Voluntary Carbon Standard 2007
Validation Report Template

19 November 2007

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Validation Report for BAESA Project	Antonio Daraya – Leader GHG Verifier Ashok Mammen – Internal Technical Reviewer
Client:	Project Title:
ENERGÉTICA BARRA GRANDE S.A – BAESA	BAESA Project, BRAZIL
Summary:	
Bureau Veritas Certification has made the validation of the 708 MW BAESA project Hydro Power Plant (HPP), located in the Southern Region of Brazil, between the cities of Anita Garibaldi, State of Santa Catarina and Pinhal da Serra, State of Rio Grande do Sul, Brazil. The validation scope is defined as an independent and objective review of the project design document, the project's baseline study, monitoring plan and other relevant documents, and consisted of the following three phases: i) desk review of the project design and the baseline and monitoring plan (October 2008); ii) follow-up interviews and on site visit (October 2008); iii) resolution of outstanding issues and the issuance of the final validation report and opinion (February, 2009). The overall validation, from Contract Review to Validation Report & Opinion, was conducted using Bureau Veritas Certification internal procedures. The first output of the validation process is a list of Clarification and Corrective Actions Requests (CL and CAR), presented in the Validation Report, version 03. Taking into account this output, the project proponent revised its project design document, originating the PD version 04, of February 03, 2009. In summary, it is Bureau Veritas Certification's opinion that the project correctly applies the baseline and monitoring methodology ACM 0002, version 07 and meets the relevant VCS requirements, and local legislation.	
Work carried out by:	Number of pages:
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1. Introduction

This report summarizes the findings of the validation of the project, performed on the basis of VCS criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

1.1 Objective

The validation serves as project design verification and is a requirement of all projects. The validation is an independent third party assessment of the project design. In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant VCS criteria which are validated in order to confirm that the project design, as documented, is sound and reasonable, and meets the stated requirements and identified criteria. Validation is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of Voluntary Carbon Units (VCUs).

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the project design document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, VCS rules and associated interpretations. The validation is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 VCS project Description

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) Barra Grande, located in the Southern of Brazil, between the cities of Anita Garibaldi, state of Santa Catarina and Pinhal da Serra, state of Rio Grande do Sul, with an installed capacity of 708 MW, using a small reservoir, with low environmental impact related to its installed capacity.

The Hydro Power Plant Barra Grande 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. The installation of HPP Barra Grande provides the generation of enough electricity to the supply of 30% of the energetic demand of the state of Santa Catarina or 20% of the total energy consumed in the state of Rio Grande do Sul.

The scenario prior to the implantation of the project points 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 to the emission of CO2 in the national energetic matrix) being in the Southern Region of the country, where BAESA Project is located. Moreover, the projection of the Ministry of Mines and Energy (MME) points to a total growth in the offer of thermoelectric energy in the country of 10,486 MW in the period

of 2006-2015, 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 BAESA 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 BAESA Project is located.

BAESA Project makes use of three generator units with three specific meters (for each unit), destined to measure the Project's generation of energy. The project activity reduces the emission of greenhouse gases (GHGs) through the use of renewable sources of energy and making use of clean technology, avoiding the generation of electricity via sources of fossils fuels with consequent emissions of CO2, that would be generated if the project did not exist. The reservoir of HPP Barra Grande is responsible for emissions of CH4 which will be accounted for and reduced from the total project emission reductions.

Through actions that exceed the simple compliance of compensatory measures determined by the authorities involved in the entrepreneurship implementation, the construction of BAESA project proved that it is possible unite social and economic development with environment preservation, social responsibility and historical and cultural heritage recuperation.

1.4 Level of assurance

Emission reductions are directly connected to the hydraulic generation of energy, which depends significantly on the volume of water in the basin of the rivers in which it is located. Scarce rains, floods, or any other natural factor may cause an impact on the generation capacity of the project and, consequently, may affect the emission reductions provided by it.

The control of reservoirs' level realized by ONS – Operador Nacional do Sistema (National System Operator) seeks to optimize the level of water available for the generation of hydroelectric energy in each of the power plants associated to the respective reservoirs, besides keeping a certain amount of water reserved for situations of emergency. In this context, the ONS may, for example, prevent a power plant located at the beginning of a river's course to increase its rate of flow, in case it negatively affects the other power plants along the course of the same river. Thus, this control on reservoirs can also affect the emission reductions of greenhouse gases provided by the project.

Another risk that project participants considered to be low, but that must be mentioned is the fortuitous loss of concession to exploit the hydraulic energy located in Pelotas River. The right to exploit this hydraulic potential was acquired by the entrepreneurs through a Contract of Concession and its modifications.

There are hypotheses that may provide the extinction of the concession of the project's owners before the Final Term of Concession, such as (i) expropriation of the concession by the conceding power and (ii) decreeing of caducity of the concession by the conceding power. The occurrence of these hypotheses, although remote, may happen and may also prevent that emission reductions are reached by the project.

2. Methodology

The overall validation, from Contract Review to Validation Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

In order to ensure transparency, a Validation Report was customized for the project. The Validation Report shows, in a transparent manner, criteria (requirements), means of verification and the results from validating the identified criteria. The validation report serves the following purposes:

- It organizes, details and clarifies the requirements of a VCS project is expected to meet;

- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.
VCS methodologies describe either:
- The methodology to determine a projects baseline scenario emissions levels and the process to monitor emission reductions;
- A performance standard methodology to demonstrate that a project is additional (beyond normal business activities).

