$F = 1-(N_{diff}/N_{all})$	0.05
N_{all}-Nd_{iff}	2

So, the proposed project activity is not common practice within the identified sector in Brazil.

According to the Methodology ACM0002 version 13.0.0, if Sub-steps above are satisfied, (i) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional.

SATISFIED/APPROVED – Project is ADDITIONAL

2.6 Methodology Deviations

Not applicable.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

To monitor Baseline emissions is necessary to monitor also the electricity supplied to the grid (EG_y) and the Combined Margin Emission Factor and its components.

The baseline methodology ACM0002, version 13.0.0, establishes that baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emission is calculated as follows:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$ Equation (3)

Where:

BE_y = Baseline Emission in year y (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

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

3.2 Project Emissions

According to ACM 0002 (version 13.0.0) methodology, the project emissions and the power density are calculated below.

For most renewable power generation project activities, PEy = 0. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$ Equation (4)

Where:

PE_y = Project emissions in year y (tCO2e/yr)

$PE_{FF,y}$, = Project emissions from fossil fuel consumption in year y (tCO2/yr)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO2e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO2e/yr)

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, estimated as follows:

(a) If the power density of the single or multiple reservoirs is greater than 4 W/m2 and less than or equal to 10 $W/m^{2.}$

$$PE_{HP,y} = \frac{EF_{Res} * TEG_y}{1000}$$ Equation (5)

Where:

$PE_{HP,y}$ = Project emissions from water reservoirs (tCO2e/yr)

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

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

(b) If the power density of the project activity is greater than 10 W/m2

$PE_{HP,y} = 0$

The power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ Equation (6)

Where:

PD = Power density of the project activity (W/m2)

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

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

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

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

For new reservoirs, this value is zero

The power density of Foz do Chapecó Power Plant is 10.68 W/m^2. Therefore emissions from its reservoir must not be considered.

3.3 Leakage

There is no leakage for the project activity according to methodology ACM 0002 (Version 13.0.0).

3.4 Summary of GHG Emission Reductions and Removals

Project emission reduction is calculated according version 13.0.0 of ACM0002 methodology. As mentioned previously, LE_y and PEy are zero. Therefore, emission reduction is calculated as described below:

$ER_y = BE_y – PE_y$ **Equation 7**

Where:

ER_y = Emission Reduction in year y (t CO_2e/yr)

BE_y = Baseline emissions in year y (t CO_2e/yr)

PE_y = Project emissions in year y (t CO_2e/yr)

The baseline methodology ACM0002, version 13.0.0, establishes that baseline emissions include only CO_2 emissions from electricity generation by fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emission is calculated as follows:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$ **Equation 8**

Where:

BE_y = Baseline emissions in year *y* (tCO_2);

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr);

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the *"Tool to calculate the emission factor for an electricity system"*. (tCO_2/MWh).

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield renewable energy power plants), then:

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

Equation 9

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh);

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

To calculate $EF_{grid,\ CM,\ y}$ it will be used the data provided by the Brazilian DNA, which provides data of the operating margin emission and the build margin emission factors by dispatch analysis by using the *tool to calculate the emission factor for an electricity system*. In case the Brazilian DNA discontinues the publication of these data during the monitoring period, they will be calculated by the project participants.

The steps recommended to *Tool to calculate the emission factor for an electricity system,* version 02.2.1, are discussed below.

Step 1: Identify the relevant electricity systems

The National Interconnected System (SIN) is defined as the relevant grid to the project activity. The definition of the SIN as the relevant electricity system is also recommended by the DNA[17]

[17] Source: http://www.mct.gov.br/upd_blob/0024/24719.pdf. Accessed on 04 January 2012.

through Resolution N° 08 of May/2008, which defines the National Interconnected System as a single system that shall be used for the calculation of CO_2 emission factors

This definition will be applied to Foz do Chapecó Hydro Power Plants Project.

<u>Step 2: Choose whether to include off-grid power plants in the project electricity systems</u>

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

The option I was chosen for the project activity, once the operating margin and build margin emission factor calculated by the Brazilian DNA or alternatively calculated by the project developer are based on the data of plants connected to the grid.

<u>Step 3: Select a method to determine the operating margin (OM)</u>

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple Operating Margin; or
(b) Simple adjusted Operating Margin; or
(c) Dispatch data analysis Operating Margin; or
(d) Average Operating Margin.

