Voluntary Carbon Standard
Project Description Template

19 November 2007

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1 Description of Project:

1.1 Project title

BAESA Project

1.2 Type/Category of the project

BAESA Project fits in the category of sectoral scope 1 – Energy Industries (Renewable Source) and it is not a grouped project.

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

The estimated amount of emission reduction over the crediting period is presented below.

Table 1: Estimated Amount of Emission Reduction

Year	Estimation of project activity emissions (tonnes of CO2 e)	Estimation of baseline emissions (tonnes of CO2 e)	Estimation of Leakage (tonnes of CO2 e)	Estimation of overall emission reductions (tonnes of CO2 e)
2006	125.471,81	279.042,08	-	153.570,27
2007	332.062,93	666.561,60	-	334.498,67
2008	265.561,96	771.471,50	-	505.909,54
2009	300.065,04	613.487,99	-	313.422,95
2010	300.065,04	613.487,99	-	313.422,95
2011	300.065,04	613.487,99	-	313.422,95
2012	300.065,04	613.487,99	-	313.422,95
2013	300.065,04	613.487,99	-	313.422,95
2014	300.065,04	613.487,99	-	313.422,95
2015	300.065,04	613.487,99	-	313.422,95
Total	**2.823.552**	**6.011.491**	-	**3.187.939**

1.4 A brief 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) 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 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 CO_2 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.

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".

The alternative scenarios to the project activity are two situations which reflets the calculation of the combined margin of baseline scenario: (i) the continuity of the present scenario, with electricity generation happening according to the current generation composition of the National Interconnected System, more specifically of the South Subsystem and (ii) the construction of a new mineral coal thermoelectric power plant.

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 CO_2, that would be generated if the project did not exist. The reservoir of HPP Barra Grande is responsible for emissions of CH_4 which will be accounted for and reduced from the total project emission reduction.

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.

Therefore, BAESA Project contributes to the sustainable development of the cities involved and of the country once contributing to the economic growth without compromising the future generations, respecting the concept of Sustainable Development, established by Brundtland Report, elaborated by the World Commission on Environment and Development, which defines the term "sustainable development" as "the development that satisfies the present necessities, without compromising the capacity of future generations of supplying their own necessities"[1].

Through the following actions, BAESA Project contributes to the sustainable development of its region and country:

- BAESA Project supplies clean and renewable electricity to the Brazilian National Interconnected System, displacing possible entrepreneurships that would generate energy through the burning of fossil fuels, avoiding, thus, the emission of pollutants gases to the atmosphere and preserving the environment to future generations.

- Through the generation of more than 5,000 direct and indirect jobs during the phases of construction and operation and through the improvement of the economic activities aggregated to the implantation of the entrepreneurship, BAESA Project promotes region economical development, which occurs through the generation of revenue to the communities of the municipalities involved and their collaborators. Moreover, through taxes and tributes generated by its activities to the municipalities involved and to the Union, BAESA Project provides financial resources that will be reverted to the population of the region and of the country at large. It is estimated that during the period of construction of the entrepreneurship, (1) R$ 240 millions were brought to the local,

[1] WCED [CMMAD], 1987. Our Commom Future [Nosso Futuro Comum]. The World Commission on Environment and Development [Comissão Mundial sobre Meio Ambiente e Desenvolvimento]. Oxford University Press.

regional and state economy through the purchase of materials, payment of salaries and hiring of services; (2) 8.5 millions were directly applied to health, education, leisure, security and social assistance infra-structure of the municipalities; (3) R$ 7.5 millions were collected by the municipalities of Anita Garibaldi and Pinhal da Serra through Taxes over Services of any Nature (ISSQN – Imposto Sobre Serviços de Qualquer Natureza) and (4) R$ 9.0 millions were collected to the states of Rio Grande do Sul and Santa Catarina, referring to the Tax over Circulation of Goods and Services (ICMS – Imposto Sobre Circulação de Mercadorias e Serviços). It is still estimated that with total operation of the entrepreneurship, City Halls will receive about R$ 25.5 millions annually, referring to the Financial Compensation for the Utilization of Hydro Resources (CFURH – Compensação Financeira pela Utilização de Recursos Hídricos) which may make, if well managed by the public power, a long-term plan of socio-economical development.

- Besides BAESA project presents low environmental impacts, with small reservoir formation and elevated power density, BAESA makes considerable investments in environmental programs and actions. Twenty-six programs are being developed, distributed in 6 programs, which totalize an invested amount of approximately R$ 209 millions. Among the environmental projects, it can be highlighted the reforestation program that has the goal of planting one million seedlings until the year of 2013. In order to achieve this goal, BAESA implanted in 2007 a plant nursery of forest seedlings along with the Power Plant, with a capacity of production of 150 thousand seedlings per year, destined to the project of reforestation and environmental education. The project of rearrangement of the population affected by the entrepreneurship also deserves emphasis, once some families that lived in houses hanging from the river's side, without electricity and without the minimum conditions of sanitation were relocated to dwellings of quality, with excellent infra-structure conditions. The participation of government and social movement representatives has contributed to the project success. The collaborative work among company, government and social movement allowed better conditions to be obtained for the families involved.

- Since HPP Barra Grande is located in the rural area of Rio Grande do Sul and Santa Catarina, the implantation of this kind of project in the region will demand the capacitating of the collaborators to be hired or sub-hired in the region and of the population itself in the municipalities involved. Through environmental education program, BAESA Project has invested in formation of multipliers in the municipalities of the region of range, having as target the public and private schools teachers, members of the organized civil society and the public power to act as spreaders of the principles and techniques of environmental education, besides the activities of training with sub-hired construction workers and educational activities with inhabitants from the reservoir's surroundings. Through this action, BAESA Project seeks to capacitate its collaborators to the market and contribute to the growth of knowledge and to the level of education of the municipalities where it acts.

Through all these actions, BAESA Project proves that it is possible to promote economical growth, balancing the economical (generation of energy), social (communities and municipalities involved) and environmental components (the ecosystem), respecting, thus, the principles of sustainable development.

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

HPP Barra Grande is located in Pelotas River, about 43 km from its confluence with Canoas River, between the municipalities of Anita Garibaldi/SC and Pinhal da Serra/RS. The geographic coordinates are: Latitude 27º46'South and Longitude of 51º13' West.

The reservoir formed by the Plant occupies an area of 94 km², partially flooding the areas of 9 municipalities: Anita Garibaldi, Cerro Negro, Campo Belo do Sul, Capão Alto and Lages, in Santa Catarina; and Pinhal da Serra, Esmeralda, Vacaria and Bom Jesus, in Rio Grande do Sul.

The map below shows the localization of HPP Barra Grande:

Map 1 – Localization of HPP Barra Grande

1.6 Duration of the project activity/crediting period:

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: 11/01/2005 *(mm/dd/yyyy)* – (Operation Starting Date of the First Turbine).
- Crediting period start date: 01/01/2006 *(mm/dd/yyyy)*
  - VCS project crediting period: 10 years renewed at most two times.