2.1 Review of Documents

The Project Description Template of the BAESA project was reviewed and compared with the Project Description Template, of 19 November 2007.
The methodologies used are:
- Approved consolidated baseline and monitoring methodology ACM0002, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 7,
- "Tool for the demonstration and assessment of additionality", version 05.2,
- "Tool to calculate the emission factor for an electricity system", version 01.1.
ACM0002 consolidated baseline methodology is applicable to grid-connected renewable power generation that involves electricity capacity additions because:
- The project activity is the installation or modification/retrofit 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.
- In case of hydro power plants:
- The project activity is implemented in an existing reservoir, with no change in the volume of reservoir;
- The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emission section, is greater than 4 W/m2;
- The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2;
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on characteristics of the grid is available;
The ACM0002 methodology can be applicable to BAESA Project due to the following aspects:
- HPP Barra Grande is an installation of a new hydro power plant/unit;
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on characteristics of the grid is available due to the geographic data and the relevant electricity grid system limits are easily identified, as well as all information about the grid is available in ONS, Operador Nacional do Sistema (National System Operator), (www.ons.org.br), and in ANEEL, Agência Nacional de Energia Elétrica (National Agency of Electric Energy), (www.aneel.gov.br).
- HPP Barra Grande is a project activity which results in new reservoirs and the power density of the power plant is greater than 4 W/m2, as described in the table 7 of the PD;

The power density of the project activity, according to ACM0002 methodology, is calculated as demonstrated below:

$$PD = \frac{CapPJ - CapBL}{APJ - ABL}$$

Where:
PD = Power Density of the project activity, in W/m2
CapPJ = Installed capacity of the hydro power plant after the implementation of the project activity (W);
CapBL = Installed capacity of the hydro power plant before of the project activity (W); for new hydro power plants, this value is zero;
APJ = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m2);
ABL =Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero.

$$PD = \frac{708{,}000{,}000\ W}{94{,}000{,}000\ m2} = 7.3\ W/m2$$

Then, PD is greater than 4 W/m2

2.2 Follow-up Interviews

On October 16, 2008, Bureau Veritas Certification performed interviews with persons of Energética Barra Grande S/A – BAESA and Enerbio Consultoria Ltda, related to project specific questions and emission factor.
Persons interviewed were:
From Baesa: Ana Cristina Karl, Hamilton Garboggini and João Rezeck Junior.
From Enerbio: Eduardo Baltar.

2.3 Resolution of any material discrepancy

During the Validation, no material discrepancies were identified.

3. Validation Findings

3.1 Project Design

Technology used

HPP Barra Grande will use the hydraulic potential of Pelotas River to generate electricity with an installed capacity of 708 MW and assured energy of 380.6 MW. HPP Barra Grande generates electricity with a small reservoir in relation to its installed capacity.
All equipments and technologies employed in the project were developed in Brazil and have already been successfully applied to similar projects in the country and in the world. The technology applied in the project is well established in the sector. There are three units of generation with an installed capacity of 236 MW each, totalizing a maximum installed capacity of 708 MW.
BAESA Project will use three generation units, with Francis turbines, which is the most widely used turbine in the world for hydro electrical projects. Each generation unit will have three meters. One (1) meter for each turbine measures the gross electricity generation and is located in the Power House and two (2) more meters for each generation unit, that are located in the substation that makes the connection with the National Interconnected System, responsible for the measurement of net electricity.
Entrepreneurship implantation was responsibility of national companies, since Construções e Comércio Camargo Corrêa was responsible for construction and equipment assembly of the plant, Alston do Brasil was responsible for supplying the

equipment and Engevix Engenharia was responsible for executive and basic project of the plant, as well as for its substation (supplying of the equipments and their assembly).

Detour Tunnels

The first structure of the plant built were the detour tunnels, whose objective was to redirect the water of the river, allowing the construction of the main dam. They were totally excavated on the rocks. The tunnels remained open up to the conclusion of other structures and liberation of the area of the future reservoir. With the issuance of the Operation License, they were closed, having begun the filling of the reservoir.

For the construction of HPP Barra Grande, two detour tunnels were excavated, one with 864 meters of length and the other with 935 meters. Both are 17-meters high and are located at the right margin of Pelotas River, in Santa Catarina State's side.

Forced tunnels and penstock

The forced tunnels or forced conducts were excavated on the rocks and have the function of conducting the water to the spiral case, in order to spin the axis of the turbines and penstock is the structure that captures and directs water to the forced tunnels.

For the subterraneous excavation of the forced tunnels, it was used a special equipment, named Raise Boring.

The perforation consists of a pilot hole with 30 centimeters in diameter, top down. After this phase, a diamonded crown of 2.40 meters in diameter is attached and, afterwards, it is done the extending to the final diameter.

In HPP Barra Grande, there are three forced tunnels, each one composed of two parts: one vertical, with 98 meters, and the other slightly inclined, with approximately 310 meters. Each one of the forced tunnels has 6.20 meters of internal diameter in the segment covered by concrete, and 5.50 meters of diameter in the reinforced segment. The water of the reservoir passes the tunnels to the turbines, when the electricity is generated. After passing through the turbine, the water returns to its normal course in Pelotas River.

Dam

The main dam was also built in embankment, with its upstream face covered by reinforced concrete slab. It is a definitive structure destined to the obstruction of the river and to the formation of the reservoir.

The formation of the main dam consisted in the execution of a compacted embankment. In the upstream face, it was used extruded concrete, whose objective was regularizing the face of the dam and confining the transition.

Powerhouse

The Powerhouse is the structure that shelters the turbines, generators and other equipment and systems of the electricity generation.

Its function is the transformation of hydraulic/mechanic energy into electric energy through the movement of the turbine's rotors, whose axis is attached to the generators.