The method chosen to the calculation Operating Margin emission factor of the Foz do Chapecó Hydro Power Plants Project is the dispatch data analysis operating margin method.

<u>Step 4: Calculate the operating margin emission factor according to the selected method</u>

The method chosen for the calculation of the operating margin emission factor of the Foz do Chapecó Hydro Power Plants Project is the dispatch data analysis calculated on an ***ex-post*** basis for the operating margin.

As previously stated, the emission factor OM ($EF_{grid,OM-DD,y}$) calculation based on the dispatch data analysis method is currently conducted by the Brazilian DNA, in accordance with the dispatch data provided by the Electric System National Operator (ONS).

According to the "*Tool to calculate the emission factor for an electricity system*" (version 2.1.1) the dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the grid power units that are actually dispatched at the margin during each hour h where the project is displacing grid electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$.

Dispatch data OM emission factors for 2011 will be used for an ***ex-ante*** estimation of ERs that will be generated as a result of project's implementation.

<u>Step 5: Calculate the build margin emission factor</u>

In terms of the vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group *m* at the time of VCS-PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ***ex-post***, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated ***ex-ante***, as described in option 1 above. For the third crediting period, the built margin emission factor calculated for the second crediting period should be used.

The option that was chosen by project participants was Option 2.

The build margin emission factor is calculated by Brazilian DNA[18] and in case the Brazilian DNA discontinues the publication of these data during the monitoring period, the required data will be calculated by the project participants.

Build Margin emission factor for 2011, as published by the Brazilian DNA, will be used for an ***ex-ante*** estimation of CERs that will be generated as a result of project's implementation. The 2011 data vintage was adopted for build margin calculation as they are the latest data available.

Step 6: Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average Combined Margin; or
(b) Simplified Combined Margin.

Foz do Chapecó Hydroeletric Power Plants Project used option (a) to calculate the combined margin emission factor.

The combined margin emission factor $EF_{grid,CM,y}$ is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$ **Equation 11**

Where:
$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (tCO2e/ MWh)
$EF_{grid,OM,y}$ = Operating Margin CO2 emission in year y (tCO2e/ MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

The CO_2 emission factors of build margin and operating margin is calculated ***ex-post***. CO_2 emission factors from electricity generation verified on Brazilian Interconnected System (SIN) are calculated based on the generation record of plants centrally dispatched by the **National Operator of the System** (From the Portuguese Operador Nacional do Sistema - ONS).

Combined Margin CO_2 Emission Factor was calculated based on data supplied by Ministry of the Science, Technology and Innovation (MCTI) (www.mct.gov.br), institution which chairs the

[18] For more information: http://www.mct.gov.br/index.php/content/view/74689.html

Brazilian DNA of CDM. Operating Margin Emission Factor and Build Margin Emission Factor, necessary data to calculate the Combined Margin Emission Factor were calculated by ONS (National System Operator) and made available by MCTI.

The tool to calculate the emission factor for an electricity system recommends that the following default values should be used for W_{OM} and W_{BM}:

- Wind and Solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.
- All other projects: W_{OM} = 0.5 and W_{BM} = 0.5 for the first crediting period, and W_{OM} = 0.25 and W_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

This way, Foz do Chapecó Hydro Power Plant, it was adopted the following weights: W_{OM} = 0.50 and W_{BM} = 0.50.

Therefore, the baseline emission, project emissions and emission reductions provided by the project are presented in the table below.

Years	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2010	114,775	0	0	114,775
2011	981,352	0	0	981,352
2012	752,243	0	0	752,243
2013	752,243	0	0	752,243
2014	752,243	0	0	752,243
2015	752,243	0	0	752,243
2016	752,243	0	0	752,243
2017	752,243	0	0	752,243
2018	752,243	0	0	752,243
2019	752,243	0	0	752,243
2020	564,182	0	0	564,182
Total	7,678,253	0	0	7,678,253

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	Cap_{bl}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plant the value is zero.
Source of data:	Project site
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied:	As HPP Foz do Chapeco is a new power plant, this value is 0 (zero).
Any comment:	-

Data Unit / Parameter:	A_{BL}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.
Source of data:	Project site
Value applied:	0
Justification of choice of data or description of measurement methods and procedures applied:	As HPP Foz do Chapeco is a new power plant, this value is 0 (zero).
Any comment:	-