1.7 Conditions prior to project initiation:

BAESA project consists on the supply of a new Hydro Power Plant that will generate electricity from the hydraulic potential with an installed capacity of 708 MW and assured energy of 380.6 MW, using a small reservoir, with low environmental impact in relation to the installed capacity.

The Brazilian energetic matrix presented prior to the BAESA Project beginning operation was distributed according the table below:

Table 2: Brazilian Energetic Matrix in December of 2005[2]

Source	Installed Capacity (MW)	%
Hydroelectric	68,637	73.23
Thermoelectric	12,407	13.24
Nuclear	2,007	2.14
Others Sources	2,899	3.09
Subtotal	**85,950**	**91.70**
Interligation with Argentina	2,178	2.32
Itaipu Portion of ANDE	5,600	5.97
Total	**93,728**	**100%**

It is important to say that although the hydro electrical Plants represent 73.23% of the country installed capacity, according to the Atlas de Energia Elétrica do Brasil[3], in 2002, there were just 8 hydro power plants

2 Source: Ministério de Minas e Energia [Ministry of Mines and Energy]. Plano Decenal de Expansão de Energia Elétrica 2006-2015 [Decennial Plan for Energy Expansion 2006-2015]

with installed capacity ranging from 501 MW to 1.000 MW (similar characteristic of BAESA) in operation in Brazil and all entrepreneurships had been developed by state companies counting, therefore, on less exposure to market conditions and, thus, with less exposure to risk.

In 2006, the Ministry of Mines and Energy elaborated a Decennial Plan for Electric Energy Expansion for the period of 2006-2015, establishing three possible scenarios, based on the growth projection of country Gross Domestic Product (GDP). We adopted for this analysis the scenario pointed out by the MME as the most likely to happen, called reference scenario. This reference scenario adopts the premises to estimate the necessity of expansion of the Brazilian electrical sector.

Considering MME's projection, it was traced a plan for the generation expansion based on the energetic offer from the implantation of entrepreneurships of hydroelectric and thermoelectric generation. It was estimated a necessity of growth in the energetic offer that points out for an additional offer from thermo electrical plants of 10,486 MW in the period 2006-2015, according the table below:

[3] Atlas of Electric Energy in Brazil / National Agency of Electric Energy, page 32. (*Atlas de Energia Elétrica do Brasil / Agência Nacional de Energia Elétrica, Página 32. – Brasília: ANEEL, 2002.*).

Table 3: Thermoelectric Power Plants to be connected to the National Interconnected System predicted in the Decennial Plan for the Expansion of the Electrical Sector.[4]

Plant	Subsystem	Installed Capacity (MW)	Fuel	Operation Beginning
Termorio	SE/CO/RO	1,163	Natural Gas	Aug/2006
Gás NE	NE	2,550	Natural Gas	Dec/2011
Araucária	S	469	Natural Gas	Dec /2008
Três Lagoas	SE/CO/RO	350	Natural Gas	Jan/2008
Vale do Açu		340	Natural Gas	Mar/2007
Canoas	S	250	Natural Gas	Jan/2008
Cubatão	SE/CO/RO	216	Natural Gas	Jul/2008
Camaçari	NE	347 3	Diesel Oil Natural Gas	Dec/2006
Santa Cruz Nova	SE/CO/RO	166 316	Diesel Oil	Feb/2007
Goiânia II – BR	SE/CO/RO	140	Diesel Oil	Nov/2008
Biomassa Indic. SE	SE/CO/RO	1,300	Biomass	Dec /2012
Biomassa – LEN 2005	SE/CO/RO	267	Biomass	Nov/2008
Biomassa Indic. NE	NE	250	Biomass	Dec/2010
Angra III	SE/CO/RO	1,309	Urânio	Dec/2012
Jacuí	S	350	Mineral Coal	Dec/2008
Candiota III	S	350	Mineral Coal	Dec/2008
Carvão Indic. S	S	350	Mineral Coal	Dec/2009
Total		**10,486**		

It is important to highlight that from the additional offer of 10,486 MW coming from thermoelectric Plants, the projection indicates that 1,769 MW will be generated from the entrepreneurships that will dispatch energy to SIN in the South Region of Brazil.

It is also important to highlight that there were before the implementation of BAESA Project 7 thermoelectric plants in Brazil, operating with mineral coal, totalizing an installed capacity of 1,415 MW, according to the table[5] below:

[4] [4] Source: Ministério de Minas e Energia [Ministry of Mines and Energy]. Plano Decenal de Expansão de Energia Elétrica 2006-2015 [Decennial Plan for Energy Expansion 2006-2015]

[5] Source: Aneel - http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2

Table 4: Thermo Power Plants in Operation in Brazil

Power Plant	Installed Capacity (MW)	State
Figueira	20	Paraná
Charqueadas	72	Rio Grande do Sul
Pres. Médici A, B	446	Rio Grande do Sul
São Jerônimo	20	Rio Grande do Sul
Jorge Lacerda I e II	232	Santa Catarina
Jorge Lacerda III	262	Santa Catarina
Jorge Lacerda IV	363	Santa Catarina
Total	1,415	

All thermo electrical entrepreneurships that generate energy from mineral coal in the country were situated in the South Region, where BAESA Project is located.

It is also valid to mention that the projection of thermoelectric generation offer established by MME predicts an addition of 50.9% of natural gas electricity that despite being less pollutant in relation to petroleum and mineral coal also generates undesirable impacts on the environment. In terms of atmospheric pollution, the use of this technology provided the emissions of nitrogen oxides (NO_x), among which are nitrogen dioxide (NO_2) and nitrous oxide (N_2O). N_2O is one of the greenhouse gases and also contributes to the reduction of the ozone layer.

It is still important to highlight that the dispatch order for Brazilian Interconnected System is established in the following way: hydroelectric power plants, wind, nuclear, imports from other systems in ascending order of cost, thermoelectric power plants in ascending order of generation cost.

This way, it can be said that the technology used by BAESA Project avoid CO_2 emissions that would happen through the electricity generation of thermo electric plant in operation and of future thermoelectric entrepreneurships to be connected to the National Interconnected System.

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

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 reduction of the project is the difference between the baseline emissions and the project emissions, represented by CH_4 from the plant's reservoir, according indicated in version 07 of Methodology ACM0002.

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

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 an 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 236MW each are used, totalizing a maximum installed capacity of 708 MW.

BAESA Project will use three generation units, with a Francis turbine, 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 are located in the substation that makes the connection with the National Interconnected System, responsible for the measurement of net electricity electricity.

Entrepreneurship implantation was responsibility of national companies, since a Construções e Comércio Camargo Corrêa was responsible for construction and equipment assembly of the plant; and 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 and equipments assembly).