It is in the Powerhouse that all the electricity of HPP Barra Grande is being generated. There are three generation units, which will have an installed capacity of 236 MW each, totalizing a maximum installed capacity of 708 MW. Each generation unit has three meters. One of them is located in the Powerhouse and the other two in the substation.

Spillway

The spillway has the function of controlling the level of water in the reservoir through its floodgates. In Barra Grande, there will be 6 floodgates, each one 15-meter wide and 20.98-meter high. The probable maximum flow rate will be of 23,840 m^3 per second, equivalent to six times the average rate of flow of Pelotas River.

Project duration, crediting time and project start date
According to the Policy Announcement from the VCS Association in 10 September 2008, the VCS definition for project start date is the date the project activity began reducing or removing GHG emissions.
Project Start Date: November 01, 2005 (Operation Starting Date of the First Turbine).
The VCS PD version 04 has defined as the crediting period start date: January 01, 2006.
VCS project crediting period: 10 years, renewed at most two times.

CAR 01 – As the Validation Process is being initiated in October 2008, the crediting period start date, September 01, 2006, is not in compliance with the Policy Announcement from the VCS Association of 19 March 2008, "The VCUs can be registered back to the project start date provisions in VCS 2007 Clause 5.2.1. This is, 28 March 2006 or two years prior to the completion of the project validation whatever is later.
Answer to CAR 01 was given by the project participants and was accepted by the Validation Team:
According to the Policy Announcement from the VCS Association in 10 September 2008, the VCS definition for project start date is the date the project activity began reducing or removing GHG emissions.
Project Start Date: November 01, 2005 (Operation Starting Date of the First Turbine).
The VCS PD version 04 has changed the project start date to November 01, 2005 and defined as the crediting period start date: January 01, 2006.

Ownership
- Proof of title
-The concession contract and its following Additional Terms, signed between ANEEL -Agência Nacional de Energia Elétrica (National Agency of Electric Energy), representing the Brazilian conceding power, and Energética Barra Grande S.A – BAESA constitute the evidence of BAESA's right over the hydroelectric power plant of Barra Grande and over the project's emission reductions.
- Double counting and whether the project participated in another emission trading programme

CAR 02 – The information stated in item 1.13 of the VCS Project Description "Entrepreneurs are considering the possibility of submitting BAESA Project to the CDM. However, it is still being carried out the consultation with local stakeholders" is not correct. The company is already working in the Validation Report to submit the BAESA Project to the CDM.
Answer to CAR 02 has been given by the project participants and has been accepted by the Validation Team:
The PD version 4 has been modified and item 1.13 now states that:
BAESA Project is under validation process through the CDM, Clean Development Mechanism."

Project applicability to the VCS for projects rejected under other GHG programme
The project being submitted has not been rejected under other GHG Programme.

Whether the project is eligible under the VCS
BAESA project will be registered as a Voluntary Carbon Standard (VCS) project and facilitate the project implementation with carbon revenue coming from the carbon credits sale. Due to its significant contribution in diminishing carbon emissions and protecting the climate, this project is anticipated to fulfil VCS and qualify for carbon finance.

3.2 Baseline

In the absence of the project activity, the clean electricity generated by BAESA Project dispatched to the National Interconnected System (SIN), through the delivery in the South Subsystem, would have been generated through non-renewable sources from Power Plants connected to the interconnected grid, fostering the emission of greater quantities of green house gases.

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

"Electricity delivered to the grid by the project would have otherwise been generated by the operation of a grid-connected power plant and by the addition of new generating sources, as reflected in the combined margin calculations described in the "Tool to calculate the emission factor for an electricity system".

To use the methodology ACM0002, the CIMGC - Interministerial Commission of Global Climate Change, that is the DNA - Designated National Authority in Brazil, defined that the National Interconnected System must be considered as an unique System and, this way, this configuration will be valid for calculating the emission factor of CO2 for electricity generation connected to the grid CDM Projects use to calculate the emission reduction of greenhouse gases.

The calculation of emission factor of CO2, published by CIMGC, follows the methodological tool "Tool to calculate the emission factor for an electricity system" approved by the CDM Executive Board and published in the Annex 12 of EB 35 Report.

The CO2 emission factors for power generation in the Brazilian National Interconnected System (SIN), necessary for Combined Margin (CM) calculation, 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). The procedures for that calculation were elaborated in cooperation among the ONS, the Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT).

It will be, therefore, used the combined margin emission factor of the National Interconnected System to calculate the emission reductions of the project.

According to what was presented in tables 2, 3 and 4 of the item 1.7 of the VCS Project Description, the national energetic matrix has a significant quantity of thermoelectric power plants in operation and the MME points to an increase in the thermoelectric installed capacity in the country. The Southern region, where BAESA Project is located, presents a potential of greenhouse gases emission proportionately higher in relation to the other regions in the country, due to the presence of the only thermoelectric power plants in the country operating with mineral coal.

Therefore, it is reasonable to consider that the electric energy generation of BAESA Project can avoid the thermo-electrical entrepreneurships that generate energy from mineral coal, whether they are new or existent, from being activated.

In the absence of the project activity, the clean energy generated by BAESA Project dispatched to the National Interconnected System (SIN), through the delivery in the South Subsystem, would have been generated through non-renewable sources from Power Plants connected to the interconnected grid, fostering the emission of greater quantities of green house gases, as reflected in the calculation of the combined margin.

Therefore, the electricity generation of BAESA Project reduces emission of greenhouse gases from entrepreneurships connected to the National Interconnected System and from the new entrepreneurships that will generate electricity from fossil fuels.