4.2 Data and Parameters Monitored

Data Unit / Parameter:	Electricity Supplied to the Grid – Net Electricity

	($EG_{facility,y}$)
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data:	Project Activity Site (Meters).
Description of measurement methods and procedures to be applied:	The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid Spreadsheets were used, obtained directly from the meters with information generated hourly, or according to what was programmed by CCEE (Câmara de Comercialização de Energia Elétrica/ Electric Power Commercialization Chamber). Monthly, the information was checked with the generation spreadsheets available at the CCEE's Website. Besides, information of generation can be checked by receipt of sales, if it is necessary to do so. Each Generation Unit has two specific meters (one principal and one backup) located in the substation that registers the net electricity supplied to the System by the Unit.
Frequency of monitoring/recording:	Continuous measurement and at least monthly recording.
Value applied:	The values of $EG_{facility,y}$ for each year are: Year 2010: 577,400; year 2011: 4,936,896; Years 2012 to 2019: 3,784,320 each year, and year 2020: 2,838,240. These values can be checked in the CCEE official generation spreadsheet for 12 months of 2011 and PP's records of net electricity generation from months October – December 2010. The evidences were provided to the auditors.
Monitoring equipment:	Each Generation Unit has two specific meters

	(principal and backup) located in the substation that registers the net electricity supplied to the Grid by the Unit. Each meter has the same model. The manufacturer is Schneider, model ION8600C, with accuracy class 0,2. The serial number of the main meters are: PT-0902A259-01, PT-0907A212-01, PT-0907A215-01, PT-0902A220-01. The serial number for rear meters are: PT-0902A301-01, PT-0810A884-01, PT-0907A574-01, PT-0907A571-01.
QA/QC procedures to be applied:	The uncertainty level for these data is low. They will be used to calculate the emission reductions. The electricity generated will be monitored by the project participants and checked by spreadsheets available at the CCEE`s Website (information comparison between operation data and CCEE reports). The last calibrations of the principal and rear meters were in: 28/02/2012 and 29/02/2012, ONS Grid Procedures (Sub-module 12.3) establishes calibration frequency and other maintenance procedures. By the time of completion of this document, the frequency of calibration is a maximum of two years, but in the case of any changes occurred in the ONS Grid Procedures, the project owners shall follow the rules from the relevant sector organizations (e.g. ONS, ANEEL, CCEE).
Calculation method:	The electricity supplied to the grid is calculated in a direct way with information controlled by the meters.
Any comment:	-

Data Unit / Parameter:	$EF_{grid,CM,y}$ - Combined Margin CO_2 Emission Factor
Data unit:	tCO_2/MWh

Description:	The 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". The combined margin CO_2 emission factor used on Foz do Chapecó Project was calculated based on data supplied for the National Interconnected System by Brazilian DNA.
Source of data:	Ex-post emission factor was calculated by project participants with data supplied by MCTI with the ONS data. The variables EFgrid,OM,y and EFgrid,BM,y, necessary for EFgrid,CM,y calculation, was also monitored and calculated by MCTI and ONS, through the Dispatch Data of the National Interconnected System.
Description of measurement methods and procedures to be applied:	As described in the most recent version of the "Tool to calculate the emission factor for an electricity system".
Frequency of monitoring/recording:	Annually
Value applied:	The values of Combined Margin CO_2, Emission Factor $EF_{grid,CM,y}$ is: 0.1988 tCO_2/MWh.
Monitoring equipment:	Not applicable
QA/QC procedures to be applied:	As described in the most recent version of the "Tool to calculate the emission factor for an electricity system". The uncertainty level for these data is low.
Calculation method:	As per the "tool to calculate the emission factor for an electricity system". Dispatch Data Analysis OM is the Operating Margin Emission Factor method used and the build margin emission factor is updated annually. Both Operating Margin Emission Factor and Build Margin Emission factor are supplied by MCTI.

Any comment:	-

Data Unit / Parameter:	Cap_{pj}
Data unit:	W
Description:	Installed Capacity of the hydro power plant after the implementation of the project activity.
Source of data:	Project site
Description of measurement methods and procedures to be applied:	The installed capacity will be monitored annually by ANEEL, environment regulators or by sub-hired companies, according recognized standards. It will be monitored yearly.
Frequency of monitoring/recording:	Yearly
Value applied:	855.000.000 W
Monitoring equipment:	The generator capacity at the project site
QA/QC procedures to be applied:	The uncertainty level for these data is low. The installed capacity is determined on the project's beginning and it will be monitored by the Regulator Agent.
Calculation method:	The total of 4 generators capacity
Any comment:	-

Data Unit / Parameter:	A_{pj}
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data:	Project site
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc.