Below, it is described some characteristics of the entrepreneurship structures

Detour Tunnels

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

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

Forced tunnels and penstock

The forced tunnels or forced conducts were excavated on rock 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 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, three are the forced tunnels, each one composed of two parts: one vertical, with 98 meters, and the other slightly inclined, with approximately 310 meters. Each 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 entrepreneurship 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 executed 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 means 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 units of generation 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 rate of flow will be of 23,840 m³ per second, equivalent to six times the average rate of flow in Pelotas River.

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

BAESA project has all the necessary licenses to the complete implantation of the entrepreneurship, besides a contract of concession established with ANEEL, Agência Nacional de Energia Elétrica (National Agency of Electric Energy), in which the use of public asset necessary to the exploitation of the hydraulic electrical potential, located in Pelotas River, between the states of Rio Grande do Sul and Santa Catarina, is granted to Energética Barra Grande – BAESA, for a period of 35 years.

The most relevant local laws and regulations related to BAESA project activity correspond to the environmental laws.

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 Necional de Meio Ambiente (National Environmental System). Ibama acts mainly in the licensing of great projects whose infra-structure involves impacts to more than one state of the country.

Aiming at providing a general view on the procedure used in the environmental licensing for a hydroelectric power plant project in Brazil with impacts to more than one state, it is presented below a section taken from Ibama's website:

> *"The process of environmental licensing has three different phases: Prior Licensing, Installation Licensing and Operation Licensing. Prior License (PL) must be requested to IBAMA in the planning phase of the implantation, alteration or enlargement of the entrepreneurship. This license does not authorize the installation of the project, but approves the environmental viability of the project and authorizes its location and technological conception. Besides, it establishes the conditions to be considered in the development of the executive project. Installation License (LI) authorizes the start of the construction or installation of the entrepreneurship. The deadline of this license is established by the timetable of installation of the project or activity, which cannot be superior to 6 (six) years. Operation License (LO) must be requested before the entrepreneurship begins its operation, since it is this document that authorizes its function. Its issuance is conditioned to an inspection to verify whether all demands and technical details described in the project approved were developed and met throughout its installation and whether they are according to what is expected in the LP and LI. During the licensing process, IBAMA listens to the Environmental Organs (EO) involved and to the Federal Organs of Management of Historic Patrimony (Órgãos Federais de Gestão do Patrimônio Histórico – IPHAN), to Indian Communities (FUNAI), Communities of Quilombolas (Fundação Palmares), to endemic control (FUNASA), among others. To subsidize the LO phase, the entrepreneur elaborates a group of reports, describing the implantation of the environmental programs and mitigating measures expected in the phases of LP and LI".*[6]

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.

All documents related to the concession and to the licensing process will be supplied to the Designated Operational Entity that will execute the validation.

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

Emissions 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.

[6] http://www.ibama.gov.br/licenciamento/index.php

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.

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

BAESA Project was implanted with the objective of exploiting the potential of hydraulic energy located in Pelotas River, from the construction and operation of the HPP Barra Grande to be operated in the integrative modality, through centralized dispatch, according to the Contract of Concession and further Additional Terms signed between Brazil's National Agency of Electric Energy, ANEEL, and Energética Barra Grande.

This way, BAESA Project was not implemented to create emissions of greenhouse gases and, afterwards, eliminate them.

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

BAESA Project is under validation process through the CDM, Clean Development Mechanism.

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

It does not apply, once, as mentioned in the previous item, the entrepreneurs have just submitted BAESA project to CDM and the Project is under validation..

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

BAESA Project will have two participants: BAESA - Energética Barra Grande S.A. and Enerbio Consultoria Ltda.

Energética Barra Grande S.A is the proprietor of Barra Grande Hydro Electric Plant and it is responsible, in the condition of independent producer of energy, for implanting and operating the HPP Barra Grande. Energética Barra Grande S.A has as shareholders the companies (1) Alcoa Alumínio S.A., 42.1752%; (2) CPFL Geração de Energia S.A., (3) 25.0059%;Companhia Brasileira de Alumínio,(4) 15.0000%; (5) Camargo Corrêa Cimentos S.A., 9.0000% e (6) DME Energética Ltda., 8.8189%.

Enerbio Consultoria Ltda advises Energética Barra Grande S.A to develop VCS Project and to monitor the VCUs to be generated from BAESA Project.

Detailed information for contact with private entities involved in the project activity are related in tables below.

Table 5 – Contact information on participants in the project activity

Organization:	ENERGÉTICA BARRA GRANDE S.A – BAESA
Street/P.O.Box:	Madre Benvenuta Avenue, 1.168 – Santa Mônica
Building:	
City:	Florianopólis
State/Region:	Santa Catarina
Postfix/ZIP:	88035-000
Country:	Brazil
Telephone:	55 48 3331-0000
FAX:	55 48 3331-0031
E-Mail:	ana.karl@baesa.com.br
URL:	
Represented by:	
Title:	
Salutation:	Ms.
Last Name:	Karl
First Name:	Ana
Department:	Social Responsibility
Mobile:	
Direct FAX:	55 48 3331-0000
Direct tel:	55 48 3331-0031
Personal E-Mail:	ana.karl@baesa.com.br

Organization:	ENERBIO CONSULTORIA LTDA
Street/P.O.Box:	Carlos Gomes Avenue, 281, 202, Auxiliadora.
Building:	Business Centre Eugenio Gudin
City:	Porto Alegre
State/Region:	Rio Grande do Sul
Postfix/ZIP:	90480-003
Country:	Brazil
Telephone:	55 51 3392-1500
FAX:	55 513392-1504
E-Mail:	contato@enerbio-rs.com.br
URL:	www.enerbio-rs.com.br
Represented by:	Eduardo Baltar
Title:	
Salutation:	Mr.
Last Name:	Baltar
First Name:	Eduardo
Department:	Board of Directors
Mobile:	
Direct FAX:	55 51 3392-1504
Direct tel:	55 51 3392-1505
Personal E-Mail:	eduardo@enerbio-rs.com.br

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

Since the beginning of its implementation, BAESA Project considered revenues from the sales of assets related to the evidence of emission reductions.

Table below presents the registers and evidences about the actions BAESA developed during its implantation timetable, proving the benefits of revenues from emission reductions assets were and are fundamental to the decision of implementing the project.