The emission reductions of the project is the difference between the baseline emissions and the project emissions, represented by CH4 from the plant's reservoir, according to what was indicated in version 07 of Methodology ACM0002.

Assessment and demonstration of additionality

Project participants chose to demonstrate the project additionality, applying the "Test 1 – The Project Test", indicated by Voluntary Carbon Standard 2007.1.

"Project Test" recommends that to demonstrate project additionality the following steps must be applied:

Step 1: Regulatory Surplus

The project activity of BAESA is not a mandatory activity by Law, Statute, or other Regulatory Pattern.

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, "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".

This way, it can be noticed that there are no restrictions in the applicable laws and regulations to the implantation of the alternative scenarios to the project activity. Furthermore, we can also verify that through the MME's projection mentioned before, there is even a tendency with great probabilities of occurrence of the alternative scenarios in the absence of projects similar to BAESA Project.

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, both the activity project and the alternative scenarios fulfil all the Brazilian norms and regulations, being also plausible according to the tendencies in the country's electrical sector.

Step 2: Implementation Barriers

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

- Investment Barrier: Project faces capital or investment return constraints that can be overcome by additional revenues associated with the generation of VCUs;

-Technological Barriers: Project faces technology-related barriers to its implementation.

- Institutional Barriers: Project faces financial, organizational, cultural or social barriers that the VCUs revenue stream can help overcome.

BAESA project faces Investment Barriers. To prove that the additional revenues associated with the generation of VCUs are essential to make the project financial feasible was used the "Tool for the demonstration and assessment of additionality", version 05.2, as described below.

It describes some steps to be followed to prove and evaluate the additionality of the project.

Sub-step 2a. Determine appropriate analysis method

The project generates financial and economics benefits, other than CDM related income, then, it will be used the benchmark analysis to analyze the project activity of BAESA Project.
Sub-step 2b – Option III. Apply benchmark analysis
The project proponent has chosen Option III, benchmark analysis, and the project internal rate of return (IRR) as the project indicator. BVC was able to confirm the investment analysis and particularly benchmark analysis presented by BAESA, wherein the weighted average cost of capital (WACC) of the project activity has been used as benchmark to assess the financial attractiveness of the project activity to demonstrate additionality.
BVC has accepted the WACC as the benchmark based on the following:
The total finances obtained for the project include two components viz.: loan and equity. Hence, the project IRR is based on the total investment (including the debt and the equity portions).
In order to evaluate the financial viability of the project, the project developer is required to assess the expected minimum returns on all components of the investment made. Therefore, the benchmark selected needs to be such that, the expected minimum returns takes into consideration the risks associated with each of the components of the total investment. Thus, from an investor's perspective, the WACC is one of the most appropriate and common benchmarks for comparing project IRR to, since it is the weighted average of the total cost of the different components of the investment.
BVC was able to confirm the correctness of the WACC based on the following evidences that were reviewed:
- In BVC's opinion the assessment of the IRR's, by the project proponent is justified and is based on the following fact:
BVC was able to confirm the investment analysis and the IRR's = 14,429%, determined there-in through the detailed spread sheet calculations forwarded by the project proponent.
BVC has adopted the following procedures to verify the correctness of WACC:
- BVC verifies that the cost of equity is 30,90%, based on document forwarded by the company, which uses the Capital Asset Pricing Model (CAPM) to calculate the cost of equity.
All the data (rate of return of U.S. Treasuries of 30 years, median of Brazilian Risk between 1998 and 2002, average adjustment between U.S. and Brazilian Inflations between 1998 and 2002, levered Beta between the Electric Energy Index and Bovespa Index for the period from 1998 to 2002, and Equity Risk Premium in Brazil for the year of 2001) were checked and the sources validated by BVC. This information is available at pages 20 and 21 of PD.

Cost of Equity (CAPM)	30,90%
Risk Free Rate (Treasury 30y)	5,01%
Beta	1,11
Risk Premium	10,01%
Country Risk	9,85%
Inflation	4,90%

- BVC could verify that the cost of debt is 15,66%, according document forwarded by BAESA. The cost of debt is based on costs of each source of third parties capital of BAESA Project. BAESA Project will count with lending contracts of BNDES (National Bank for Economic and Social Development) and two debentures.

Cost of Debt	15,66%			
Agent	**Investment**	**%**	**Index**	**Debt cost**
BNDES	278.770,282	29,4%	TJLP + 3,125%	14,13%
BNDES	302.601,129	31,9%	TJLP + 4,125%	15,13%
BNDES	185.847,527	19,6%	UMBNDES + 3,125%	11,97%
Debêntures	90.000,00	9,5%	105% do CDI	22,66%
Debêntures	90.000,00	9,5%	IGPM + 9,30%	22,80%
Total	947.218,94	1,00		

- The BAESA Weighted Average Capital Cost was calculated according the equation below (page 17 of PDD):

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - Tc)$$

Where:
E/V = Percentage of Equity in the Capital Structure of the Company;
Re = Cost of Equity;
D/V = Percentage of Debt in the Capital Structure of the Company;
Rd = Cost of Debt
Tc = Income Tax in Brazil + Social Contribution

OBS 1: Income tax in Brazil is 25% and social contribution is 9% (page 20 of PD)
OBS 2: Capital Structure:

WACC	16,42%
Total Investment	1.345.603
Equity	398.384
%	29,6%
Debt	947.219
%	70,4%
Cost of Equity	30,90%
Cost of Debt	15,66%
Tax	34%

The project's WACC is 16,42% and BVC agrees with all data used in Benchmark and would like to point out that they are clearly presented, available to consult and correct.
Then, Nominal Project IRR = 14,429% is lower than Nominal WACC = 16,42%.
Sub-step 2d Sensitivity analysis
- According to the "Tool for the demonstration an assessment of additionality", version 05.2, the PD must Include a sensitivity analysis that shows whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. Through a spread sheet forward by BAESA with such analysis, BVC was able to verify and validate it. The sensitivity analysis is available at page 23 of PD.
In all the assumptions, the Nominal Project IRR is lower than the Nominal WACC = 16,42%.
- In BVC's opinion, it is thus sufficiently demonstrated that the proposed project activity is not economically or financially attractive. Moreover, the investment analysis is presented in a transparent manner and all the relevant assumptions are provided, clearly presenting and justifying the critical techno-economic parameters and assumptions.
Barrier analysis
This step will not be considered.