Frequency of monitoring/recording:	yearly
Value applied:	The area of the reservoir of HPP Foz do Chapecó is 79.930.000 m^2 from the "principal reservoir"[19] + 90.000 m^2 from the "passage way"[20]. Total of 80.020.000 m^2.
Monitoring equipment:	Topographical measurement to measure the area of the reservoir
QA/QC procedures to be applied:	The uncertainty level for these data is low. The reservoir area is monitored by environment regulators.
Calculation method:	Before filling the reservoirs, the area to be flooded is demarcated by pickets. Each picket has precise geographical coordinates which generate a faithful reference to the future area to be flooded. After the fulfilment of the reservoir, the water levels will get the base of each picket that will be monitored systematically during the plants operation. The level of water near to the pickets assures that the area of the reservoir is not changed.
Any comment:	-

4.3 Description of the Monitoring Plan

Monitoring has the objective of measuring the emission reductions achieved by the project. To elaborate the monitoring plan, it was followed the Monitoring Methodology present in consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 13.0.0 (methodology applied to the project).

The main parameters that will be controlled were:

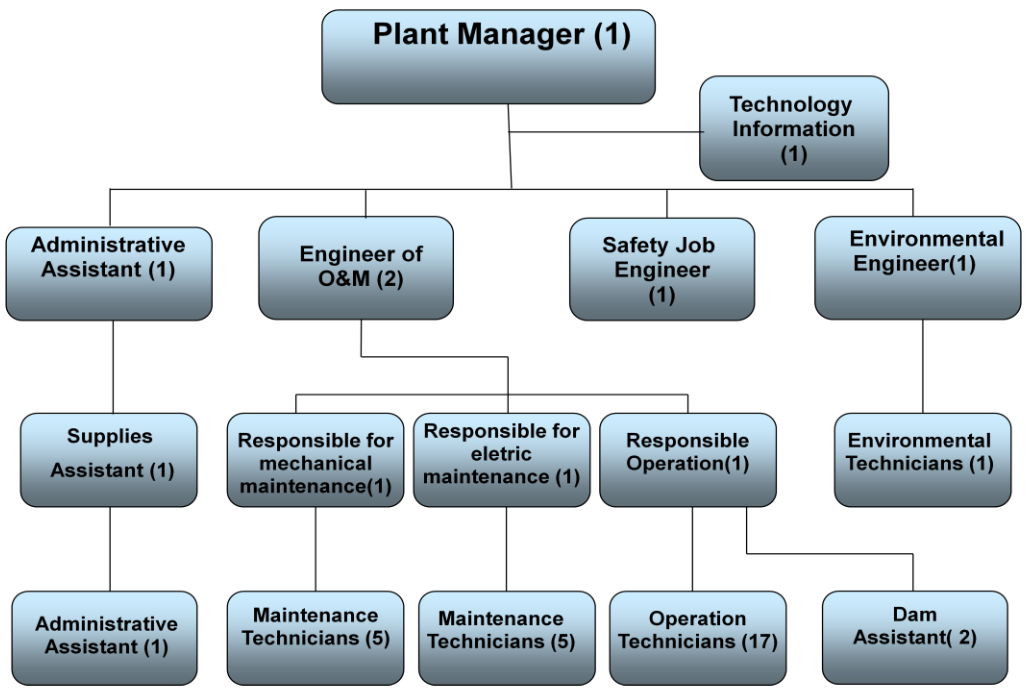
[19] ANEEL's Dispatch 911 of 30/03/2007 for flooded reservoir area of 79.93 km^2

[20] Consolidated Basic Engineering Project prepared by CENEC Engenharia S.A. "HFC-RT1P-GEG00-1001-0"

- Net Electricity Supplied to the Grid (MWh);
- Emission Factor for Electricity Generation Connected to the Brazilian Interconnected Grid (tCO_2e/MWh).
- Installed Capacity
- Reservoir Area

HPP Foz do Chapecó Operation and Maintenance Manager is responsible for the operation and maintenance activities of the plant and for the activities of consolidation and analysis of gross and net electricity. Measurements activities are carried out by the operators of the Technology Information team.