Table 6: Events of BAESA Project and Evidences of CDM

Event	Event Date (mm/dd/yyyy)	Evidence
Constitution of the Companhia Energética Barra Grande S.A. - BAESA	09/17/2001	In 07/31/2001 CPFL Energia, one of the future shareholders of BAESA, authorizes, through Resolution nº 2001022/CPFL, the hiring of a consultant company for formatting a financial derivative (CERs), qualified to be internationally transacted, from avoided emissions of greenhouse gases. It was defined that CarboNetwork S/C Ltda would be hired to evaluate the potential of carbon credits generated by the activities and investments that CPFL Energia was developing at that moment and that would be developed in the future.
		CPFL Energia hires CarboNetwork S/C Ltda in 08/29/2001 to carry out studies on the potential of carbon market, aiming at estimating the revenues that may help to make investment projects viable.
Authorization Date of Construction Beggining	09/09/2002	In April 2002, it is given to CPFL Energia an analysis report on the incipient carbon market emerging of the discussions on climate changes. On page 32 of this report, the company's projects of investment in hydroelectric generation are described, and it is expressed that HPP Barra Grande's project is one that may obtain Certified Emission Reductions. In June, 2002, BAESA Board of Management decides that studies should be carried out to evaluate the potential of carbon credits to HPP Barra Grande. It was determined that professionals from CPFL Energia would realize an exposition about the subject. In the minutes of BAESA Management Board meeting of 09/30/2002, it is registered CPFL Energia's position that in case there is no definition regarding the deadline for liberation of third party resources to the entrepreneurship, the company would stop to invest financial resources on the entrepreneurship and would have its participation deluded.
Commercial Operation Starting Date of the three turbines of		Minutes of the BAESA Management Board meeting of September 27, 2007 register the presentation about Carbon

BAESA Project	05/01/2006	Credits carried out by the consulting company ATA (Ativos Técnicos e Ambientais – Technical and Environmental assets).ATA is a specialist in projects for obtaining carbon credits and was, at that time, serving ALCOA Company, one of the shareholders of the group. Meeting minutes register the considerations of the consultant delivering the speech. It was said that obtainment of CERs from the implementation of hydroelectric power plants is possible, but complicated from the point of view of Kyoto Protocol. Different interpretations about ACM0002 methodology are also mentioned, mainly in what concerns the calculation of emission factors. Further, it is highlighted that the method of calculation for emission factors of CO_2 to the National Interconnected System is being discussed between project developers and Brazilian Designated National Authority and that the result of this discussion must happen until the end of that year. From that presentation, BAESA starts a price competition among the companies that develop emission reduction projects. The Management Board meeting minute of December 4, 2007 register the request of information about the development of "carbon credit" issue and the information that a competition was taking place at that moment. In 26th February, 2008, BAESA published a Selection Process Edict aiming at hiring a consulting company to develop emission reduction projects. In 06/27/2008, BAESA hired Enerbio Consultoria to develop all activities related to emission reduction projects.

Although had considered essential to implement its entrepreneurship the revenues from selling emission reductions assets because of the lack of knowledge about how to develop Emission Reduction projects and the lack of definition existing in this market, BAESA decided to wait for more knowledge accumulation and for a greater maturity in the CDM market and in the Emission Reduction Voluntary Market to begin its projects.

1.17 List of commercially sensitive information (if applicable):

Project financial analysis spreadsheet has been excluded from the public version of the VCS PD but will be displayed on the VCS Project Database. Besides, all assumptions used in the spreadsheet elaboration will be supplied to the auditors and, if necessary, can also be available in the VCS Project Database.

2 VCS Methodology:

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

The methodologies that will be used are:

- Version 7 of Consolidated baseline and monitoring methodology ACM0002 - Methodology Consolidated for grid-connected electricity generation from renewable sources.

- Tool for Demonstration and Assessment of Additionality, Version 05.2.

- Version 01.1 of "Tool to calculate the emission factor for an electricity system".

For more information about the methodology consult the following link:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

ACM0002 consolidated methodology is applicable to grid-connected renewable power generation that involves electricity capacity additions:

- 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/m^2;
  - 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/m^2;
  - 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 result in new reservoirs and the power density of the power plant is greater than 4 W/m^2 as described on the table 7;

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad \textbf{Equation 1}$$

Where:

PD = Power Density of the project activity, in W/m^2
Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W);
Cap_{BL} = Installed capacity of the hydro power plant before of the project activity (W). For new hydro power plants, this value is zero;
A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2);
A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

The table 7 below evidences that HPP Barra Grande has a power density greater than 4 W/m2:

Table 7: Power Density of HPP Barra Grande

Item	HPP Barra Grande
Cap_{PJ}	708,000,000
Cap_{BL}	0
A_{PJ}	94,000,000
A_{BL}	0
PD	**7,3**

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

The National Interconnected System (from Portuguese Sistema Interligado Nacional - SIN) is managed by ONS, which is responsible for all activities related to the operation's planning. The ONS traditionally subdivides the National Interconnected System into four subsystems interconnected: the South Subsystem, the Southeast/Midwest Subsystem, the North Subsystem and the Northeast Subsystem. These Subsystems are related to the Brazilian geographic regions: South Region, the Southeast/Midwest Regions, the North Region and the Northeast Region.

Due to the offer's real availability and the consumption behavior in each region, ONS establishes inter-regional energy exchange politics, besides exceptional attitudes to thermal generation dispatch, in case the storage levels of water significantly reduce and tend to violate the security curves. These conditions are permanently monitored and available to the electric industry agents.

In May 2008, through the resolution nº 8, Brazilian DNA defined that the National Interconnected System should be considered a unique electricity system and that this configuration is valid for calculating the emission factors of CO2 used to estimate the emissions reductions of greenhouse gases of electricity generation connected to the national interconnected grid CDM projects.

According to ACM0002, version 07, the special extension of the Project boundaries includes the Project power plant and all power plants physically connected to the electricity system that the CDM Project power plant is connected to. The HPP Barra Grande is connected to National Interconnected System, more specifically to the South Subsystem.

BAESA Project presents emissions of CH_4 from its reservoir that will be calculated according to the methodology ACM0002, version 07. The baseline scenario includes the emission of CO2 that will be displaced by the project activity.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the table below:

Table 8: Emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the Project activity	CO2	Included	Main Emission Source. In the absence of the Project, the presence of coal thermoelectric plants in the National Interconnected System, more precisely in the South Subsystem, where BAESA Project is located, would cause emission of GHGs.
		CH4	Excluded	Minor Emission Source
		N20	Excluded	Minor Emission Source

	Source	Gas	Included?	Justification / Explanation
Project Activity	Hydropower Electricity Generation	CO_2	Excluded	As described on the item 2.2, table 7, the power density of HPP Barra Grande is greater than 4 W/m^2 and less than 10 W/m^2, therefore, therefore the emission of CH_4 from reservoir must be included in the project boundary.
		CH_4	Included	
		N_20	Excluded	

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

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, 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 to electricity generation connected to the grid CDM Projects used 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 to 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 to calculate were elaborated in cooperation between ONS, Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT).

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

According to what was presented in tables 2, 3 and 4 of the item 1.7, 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 being in this region.

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.

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

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 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".

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

[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].

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 version 05.2 of"Tool for Demonstration and Assessment of Additionality", as described below.

According to the Tool for Demonstration and Assessment of Additionality, to conduct the investment analysis, it must be used the following steps:

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 analyse the project activity of BAESA Project.

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

It will be used the project internal rate of return (IRR) as a project financial indicator, due to it is the most commonly and appropriate indicator used to infrastructure projects` investment analysis. As a benchmark, it will be used Weighted Average Capital Cost – WACC - of the project.