Step 3 - Common practice analysis

CAR 03 - Common Practice Analysis is step 4 of the Tool for the Demonstration and Assessment of Additionality, but according to VCS methodology, Test 1 – The project test, Common Practice Analysis is step 3. The PD asks the analysis to proceed to step 4, but in the PD the step common practice is named step 3.
Answer to CAR 03 was given by the project participants and was accepted by the Validation Team:
The PD version 3 was modified to correct the mistake.

It is observed that there are in the states of Rio Grande do Sul and Santa Catarina where HPP Barra Grande is located, entrepreneurships with activities similar to those of the project being proposed.
Table 13 of the PD presents a summary of the electricity generation entrepreneurships in operation in the states of Rio Grande do Sul and Santa Catarina, according to information in ANEEL website.
The table shows that 9.5% of electricity generation entrepreneurships in the states of Rio Grande do Sul and Santa Catarina are similar to BAESA project activity.
The greatest part of these entrepreneurships has been implanted by state companies or organs, within the national energy development politics, when the sector was still centrally ruled. At that time, environmental legislation was softer and there was, according to Atlas of Electric Energy in Brazil, the option of forming great reservoirs and for the inundation of big flooded areas in the construction of hydroelectric power plants in the country, with little consideration to the environmental aspects of the projects.
The data on table 13 correspond to only one sample of the group of entrepreneurships of energy generation in the country. However, the percentage of participation of hydroelectric power plants in the generation matrix of the states of Santa Catarina and Rio Grande do Sul is similar to the percentage of participation of this kind of entrepreneurship in the composition of the national energetic matrix. The description of the national energetic generation matrix as a whole, in which this affirmation can be checked, is represented in table 14 of the PD (information as of July, 2008).
All the entrepreneurships that had installed capacity similar to the one in BAESA Project, mentioned in table 15, were developed by state companies, counting, therefore, on less exposure to market conditions and, thus, with less exposure to risk.
Besides, it is valid to highlight that, according to Atlas de Energia Elétrica do Brasil, historically, the use of hydraulic potentials in Brazil to the generation of electric energy has historically demanded the formation of great reservoirs and inundation of big flooded areas. These constructions have used, in the majority of the cases, water accumulation reservoirs and regulations of water flow that provoked alterations in the regimen of water and the formation of microclimates, contributing, damaging or even extinguishing certain species.
Other fact that must be highlighted is that, analyzing the history of Brazilian electrical sector, it is verified that, in the past, country's legislation did not incorporate the environmental variable in national electric sector planning. However, facing the undesirable social-environmental impacts resulting from the implantation of hydroelectric entrepreneurships, a series of legal demands that aim at avoiding and mitigating the environmental effects of this kind of project have become demands of the conceding power and of the legislative organs. With this, new investments, in the implantation of hydro electrical entrepreneurships in Brazil, are demanded from the investors.
Additionally, it is also important to emphasize that the construction of new hydroelectric power plants demands a volume of initial capital for investment that is very high and the risks associated to the development of this kind of project are also quite superior when compared to the risks in the construction of a thermoelectric power plant, for example. The construction of new thermoelectric power plants is

significantly less risky, less complex and less costly than the construction of a hydroelectric one. Besides, analyzing the environmental component, it is perceived that the environmental requirements for the implantation of hydroelectric power plants in Brazil are much more complex than those for the installation of thermoelectric entrepreneurships, for example.
HPP Barra Grande is an entrepreneurship that has 708 MW of installed capacity and 380.6 MW of assured energy, developed by private companies, financed by private capital and third party capital that demands the payment of taxes according to the market, not holding resemblance, therefore, to the great national Hydroelectric power plants' constructions, built with public capital with the investment of public companies and governmental benefits and incentives.
Moreover, HPP Barra Grande is a power plant that has a power density of 7.53 MW/km², presenting low environmental impacts and that considers in its planning a series of investments in programs and environmental actions that did not exist when there was the implantation of the greatest part of hydroelectric power plants of the country. This way, the implantation of this project does not count on large revenues from the great Brazilian hydroelectric entrepreneurships and has minimal environmental impacts that demand investment and, for these characteristics, its cash flow presents return rates below the markets references and the revenue from selling VCUs becomes important to make the project possible.
It is also interesting to notice that as demonstrated on table 13, the number of hydroelectric power plants in the states of Rio Grande do Sul and Santa Catarina corresponds to only 9.5% of the entrepreneurships of its energetic matrix, presenting a greater concentration of small hydroelectric power plants and thermoelectric power plants. This greater quantity of small hydroelectric power plants in operation is directly associated to economical and tax benefits conceded by the Federal Government and to the creation, through the law nº 10,438, in April 26, 2002, of the Program PROINFA.
The massive presence of thermoelectric power plants in the region is closely related to the fact that the region detains 90% of the country's natural coal reserves, favoring thermoelectric power plants implantation.
With this, it is noticed that, despite the existence of few projects similar to the Project activity of BAESA Project in operation in the country, BAESA Project was developed in different regulatory and financial conditions, presenting a higher exposure to risk and, thus, seeking for additional revenues that aimed at mitigating the new risks and difficulties present in the implantation of hydroelectric entrepreneurships in the Brazilian market. Furthermore, it was possible to observe that hydro power plants are not the main component in terms of number of entrepreneurships in the energetic matrix of the country and of the states involved in BAESA Project. It was also verified that a great part of the hydroelectric entrepreneurships built in Brazil in the past has the characteristic of a large flooded area in relation to the installed capacity and did not respect or gave priority to environmental questions, different from what happens and will happen in BAESA Project. These characteristics make the BAESA Project singular among other similar entrepreneurships.