The organizational structure of the company is presented below:



Each generator unit has three measurement instruments, Model ION8600C - Schneider. One of them is located in the Powerhouse and it measures the gross electricity generated by the unit and the other two, called "Principal" (Main) and "Retaguarda" (Rear), are located in the substation with the objective of measuring net electricity.

Daily, operators of Foz do Chapecó operation team collects electricity generation data from each meter. Information of net electricity supplied by the principal meters is consolidated in one spreadsheet. The frequency of monitoring/recording is continuous measurement and at least monthly recording. Information of gross electricity is consolidated in another spreadsheet.

This internal control is supplied every day for one of the shareholders (CPFL) which is responsible for the relations with CCEE.

Data of net electricity generation may be confronted with the information present in the website of the CCEE (Câmara de Comercialização de Energia Elétrica/ Electric Power Commercialization Chamber) Entity responsible for measurements, accounting and settlement on Brazilian electric energy market.

The emission factor for power generation connected to Brazilian National Interconnected System was made available by Ministry of Science, Technology and Innovation (MCTI) with data of National System Operator, ONS. The variables $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ were calculated and monitored by Enerbio Consultoria through the dispatch data of National Interconnected System. Emission reductions calculations are carried out by Enerbio team.

All twelve meters details of the plant below:

Table 09: Meters details

	Type	Location	Meters	Serial Numbers
GEU1P	Net	substation	Main	PT-0902A259-01
GEU1R	Net	substation	Rear	PT-0902A301-01
GEU1B	Gross	power house	Main	PT-0906A752-01
GEU2P	Net	substation	Main	PT-0907A212-01
GEU2R	Net	substation	Rear	PT-0810A884-01
GEU2B	Gross	power house	Main	PT-0903A347-01
GEU3P	Net	substation	Main	PT-0907A215-01
GEU3R	Net	substation	Rear	PT-0907A574-01
GEU3B	Gross	power house	Main	PT-0903A337-01
GEU4P	Net	substation	Main	PT-0902A220-01
GEU4R	Net	substation	Rear	PT-0907A571-01
GEU4B	Gross	power house	Main	PT-0906A757-01

All meters were calibrated and are according to the specifications of ONS. The standard used in these calibrations is calibrated in regular intervals, in INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia/National Institute of Metrology, Quality and Technology) and/or in accrediting agency by the same, with the calibration Brazilian Network Seal.

ONS Grid Procedures (Sub-module 12.3) defines the calibration frequency and other maintenance procedures. By the time of completion of this document, the frequency of calibration is a maximum of two years, but in the case of any changes occurred in the ONS Grid Procedures, the project owners shall follow the rules from the relevant sector organizations (e.g. ONS, ANEEL, CCEE). In HPP Foz do Chapecó, there is a Measurement Billing System (SMF- from the Portuguese Sistema de Medição de Faturamento) according the technical specifications defined by ONS Grid Procedures. The communication of this SMF with CCEE occurs directly through a VPN (Virtual Private Network) and, this way, SCDE (Sistema de Coleta de Dados de Energia Elétrica/ Electric Power Data Collection System) has direct access to the mass memory of the electricity meters.

Monthly, HPP Foz do Chapecó operators collect, in the electricity meters mass memory, gross and net hourly generation data of generation unit referring to the previous month. This data are compiled in a unique spreadsheet which is the HPP internal control generation spreadsheet for the referred month under analysis.

Information present in internal control generation spreadsheet was confronted with SCDE spreadsheet. SCDE spreadsheets provide electricity generation values identical to the values of the HPP internal control generation spreadsheet. However, for emission reductions calculation, it will be used electricity generation data of CCEE General Measurement Report, present in the CCEE website. This data is consisted by the net electricity generation minus the losses of National Interconnected System (approximately 2.5%), setting, therefore, a more conservative value.

Both generation information, internally generated and through CCEE website, are electronically stored by the Operation and Maintenance Manager.

Enerbio will cross-check internal control generation spreadsheet with electricity generation data supplied by CCEE. If non-conformities are identified, an email is sent to Operation and Maintenance Foz do Chapecó Manager. The non-conformity is investigated and if the problem is in the internal control, the spreadsheet is corrected. Up to now, no non-conformity has happened.