WACC (Weighted Average Capital Cost)

The Weighted Average Capital Cost is calculated through the composition of costs and the participation percentage of each source of capital in the company's capital structure. The BAESA Weighted Average Capital Cost was calculated according the equation below:

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

Equation 2

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

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

$Re = Rf + \beta i\ (ERP)$ **Equation 3**

Where:

Re = Cost of Equity;
R*f* = Rate of Return of a Risk Free Asset;
βi = Beta Coefficient;
ERP = Equity Risk Premium;

To calculation of cost of debt was used the entrepreneurship cost of lending plus cost of debentures.

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

Energética Barra Grande S.A. considers the project's cash flow confidential information and, thus, it will be presented entirely to the Designated Operational Entity which will perform the validation and to any entity linked to VCS that ask it for the purpose of proving the project's additionality. However, it will not be available in the VCS PD. The cash flow was elaborated for operational life of the project activity (35 years) and the assumptions used are presented below:

Table 9: Assumptions used at BAESA Project cash flow

General Data	
Installed Capacity	690.0 MW
Assured Capacity	380.0 MW
Concession Period	35 Years
Construction Period	57 months
Beggining of Turbines Operation	
Turbine 1 (dd/mm/yy)	31/10/05
Turbine 2 (dd/mm/yy)	31/01/06
Turbine 3 (dd/mm/yy)	30/04/06
Turbines Assured Electricity (MW)	
Turbine 1	207.0
Turbine 2	380.6
Turbine 3	380.6
Electricity Total Losses (%)	1.35%
Internal Consumption (%)	0.15%
Transmission (%)	1.2%
Total Investment (R$ thousand)	1,345,602
Capital Structure (R$ Thousand)	
Equity	R$ 398,383,79
Debt	R$ 947,218,94
Capital Structure (%)	
Equity	29.6%
Debt	70.4%

Debt	**Debt Cost**
Debentures (R$ 90,000,000)	105% of CDI
Debentures (R$ 90,000,000)	IGPM + 9.30%
BNDES (R$ 278.770.282,00)	TJLP + 3.125%
BNDES (R$ 302,601,129)	TJLP + 4.125%
BNDES (R$ 185,847,527)	UMBNDES + 3.125%
Electricity Price (R$/MW) - Base: Dec/2001	69.62
Taxes	
Taxes on Revenues	
Cofins (% on Gross Revenue)	3.00%
PIS (% on Gross Revenue - Deductible Expenses)	0.65%
Taxes on Profit	
Income Tax (Until R$ 240 thousand)	15.00%
Additional Income Tax (Above R$ 240 thousand)	25.00%
Social Contribution	9.00%
Other Taxes	
Income Tax on Financial Revenues	20.00%
Income Tax on Interest over Equity	15.00%

Observations:

- *CDI – Interbank Deposit Certificate*
- *BNDES – National Bank of Economic and Social Development;*

- *IGPM – General Index of Market Prices;*
- *TJLP – Long Term Interest Rate;*
- *UMBNDES – Currency used by BNDES for loan indexed to foreign currency;*

The project internal rate of return resulting from the cash flow elaborated according to assumptions above is 14.429% per year, in nominal terms and in real terms (discounted by the projection of IGPM Index) is 7.80% per year.

To calculate the weighted average capital cost was used the following assumptions:

Cost of Equity:

To calculate the cost of equity, using the equation 3, the parameters adopted were the following:

- Re = Cost of Equity;
- R*f* = Rate of Return of U.S. Treasuries (T-Bond) of 30 years[8] + Median of Brazilian Risk between 1998 and 2002[9] + Average of Adjustment between U.S[10] Inflation and Brazilian Inflation[11] between 1998 and 2002
- β*i* = Project Beta. To calculate the Project Beta, it was used the following steps: 1º Step – It was obtained the Levered Beta between the Electric Energy Index (IEE)[12] and the Bovespa Index (Índice Ibovespa) [13] for the period of 1998 to 2002; 2º Step – The Beta was Unlevered according the average capital structure of the companies that compose the IEE[14]; 3º Step – The Unlevered Beta was levered again according to the capital structure of the project. This Levered Beta was used for calculation of BAESA Project cost of equity.
- ERP = Equity Risk Premium in Brazil for the year of 2001, calculated by Aswath Damodaran[15] according to data of Standard & Poors.

The table below presents the values used to cost of equity calculation.

[8]Source: http://www.bloomberg.com/markets/rates/index.html

[9] Calculated Through the Average of the Index Índice EMBI + Brasil, available at: http://www.cbonds.info/index/search.php

[10] To measure the American Inflation the Index CPI – U. Available at: ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt

[11] To measure the Brazilian Inflation the Index IPCA was used. Available at: http://pt.wikipedia.org/wiki/Infla%C3%A7%C3%A3o#Hist.C3.B3rico_do_Quadro_Inflacion.C3.A1rio_no_Brasil

[12] The Electric Energy Index is composed by the stocks of the most representatives companies in the electric industry in the São Paulo Stock Exchange. Source of Data: São Paulo Stock Exchange. Available at: http://www.bovespa.com.br/Mercado/RendaVariavel/Indices/FormConsultaAnuaisFechDia.asp?Indice=IEE

[13] Index calculated by São Paulo Exchange (Bovespa) which reflects medium performance of prices in Brazilian Stock Market. Stock that integrates Bovespa Index answers for more than 80% of number of negotiations and financial volume commercialized on cash market of São Paulo Exchange. Available at: http://www.bovespa.com.br/Mercado/RendaVariavel/Indices/FormConsultaApresentacaoP.asp?indice=Ibovespa

[14] The source of the data of the companies than compose the IEE and their capital structure was São Paulo Exchange (Bolsa de Valores de São Paulo). Available at: http://www.bovespa.com.br/Mercado/RendaVariavel/Indices/FormConsultaCarteiraP.asp?Indice=IEE

[15] *Source: Based on Standard &Poors Data, available at "Risk Premium for Others Markets" of Section "Updated Data" of website http://pages.stern.nyu.edu/~adamodar/ http://pages.stern.nyu.edu/~adamodar/

Table 10: Values Used on Cost of Equity Calculation

Parameters	
Rf - Risk Free Asset Tax (Treasury - 30 years)	5.01%
Brazilian Risk	9.85%
Inflation Adjustment	4.90%
Project Beta	**1.11**
Levered Beta	0.65
Unlevered Beta	0.43
Levered Beta - Project Capital Structure	1.11
Risk Premium	**10.01%**
Nominal CAPM	**30.90%**

The cost of equity is 30.90% per year in nominal terms. In real terms, discounted the American inflation of the period 1998 to 2002 (CPI Index), the cost of equity is 27.90% and in real terms, discounted the IPCA Index of the same period; the cost of equity is 21.93%.