3.3 Monitoring Plan

The consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 07, must be applied together with the monitoring methodology present into that methodology.
Based on the applied methodology there are no leakage for project activities, however, project presents emissions through its reservoir that must be monitored according to the default value for reservoir emissions defined by CDM Executive Board. Therefore, the parameters to be monitored are the baseline emissions through the project activity, project installed capacity, project electricity generation,

the emission factor for the Brazilian National Interconnected System and the power plant reservoir area.
Electricity measurement is essential to verify and monitor the GHGs emission reduction. It is necessary, therefore, to use meter equipment to register and check the electricity generated by the unit. The Monitoring Plan allows the calculation of GHG emissions generated by the project activity in a direct manner, applying the baseline emissions factor.
All data collected as part of monitoring will be archived and be kept at least for 2 years after the end of the last crediting period. All measurements will be conducted with calibrated measurement equipment according to Brazilian industry standards.
The monitoring has the objective of measuring the emission reductions from the project. For the execution of an efficient an effective monitoring, BAESA will follow the Monitoring Plan described in item 3.3 of the PD.
The monitoring plan was based on the Monitoring Methodology present in consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 07.
In the periodic monitoring, that will be implemented in BAESA Project, the main parameters that will be controlled are:

· Gross Electricity Generation (MWh);
· Plant Internal Consumption (MWh);
· Net Electricity Supplied to the Grid (MWh);
·Emission Factor for Electricity Generation Connected to the Brazilian Interconnected Grid (tCO2e/MWh);
· Project Emissions (tCO2e);
· Project Emission Reductions (tCO2e);

CAR 04 – The electrical energy unit is MWh and not MW.
Answer to CAR 04 was given by the project participants and was accepted by the Validation Team:
The PD version 3 was modified and the electrical energy unit was changed from MW to MWh.

For the measurement of gross electricity generation, net electricity generation and the power plant's internal consumption, the information of three different meters will be used. As mentioned previously, each Generation Unity has two meters located in the substation and one inside the Powerhouse.
Data on net energy generation may be confronted with the information present in the website of the CCEE (CCEE - Entity responsible for measurements, accounting and settlement on Brazilian electric energy market) or with receipt of sales, if necessary.
The emission factor for power generation connected to Brazilian National Interconnected System will be made available by Ministry of Science and Technology (MCT) with data of National System Operator, ONS.
The variables EFgrid,OM,y and EFgrid,CM,y will be calculated and monitored by Enerbio Consultoria, through the dispatch data of National Interconnected System.
Emissions and emission reductions provided by the project activity will be monitored by project participants, as described in Monitoring Plan, using for the emission reductions calculation, the equation indicated by methodology ACM0002, version 07.
The monitoring will be executed in a continuous way. The company plans to elaborate internal monitoring reports every six months and consolidate them annually for the realization of verifications. This periodicity may still be altered.
The frequency, responsibilities and authority for registration, monitoring, measurement and reporting activities are described in item 3.4 of the PD.

3.4 Calculation of GHG Emissions

According to ACM0002 methodology (version 07), the emission reduction are calculated as follows:
ERy = BEy – PEy – LEy
Where:
ERy = Emission Reductions in year y (t CO2e/yr)
BEy = Baseline emissions in year y (t CO2e/yr)
PEy = Project emissions in year y (t CO2e/yr)
LEy = Leakage emissions in year y (t CO2e/yr)
According to the methodology adopted, for hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, the project proponents shall account for project emissions, estimated as follows:

(a) If the power density (PD) of power plant is greater than 4 W/m2 and less than or equal to 10 W/m2:

$$PEy = \frac{EFRes * TEGy}{1000}$$

Where:

PEy = Emissions from reservoir expressed as tCO2e/ano;
EFRes = is the default emission factor for emissions from reservoirs, and the default value, as per EB23, is 90 Kg CO2e/MWh;
TEGy = 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, PEy = 0.
The power density of HPP Barra Grande is 7.53 W/m2, therefore, greater than 4 W/m2 and less than 10 W/m2.

LEy Calculation (leakage emissions in year y (t CO2e/year))
The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation. According to the Methodology applied, the project participants do not need to consider these emission sources as leakage. The project participants will not claim any credit for the project on account of reducing these emissions below the level of the baseline scenario. Therefore, for BAESA Project, the leakage emissions represented by LEy is 0 (zero).

BEy Calculation (Baseline emissions in year y (t CO2e/year)
The baseline methodology ACM0002 establishes that baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The baseline emission is calculated as follows:

BEy = (EGy – EGbaseline) * EFgrid,CM,y

Where:
BEy = Baseline Emission in year y (t CO2e/year)
EGy = Electricity supplied by the project activity to the grid (MWh)
EGbaseline = Baseline electricity supplied to the grid in case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.