It is important to say that electricity generation information impacts directly the revenues of Foz do Chapecó once electricity is the main product of the project. Therefore, a straight control is performed about this information. These controls follow the internal auditing processes presented in the management system of the company.

The emission reduction calculation is done by Enerbio analyst and revised by Enerbio’s manager.

Periodically, the Information Technology Area accomplishes an insurance backup for all plant data through backup tapes.

All data collected as part of the monitoring will be archived and be kept for at least 2 years after the end of the last crediting period.

The installed capacity will be monitored annually by ANEEL, environment regulators or by sub-hired companies, according recognized standards. It will be monitored yearly.

The monitoring area will be monitored after the fulfilment of the reservoir; the water levels will get the base of each picket that will be monitored systematically during the plants operation. The level of water near to the pickets assures that the area of the reservoir is not changed.

The combined margin emission factor $EF_{grid,CM,y}$ is calculated as item 3.4 in this VCS PD.

5 ENVIRONMENTAL IMPACT

The EIA (from Portuguese Estudo de Impacto Ambiental) and RIMA (from Portuguese Relatório de Impacto Ambiental) developed for the Project Activity highlight the environmental impacts of the hydroelectric plant and the actions to minimize the adverse impacts. The environment modifications described in the EIA and RIMA will be object of specific actions, of responsibility of the entrepreneur, that aim at the correction or compensation of its negative effects, maximizing, on the other hand, its positive effects. Such actions are presented below, always related to the impacts that had determined its recommendation.

The Project Developer has been executing out of court amicable agreements with the people affected by the Project as actions for people resettlement. Those actions were planned together with local government and concerning local stakeholder’s opinion. The objective of the document set with local government, is define the line of behavior for the treatment of the questions related to the necessary services and actions to execute the resettlement program, aiming to minimize the negative effects, assuring that the impacted population are indemnified or resettled in a satisfactory and proper form, searching life quality and access to land, natural resources and services (drinking water and infrastructure), resulting in equal or better chances that this population had before its resettlement. The process will be done in participatory way and adopting procedures communication capable to clarify the affected population about the diverse stages of the resettlement process.

IMPACTS	PROGRAMS
Alteration of the Fluvial System	Limnology and Water Quality Monitoring.
Water table elevation	Erosive Processes control.
Alteration of water quality	Limnology and Water Quality Monitoring.

IMPACTS	PROGRAMS
Interference of Authorized Areas and Mineral Concessions with the Reservoir	Mineral Investigations.
Start or acceleration of erosive processes	Erosive Processes control. Recuperation of Degraded areas.
Occurrence of Induced Earthquakes	Seismographic monitoring.
Reduction of Biological diversity of Aquatic Ecosystems	Limnology and Water Quality Monitoring. Ichthyofauna Monitoring. Implantation of a Unit of Conservation and Protection of the Fauna and Flora
Alteration of the Structure of the Aquatic Fauna and of the Water Quality pry-Operational Phase	Limnology and Water Quality Monitoring. Ichthyofauna Monitoring.
Alteration of the Structure of the Aquatic Fauna and of the Water Quality the Wadding Phase and the Operation of the Dam	Limnology and Water Quality Monitoring. Ichthyofauna Monitoring.
Migratory routes detrimental	Limnology and Water Quality Monitoring. Ichthyofauna Monitoring.
Removal of Current Vegetal Covering and Loss of Habitats	Ichthyofauna Monitoring. Implantation of a Unit of Conservation and Protection of the Fauna and Flora
Increase of the Hunting	Implantation of a Unit of Conservation and Protection of the Fauna and Flora Environmental education and Social Communication.
Generation of Population Expectation due to the Enterprise	Environmental education and Social Communication. Population resettlement and reorganization of the remaining areas. Reconstruction and improvement of Infra-structure.
Change of the social cultural Behaviour Population Affected	Environmental education and Social Communication. Support to resettled population. Support to farming activities.
Familiar Production Unit unstructured	Support to resettled population. Support to farming activities.
Archaeological sites interference	Heritage rescue.
Healthcare amendment	Health
Amendment of the Labour Market	Health Support for Migrant Populations
Amendment of the Real Estate Market	Population Re-settlement and Re-organization of remaining areas Reconstruction and Infrastructure Improvements
Amendment of Market Goods and Regional Income and Municipal Collection	Population Re-settlement and re-organization of remaining areas Reconstruction and Infrastructure Improvements