Cost of Debt:

The cost of debt is based on costs of each source of third parties capital of BAESA Project. Cost of debt is described on table 9. BAESA Project will count with lending contracts of BNDES (National Bank for Economic and Social Development) indexed to TJLP and indexed to a composition of currencies through the UMBNDES, added by a risk spread. Cost of Debt also considers two debentures emissions in a total amount of R$ 90,000,000 (each one). First debentures emission has an estimated cost based on IGPM + 9.30% and the cost of the second emission was defined as 105% of CDI.

For estimation of BNDES lending cost, it was obtained an average of TJLP and UMBNDES for the period 1998 to 2002 and it was added the spread for each lending part. TJLP average for the period was 11.00% and the average of UMBNDES was 8.85%. For estimation of debentures cost, it was also obtained and average of IGPM and CDI for the same period, resulting in an average of 13.50% and 21.58%, respectively.

Cost of debt is formed, therefore, according the participation percentage of each source of third party capital and its cost. The calculation of cost of debt will be supplied with the WACC calculation spreadsheet to DOE that will execute project validation. Cost of debt of BAESA Project is 15.66%

Weighted Average Capital Cost

The capital structure of the project was projected in 29.6% of equity and 70.4% of debt, as described on table 9. This way, considering the cost of equity of 30.9%, the cost of debt of 15.66%, an Income Tax plus Social Contribution of 34% and applying the equation 2 described previously, there is a nominal WACC of 16.42%.

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

Table 11: Project Internal Rate of Return x WACC

Nominal Project IRR	Nominal WACC
14.429%	16.42%

WACC is 16.42% per year in nominal terms. In real terms, discounted the U.S. Inflation of the period 1998 to 2002 (CPI Index), there is a WACC of 14.31% and in real terms, discounted IPCA Index (Brazilian Inflation) of the same period, there is a WACC of 10.09%.

The fact that IRR is less than WACC of the project evidences that the revenue from selling emission reduction assets was important to the financial project attractiveness.

The benchmark analysis was used (Option III) and it showed that project indicator is less favourable than benchmark, then, it can be said that the Project Activity cannot be considered as financially attractive.

Sub-step 2d. Sensitivity analysis

The main variables that might affect the project's finance would be the electricity price and the total amount of investment. The sensitivity analysis considers just the scenarios which contribute to increase the project's financial and economic attractiveness with the objective to confirm how solid the sub-step 2b and 2c's analysis is. Table below presents the results for the main parameters variation which can affect project's cash flow.

Table 12: BAESA Project Sensitivity Analysis

VARIATION ON ELECTRICITY		
Projected Situation	**MWh Price**	**Nominal Project IRR**
0%	**R$ 69.62**	**14.429%**
5%	R$ 73.10	14.436%
10%	R$ 76.58	14.443%
VARIATION ON INVESTMENT TOTAL AMOUNT		
Projected Situation	**Investment (R$ 1,000)**	**Nominal Project IRR**
-10%	R$ 1,211,042	15.609%
-5%	R$ 1,278,322	15.176%
0%	**R$ 1,345,603**	**14.429%**

The total amount of investment is the main item which can affect project's cash flow. The investment's projection is based on macroeconomic, climatic and technologic scenario that shows uncertainties which might burden the investment and to cause a total amount increase. Therefore, the total amount of investment reduction scenario, presented on Sensitivity analysis, is difficult to occur.

This fact can be proved by the current financial situation of the project. The current nominal Project IRR, after the occurrence of the most part of the investments to implant the entrepreneurship is 2.81% per year. In fact, it was verified a necessity of an increase of the investment amount and not a decrease.

Electricity Price signed in PPAs (Power Purchase Agreement) was established in the same values used in the initial financial projection of the project (R$ 69.62 R$/MW). PPAs signed will be delivered to DOE that will execute the validation process.

The sensitivity analysis demonstrates that BAESA Project is not financially attractive once the entrepreneurship's internal rate of return is lower than the reference indicator in all scenarios analyzed.

The tool for demonstration an assessment of additionality says that:

"If after the sensitivity analysis is concluded that the proposed CDM project activity is unlike to be the most financially attractive or is unlikely to be financially attractive, then proceed to Step 3 (Common practice analysis)."

Therefore, as the sensitivity analysis having shown that the proposed activity is not attractive in the financial point of view, we should proceed to the third step (the analysis of common practices).

Step 3: Commom Practice

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

It follows a summary of the numbers of electricity generation entrepreneurships in operation in the states of Rio Grande do Sul and Santa Catarina, according information present in ANEEL website:

Table 13 - Number of electricity generation entrepreneurships in operation in the states of Rio Grande do Sul and Santa Catarina - Consolidated (Source: ANEEL[16])

Number of Entrepreneurships in Operation		
Type	**Quantity**	**%**
CGH	69	34.3%
EOL	6	3.0%
PCH	58	28.9%
UHE	19	9.5%
UTE	49	24.4%
Total	**201**	**100**

Table presented show that 9.5% of electricity generation entrepreneurships in the states of Rio Grande do Sul and Santa Catarina is 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[17], 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. Table 14 shows the description of the national energetic generation matrix as a whole, in which this affirmation can be checked (data from July, 2008).

[16] http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2

[17] Atlas of Electric Energy in Brazil / National Agency of Electric Energy, pages 45. (*Atlas de Energia Elétrica do Brasil / Agência Nacional de Energia Elétrica, Páginas 45-46. – Brasília: ANEEL, 2002.*)

Table 14 – Number of electricity generation entrepreneurships in operation in Brazil (Fonte: ANEEL[18])

Number of Entrepreneurships in Operation		
Type	**Quantity**	**%**
CGH	220	12.8%
EOL	16	0.9%
PCH	303	17.7%
SOL	1	0.1%
UHE	159	9.3%
UTE	1,012	59.1%
UTN	2	0.1%
Total	**1,713**	**100**

Caption for Table 13 and 14:

- *CGH: Hydro Power Plant Central Generation (Installed Capacity smaller than 1 MW)*
- *EOL: Wind Power Plant*
- *PCH: Small Hydro Power Plant (Installed Capacity Greater than 1 MW and Smaller than 30 MW)*
- *UHE: Hydro Power Plant (Installed Capacity Greater than 30 MW)*
- *UTE: Thermal Power Plant;*
- *SOL: Solar Power Plant*
- *UNT: Nuclear Power Plant*

As an example of Hydroelectric Power Plant that has an installed capacity similar to the one in BAESA Project, it can be mentioned Capivara Power Plant, located in the state of Paraná, another state in the Southern region of the country, which has an installed capacity of 640 MW, with a flooded are of 609 km². This power plant was built in 1970 by the state company CESP and is currently under the management of a private company named Duke Energy International Generation. This power plant is a typical example of entrepreneurships of energy generation historically built in the country that show greater installed capacity: projects elaborated and implemented by state companies with low power density, due to the large volume of flooded area. In this example, the power density of the project is 1.05 MW/km².