EFgrid,CM,y = Combined margin CO2 emission factor for grid connected power generation in year y, calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
The HPP Barra Grande is a new power plant to be connected to the interconnected grid, therefore, the EGbaseline is 0 (zero).
To calculate EFgrid,CM,y, it will be used data supplied by Brazilian DNA which makes available data of operating margin emission factor through dispatch data analysis and the built margin emission factor through the use of the tool to calculate the emission factor for an electricity system (version 01.01).
The combined margin emission factor EFgrid,CM,y will be calculated as follows:

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

Where:

EFgrid, BM,y = Build margin CO2 emission factor in year *y* (tCO2e/ MWh)
EFgrid, OM,y = Operating Margin CO2 emission in year *y* (tCO2e/ MWh)
WOM = Weighting of operating margin emissions factor (%)
WBM = Weighting of build margin emissions factor (%)

The CO2 emission factors of build margin and operating margin will be calculated ex-post. As it was already mentioned, CO2 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).
The procedures to calculate were elaborated in cooperation between ONS, Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT), following the "Tool to calculate an emission factor for an electricity system" (version 01.1). Therefore, the operating margin emission factor and the build margin emission factor will be calculated directly from Brazilian DNA.
The tool to calculate the emission factor for an electricity system recommends that the following default values should be used for WOM and WBM:
· Wind and Solar power generation project activities: WOM = 0.75 and WBM = 0.25 for the first crediting period and for subsequent crediting periods.
· All other projects: WOM = 0.5 and WBM = 0.5 for the first crediting period, and WOM = 0.25 and WBM = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

This way, for BAESA Project, it was adopted the following weights: WOM = 0.50 and WBM = 0.50.

The excel sheets with all the calculations were checked by the validation team. The ex-ante emission factor for 2007 was utilized for the calculations of the estimated amount of emission reductions for the first crediting period. The period covered was from September 01, 2006 to august 31, 2016.
The total estimated emission reductions for the first crediting period was 3,233,841 tCO2e.

CAR 05 – According to CAR 01, the estimated emission reductions for the first crediting period must be recalculated.
Answer to CAR 05 has been given by the project participants and has been accepted by the Validation Team:
The PD version 4 has been modified and the estimated emission reductions for the first crediting period have been changed to

3,187,939 tCO2e

3.5 Environmental Impact

The environmental licensing is a legal obligation prior to the installation of any entrepreneurship or activity potentially pollutant or degrading to the environment in Brazil. The Brazilian licensing process presents as an important characteristic the social participation in decision taking through the realization of Public Audiences as part of the process.

The obligation of environmental licensing is shared by State Environmental Organs and by Ibama – Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of Environment and Renewable Natural Resources), as part of SISNAMA – Sistema Nacional de Meio Ambiente (National Environmental System). Ibama acts chiefly in the licensing of big infrastructure projects which involves impacts to more than one state.

The first License for Operation that authorized the start of operation of HPP Barra Grande was issued by IBAMA on July 4, 2005, reflecting the positive understanding of the Agency regarding the project's environmental viability and the agreement of environmental demands, proving that all programs and actions of mitigation of environmental impact provided by the entrepreneurship are being fulfilled.

In January, 2008, the operation license was renewed with a deadline of 6 years and a number of environmental conditionings 70% below to what was required in the License for Operation issued in 2005, and its vast majority related to the maintenance of programs already being developed, showing the correct form of work executed by the entrepreneurs.

The project will not produce trans-frontier effects. All impacts will occur within Brazilian frontiers and were mitigated, aiming at fulfilling the environmental demands to the implementation of the project.

BAESA Project meets the several demands in the national environmental legislation, having the necessary licenses for its implantation.

Below, it follows information about the current operation license of BAESA Project provided to the Designated Operational Entity in the validation stage

Operation License (LO) # 447/2005

- Signed on: July 04, 2005
- Renewed on: January 14, 2008
- Valid until: January 14, 2014

When renewing BAESA Project Operation License, issued on January 14, 2008, several technical requirements were made, being a condition for the maintenance and renewal of the License necessary for the project operation. Those conditions were checked by the Validation Team.

All investments in socio-environmental programs are being coordinated by a multidisciplinary staff, seeking to reach the balance between the results searched by the entrepreneurship and the social and environmental aspects.

BAESA's social and environmental actions trespass the compliance of compensatory measures determined by the authorities involved. The successes of social and environmental projects that have been developed in BAESA Project are proved through polls and prizes.

3.6 Comments by stakeholders

The public audience is one of the phases in the assessment of environmental impact and the main channel of participation for the community in the decisions at a local level. This procedure consists on presenting to the interested parties the content of the study and the environmental report, clarifying doubts and collecting criticisms and suggestions on the entrepreneurship and the areas to be affected.
The public audiences may take place by the determination of IBAMA, whenever judged to be necessary, or by the solicitation of a social entity, of the Public Ministry or of 50 or more citizens. The edict of realization of this audience is published in Diário Oficial da União (Union's Official Journal) and in a regional or local newspaper of great circulation, radios and banners, with the indication of the date, hour and place of the event. The place chosen for the realization of the audience must be easily accessed by the interested parties.
Therefore, due to the geographic localization of the communities and interested groups, there may be more than one event about the same project.
BAESA Project was submitted to public audiences during all the licensing process.
Furthermore, Project Proponents sent letters to stakeholders, inviting them to make comments about the project.
The following stakeholders were consulted:

· State Government of Santa Catarina
· State Government of Rio Grande do Sul;
· Legislative Assembly of Santa Catarina;
· Legislative Assembly of Rio Grande do Sul;
· IBAMA – Brazilian Institute of Environment and Renewable Natural Resources;
· Brazilian Ministry of Environment;
· Foundation of Environment of the State of Santa Catarina (FATMA);
· State Secretary of Sustainable Development (responsible for issues related to the Environment in the state of Santa Catarina)
· Secretary of Environment of State of Rio Grande do Sul (SEMA);
· State Foundation of Environmental Protection Henrique Luiz Hoessler – FEPAM;
· State of Santa Catarina Attorney of Public Interest;
· State of Rio Grande do Sul Attorney of Public Interest;
· Federal Attorney of Public Interest;
· Brazilian Forum of NGO's and Social Movements for Environment and Development;
· FIESC – Federation of Industries of Santa Catarina State;
· FIERGS – Federation of Industries of Rio Grande do Sul;
· Institute Light Brazil;
· APINE – Association of Independent Producers of Electricity.