IMPACTS	PROGRAMS
Improvement of Transmission and Communication Systems	Reconstruction and Infrastructure Improvements
Traffic Intensification and Interference with the Road Infrastructure	Environmental Education and Social Communication Reconstruction and Infrastructure Improvements
Loss of Agricultural Production Areas	Support for Agricultural Activities
Compulsory Population Displacement	Population Re-settlement and re-organization of remaining areas Support for Migrant Populations. Support for Agricultural Activities
Interference with fluvial passages	Reconstruction and infrastructure improvements.
Interference with Social Infrastructure	Reconstruction and infrastructure improvements.
Interference with Indigenous Communities	Monitoring of Indigenous populations

An extensive list of all mitigation actions to be implemented is included in the EIA.

6 STAKEHOLDER COMMENTS

During the environmental licensing process, the Environmental Impact Report is presented to stakeholders and the stakeholders are invited to perform comments about the project. A public audience is performed coordinated by Environmental Agency. This process was performed by the entrepreneurs and comments are registered in the documents related to the licensing process[21]. The public audiences occur in the cities of Alpestre/RS and Chapecó/SC.

The company has the compromise of responding to 100% of the issues it receives from the public audiences, through meetings to debate the topic, official communication related to the issues and visit to the site related to the claim.

Even when the company does not agree with the issue or cannot attend the claim, the company try to clarify the issue and explain why could not address such issues.

It is noteworthy that the Agreement Term for Relocation of Affected Population was signed between Foz do Chapecó Energia,and Municipal Committee Negotiating. This document guides the procedures and benefits for local communities affected by the project. Several meeting with local communities happened to include the demands of the community and to express the benefits it looks for. The Agreement Term for Relocation of Affected Population consolidates the terms agreed by entrepreneur and the local community related to relocation of people.

[21]The minutes of meeting were provided to auditors.

The Global Stakeholder Consultation was held during the CDM Process. The project was included in the UNFCCC website at the link below in the period from 03/05/2010 to 05/06/2010. http://cdm.unfccc.int/Projects/Validation/DB/RW0WDFRG71MV5E4EYN0TWHL46GK9F3/view.html. No comments were received about the project during this period.

The communication of Foz do Chapecó with stakeholders was based on specific plans for each stage of the project (construction and operation)[22]. During the construction phase, was prioritized communication "face to face" with meetings in affected communities, visits to affected families and the mayors of the municipalities around the hydroelectric.

The main objective was to clarify doubts and disclosure procedures and programs linked to the implementation of the plant and the relocation of the affected population. During this period, were also used tools and channels for the transmission of information of public interest: radio bulletins, publishing informational columns in newspapers of local circulation, production of books and instructional booklets for direct distribution in the affected communities.

Other materials were produced to meet the interests of shareholders and regulators as IBAMA, Ministry of Mines and Energy and ANEEL. Included in this case the monthly newsletter sent by the company to these organs and the various reports produced to provide updated information about the project. All channels and materials are being held by the company at the stage of operation of the project for ongoing communication with local people and other stakeholders. It is also maintained its commitment to meet the demands of meetings, hearings and communities of interest to clarify issues and receiving claims.

The company developed an intense communication dialogue with local communities and social movements. Several meetings were performed with the cities committees and Movement of Affected by Dams (From Portuguese Movimento dos Atingidos por Barragem – MAB). The meetings were conducted by representatives from the Government at most. This assured the democratic and transparent character of the plant implementation process

During the construction phase, there were two invasions to the plant. Both were peacefully negotiated with concessions on both sides. Otherwise, in other situations, there were registered peaceful demonstrations regarding the enterprise, which has always had its patterns of claims received by the company's board and its representatives discussed with the social movements.

[22] Social Communication Program in the Environmental Basic Plan. Page 490/735.

All reported events resulted in meetings scheduled by the company with the Movement of Affected by Dams, and widely publicized by the media and accompanied by the leaders of the municipalities affected by the project. Foz do Chapecó also always remained available to the press to clarify issues that mobilize public opinion and providing information of interest to the press and their readers/viewers. Moreover, issues official statements during these occurrences to stand before society and reaffirm their willingness for dialogue and conflict resolution. All the actions taken by Foz do Chapecó are followed by environmental official entities and are in accordance with the applicable law. This can be evidenced by the license of operation issued by the environmental entity.