The great part of hydropower project in the country has an installed capacity less than 30 MW, fact proved of ANEEL Date present on table 14, which evidences that the participation of small hydropower plants with installed capacity less than 30 MW is 30.5% of the total number of electricity generation projects in Brazil and hydropower plants with installed capacity higher than 30 MW corresponds to just 9.3%. This fact is once more verified on Rio Grande do Sul and Santa Catarina (states involved on the project) data present on table 13.

Regarding large scale hydroelectric projects (whose installed capacity is above 30 MW) in operation in Brazil, it is necessary to emphasize some predominant characteristics. The great majority of these entrepreneurships was developed by state companies or organs with complete subside from the public sector and with access to better financing conditions. In the case of big hydroelectric power plants that are under the control of companies in the current private sector in Brazil, it is observed that this fact has become possible through the opportunities of acquisition, by private capital companies, of great public hydroelectric power plants in operation during the process of privatization of the electric sector, which took place in the recent past. In these cases, private companies presented interest in investing on this kind of entrepreneurship, due to the mitigation of the various risks involved in the process of construction of this kind of the project.

[18] http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2

It is still important to stress that, according to Brazil's Atlas of Electric Energy[19], in 2002, 23 Hydroelectric Centrals in the country with capacity of generation above 1,000 MW corresponded to 71.4% of its installed capacity, being the power plant of ITAIPU responsible for about 20% of the total installed capacity of hydroelectric generation in the country in that year. According to this study[20,] there were in 2002 only 8 hydroelectric power plants with installed capacity ranging from 501 MW to 1,000 MW in operation in the country, namely:

Table 15 – Brazilian Hydro Power Plants in Operation in Brazil in the year 2002 with Installed Capacity between 501 MW and 1.000 MW

Plant	Owner*	City-State	Capacity(MW)
Henry Borden	Empr. Metropolitana de Águas e Energia S/A	Cubatão - SP	889.0
Três Irmãos	Companhia Energética de São Paulo	Pereira Barreto – SP	807.5
Paulo Afonso III	Companhia Hidroelétrica do São Francisco	Delmiro Gouveia – AL	794.2
Cachoeira Dourada	Centrais Elétricas Cachoeira Dourada	Cachoeira Dourada – MG	658.0
Capivara	Duke Energy e Geração Paranapanema S/A**	Porecatu – PR	640.0
Taquaruçu	Duke Energy e geração Paranapanema S/A**	Sandovalina – SP	554.0
Itaúba	Companhia Estadual de Energia Elétrica	Pinhal Grande – RS	512.4
Nova Ponte	Companhia Energética de Minas Gerais	Nova Ponte - MG	510.0

**Owners in 2002.*

*** Power Plants were built by estate company CESP (Companhia Energética de São Paulo) and, during the privatization process, they were sold Duke Energy e Geração Paranapanema S/A*

All the entrepreneurships that had installed capacity similar to the one in BAESA Project, mentioned in table 15 above, 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[21], 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.

[19] Brazil's Atlas of Electric Energy/ National Agency of Electric Energy (Atlas de Energia Elétrica do Brasil / Agência Nacional de Energia Elétrica), page 32. – Brasília: ANEEL, 2002.

[20] Brazil's Atlas of Electric Energy/ National Agency of Electric Energy (Atlas de Energia Elétrica do Brasil / Agência Nacional de Energia Elétrica), page 33. – Brasília: ANEEL, 2002.

[21] Atlas of Electric Energy in Brazil / National Agency of Electric Energy, pages 45-46. (*Atlas de Energia Elétrica do Brasil / Agência Nacional de Energia Elétrica, Páginas 45-46. – Brasília: ANEEL, 2002.*)

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 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 Monitoring:

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

The 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 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 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.

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

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. 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 07.

In the periodic monitoring which 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 Emissions Reductions (tCO2e);

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 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 sale if it is necessary.

The emission factor for power generation connected to Brazilian National Interconnected System will be made available by Ministry of Science and Tecnology (MCT) with data of National System Operator, ONS. The variables EFgrid,OM,y and EFgrid,BM,y will be calculated and monitored by Enerbio Consultoria through the dispatch data of National Interconnected System.

Emission and emission reduction provided by the project activity will be monitored by project participants, as described on Monitoring Plan, using for the emission reduction 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 responsibilities of the project participants in project monitoring are described on item 3.4.

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

Data / Parameter:	**Electricity Supplied to the Grid (EG_y)**
Data unit:	MWh
Description:	Electricity supplied by the project activity to the grid
Source of data to be used:	Project Activity Site (Meters).
Value of data applied for the purpose of calculating expected emission reductions	It was used the diference between the assured electricity of HPP Barra Grande, 380.6 MW, according the Concession Contract, and the projection of internal consumption of 0.361 MW to calculate expected emission reductions.
Description of measurement methods and procedures to be applied:	Spreadsheets will be used, obtained directly from the meters with information generated hourly, or according to what was programmed by CCEE. Monthly, the information will be 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 located in the substation that registers the net electricity supplied to the System by the Unit.
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 it will be checked by spreadsheets available at the CCEE`s Website (information comparison between operation data and CCEE reports).
Any comment:	*CCEE - Entity responsible for measurements, accounting and settlement on Brazilian electric energy market.

Data / Parameter:	**Total Electricity Generated (TEG_y)**
Data unit:	MWh
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y.
Source of data to be used:	Project Activity Site
Value of data applied for the purpose of calculating expected emission reductions	This data was used to calculate the expected emission reduction just for project emissions calculation, more specifically for reservoir emission calculation. The value used corresponds to assured energy value of HPP **Barra Grande**

	(380.6 MW).
Description of measurement methods and procedures to be applied:	Spreadsheets will be used, obtained directly from the meters with information generated hourly or according to what was programmed by CCEE. Each Generation Unit has one specific meter located in the Powerhouse that registers gross electricity generated by the Unit.
QA/QC procedures to be applied:	The uncertainty level for these data is low. The electricity generated will be monitored by the project participants.
Any comment:	

Data / Parameter:	**($EF_{grid,CM,y}$) Combined Margin CO_2 Emission Factor**
Data unit:	tCO_2/MWh
Description:	The 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 combined margin CO2 emission factor used on BAESA Project will be calculated based on data supplied for the National Interconnected System by Brazilian DNA.
Source of data to be used:	Ex-post emission factor will be calculated by project participants with data supplied by MCT with the ONS data. The variables EFgrid,OM,y and EFgrid,BM,y, necessary for EFgrid,CM,y calculation, will be also monitored and calculated by MCT and ONS, through the Dispatch Data of the National Interconnected System.
Value of data applied for the purpose of calculating expected emission reductions	The values of Combined Margin CO_2 Emission Factor ($EF_{grid,CM,y}$) which were used for ex-ante estimation of BAESA Project emission reduction is 0.1842 which was obtained from simple arithmetic average of National Interconnected System monthly EFgrid,CM,2007.
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".
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.
Any comment:	

3.4 Description of the monitoring plan

The Monitoring Plan is elaborated according to the Monitoring Methodology included in the consolidated baseline methodology for grid-connected electricity generation from renewable sources connected to the Grid ACM0002, version 07.