The stakeholders consulted were the same stakeholders required by Brazilian Designated National Authority for CDM projects.
Letters have been sent to the local stakeholders on September 01, 2008, before the validation process and became open for comments and opinions about BAESA Project until September 30, 2008. The VCS-PD has been available to the local stakeholders for comments at the website www.enerbio-rs.com.br. It has been offered the possibility of the receiving of the PDD in written version for reading and comments. No comments have been received**.**

CR 01 – Please, inform if there were any comments made by the stakeholders.
Answer to CR 01 was given by the project participants and was accepted by the Validation Team:
The PD version 4 was modified and the sentence "no comments were received" was added to the item 6.

4. Validation conclusion

Bureau Veritas Certification has performed the Validation of “BAESA Project” Hydro Power Plant (HPP) Barra Grande, located in the Southern Region of Brazil, between the cities of Anita Garibaldi, state of Santa Catarina and Pinhal da Serra, state of Rio Grande do Sul, with an installed capacity of 708 MW, using a small reservoir, with low environmental impact related to its installed capacity.

The validation was performed on the basis of VCS criteria and host country criteria and also on the criteria given to provide for consistent project operations, monitoring and reporting.

The validation consisted of the following three phases:

i) A desk review of the project design and the baseline and monitoring plan (October 2008); ii) follow-up interviews and on site visit (October 2008); iii) The resolution of outstanding issues and the issuance of the final validation report and opinion (February 2009).

Project participants used the latest tool for demonstration of the additionality. In line with this tool, the PD provides analysis of investment and prevailing barriers to determine that the project activity itself is not the baseline scenario.

By generating electricity using renewable energy, the project is likely to result in reductions of GHG emissions partially displacing the electricity that would have been generated using fossil fuels. An analysis of the investment barrier demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity. Given that the project is implemented and maintained as designed, the project is likely to achieve the estimated amount of emission reductions. The review of the Project Description (Version 01 dated August 27, 2008) and the subsequent follow-up interviews have provided Bureau Veritas Certification with sufficient evidence to determine the fulfillment of stated criteria. The Project Description was subsequently revised as Version 02 dated October 20, 2008, Version 03 dated November 20, 2008 and Version 04 dated February 03, 2009 to resolve the issues that rose during the interviews and subsequent interactions.

In our opinion, the project correctly applies and meets the relevant VCS requirements and the relevant host country criteria. The validation is based on the information made available to us and the engagement conditions detailed in this report.

5. References

Documents provided by the company that relate directly to the GHG components of the project.

1.PD BAESA project, version 01, of August 27, 2008.
2. PD BAESA project, version 02, of October 20, 2008.
3. PD BAESA project, version 03, of November 20, 2008.
4. PD BAESA project, version 04, of February 03, 2009.
5. Approved consolidated baseline and monitoring methodology ACM 0002, version7.
6. Methodological Tool “Tool for the demonstration and assessment of additionality”, version 05.2.
7. Annex 12, EB 35 Report - Methodological Tool “Tool to calculate the emission factor for an electricity system, version 01.1.
8. VCS PD Template – 19 November 2007.
9. VCS Validation Report Template – 19 November 2007.
10. Voluntary Carbon Standard 2007.1.

11. Calculation Excel Spreadsheets.
12. Resolução Interministerial 01, Comissão Interministerial de Mudança Global do Clima, September 2003.
13. Resolução Interministerial 07, Comissão Interministerial de Mudança Global do Clima, March 2008.
14. Kyoto Protocol to the United Nations Framework Convention on Climate Change. United Nations, Dec, 1997.
15.ISO 14064-2:2006, ISO 14064-3:2006 and ISO 14065:2007.
16. Operation License (LO) # 447/2005, Renewed on: January 14, 2008.
17. Financial Demonstrations and Calculations.

6. Verifiers' CV's

Bureau Veritas Certification Leader GHG Verifier
Antonio Daraya – is graduated in Chemical Engineering with a very large experience in Industrial and Environmental management in several industrial fields. He is ISO 9001:2000, ISO 14001:2004 and OHSAS 18001 Lead Auditor and has also experience in the implementation of Quality and Environmental Management Systems. Antonio is qualified as Lead Verifier GHG – Green House Gases.

Bureau Veritas Certification GHG Verifier
Marco F. Prauchner – is graduated in Mechanical Engineering with experience in Quality and Environmental management in mechanical, plastic and chemical industries. He is ISO 9001:2000 and ISO 14001:2004 Lead Auditor and has also experience in the implementation of Environmental Management Systems. Marco is qualified as Lead Verifier GHG – Green House Gases.

Bureau Veritas Certification, Internal Technical Reviewer
Ashok Mammen - PhD (Oils & Lubricants), MsC (Analytical chemistry). Over 20 years of experience in petrochemical sector. He has been involved in the validation and verification processes of more than 50 CDM projects.