The HPP Barra Grande 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. Each generator unit has three measures instruments. One of them is located in the Powerhouse and it measures the gross electricity generated by the unit and two of them, called "Principal" and "Retaguarda" (Rear), are located in the substation with the objective of measuring net electricity.

Measurements activities are carried out by the operators of the operation team. HPP Barra Grande follows the ONS Grid Procedures to make the calibration of its electricity meters.

It follows below the description of how is structured the Measurement System and the responsibilities of the involved in the process.

1. **Measurement Billing System – SMF**

SMF is a system composed by: (i) electricity meters "principal" and "retaguarda" (rear); (ii) transformers for instrument (TIs) – transformers of potential and electric current; (iii) communication channel between agents and CCEE and (iv) Electric Power Data Collection System for billing (SCDE).

Technical Specifications of Measurement for Billing, present in Annex I of Sub module 12.2 of ONS Grid Procedures, supplies technical requirements for SMF, which all agents must meet.

In HPP Barra Grande, there is a Measurement Billing System 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 has direct access to the mass memory of the electricity meters.

2. Electric Power Data Collection System **- SCDE**

It is the computational system implemented by CCEE for automatic collection of electricity generated and/or consumed data of each agent associated to CCEE, for settlement and accounting of electricity traded in the National Interconnected System. This collection can occur in two ways: (i) direct, where CCEE has daily access to the mass memory of each SMF electricity meter implemented in theses agents and (ii) indirect which it is one collection through one UCM (Measurement Central Unit) which compiles data of generation/consumption and it send to SCDE in CCEE.

For electricity data collection, CCEE runs a routine called "daily collection", where it registers data of generation/consumption of each agent in SCDE. To audit these data, CCEE runs another periodic routine called "logic inspection"

a. Electric Power Commercialization Chamber (CCEE) Responsibility:

To specify technical requirements of SMF in commom agreement with ONS to comply with the necessity of information for electricity accounting. Through SCDE, CCEE collects daily electricity generation data in the meters of the HPP Barra Grande Measurement Billing System (SMF)

b. HPP Barra Grande Responsability:

To keep the Measurement Billing System working and available for daily collection and for logic inspection of CCEE.

3. Data Consolidation in CCEE:

In the first week of each month, CCEE consolidates generation data of the previous month and, if there is any inconsistency or mistake between collected data, it generates an e-mail, informing the agent about the missing or inconsistent data and requires to BAESA the adjustment of this data in the SCL - Accounting and Settlement System and the reason for this adjustment necessity.

In case of unavailability of any measurement point, due to maintenances, commissioning or for any other reason, the methodology of data estimation will be used according to the item 14.3 of the Commercialization Procedure PdC ME.01.

4. Data Consolidation in HPP Barra Grande:

In the first week of each month, HPP Barra Grande 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.

5. Confronting of the internal generation data with the third part reports:

Information present in internal control generation spreadsheet will be confronted with SCDE spreadsheet. The spreadsheets of SCDE provides 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.

6. Information Storage:

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

Periodically, the Information Technology Area accomplishes a 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.

7. Training of Operation and Maintenance:

All HPP Barra Grande operators are certified according technical procedures required by ONS, aiming at ensuring quality, security and reliability in the SIN operation. This certification occurs every 3 years.

Furthermore, members of operation team participate in specific training for the function and in training programs for specific projects of the company, for example, for the implementation of ISO 14001.

8. *Emission Factor*

The emission factors will be calculated each year as described on the item B.6.2. To calculate the emission factors will be used data supplied by Ministry of the Science and Technology (MCT) (www.mct.gov.br), institution which chairs the Brazilian DNA.

9. Project Emissions

The emissions of the project will be calculated according methodology ACM0002, version 07 and it will be monitored monthly and consolidated annually by project participants. The emission of the project will be accounted in Ton CO2e.

10. Monitoring Period

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 changed.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

According to ACM0002 methodology (version 07), the emission reduction are calculated as follows:

$ERy = BEy - PEy - LEy$ **Equation 4**

Where:

ERy = Emission Reduction 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)

PEy Calculation (project emissions in year y (t CO_2e/year))

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:

$$PEy = \frac{EFRes * TEGy}{1000} \qquad \textbf{Equation 5}$$

Where:

PEy = Emission from reservoir expressed as tCO_2e/ano;
EFRes = is the default emission factor for emissions from reservoirs, and the default value as perEB23 is 90 Kg CO_2e/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.

As described on the table 7 on the item 2.2, the power density of HPP Barra Grande is 7.53 W/m2, therefore, greater than 4 W/m2 and less than 10 W/m2. Therefore, for BAESA Project, Project emissions (PEy) will be calculated according equation 5.

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 CO_2e/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:

$$BEy = (EGy - EGbaseline) * EFgrid,CM,y \qquad \textbf{Equation 6}$$

Where:

BEy = Baseline Emission in year y (t CO_2e/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 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 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:

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

Equation 7

Where:
EFgrid, BM,y = Build margin CO_2 emission factor in year *y* (tCO_2e/ MWh)
EFgrid, OM,y = Operating Margin CO_2 emission in year *y* (tCO_2e/ 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 will be calculated ex-post. As it was already mentioned, 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).

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 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, for BAESA Project, it was adopted the following weights: W_{OM} = 0.50 and W_{BM} = 0.50.

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

As described on item 4.1, the quantification of baseline scenario emission will be done according recommended by version 07 of ACM0002 methodology that 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 baseline emissions are, therefore, calculated according equation 4, described on item 4.1.

As HPP Barra Grande is a new power plant to be connected to the interconnected grid, therefore, the EGbaseline is 0 (zero).

The combined margin emission factor EFgrid,CM,y will be calculated as follows:

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

Equation 7

The operating margin of CO2 emission factor and the build margin of CO2 emission factor will be calculated ex-post from electricity generation verified in Brazilian Interconnected System registered by ONS.

Therefore, operating margin of CO2 emission factor and the build margin of CO2 emission factor will be obtained and calculated directly from data made available by MCT (Brazilian DNA for CDM) and dispatch data of ONS.

For the first crediting period of BAESA Project, it will be adopted the following weights: WOM = 0.50 and WBM = 0.50.

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

As described on item 4.1, BAESA Project emissions will be calculated according equation below:

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

$$PEy = \frac{EFRes * TEGy}{1000} \qquad \textbf{Equation 5}$$

Where:

PEy = Emission from reservoir expressed as tCO_2e/ano;
EFRes = is the default emission factor for emissions from reservoirs, and the default value as perEB23 is 90 Kg CO_2e/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).

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

As described on item 4.1, project emission reduction will be calculated according version 07 of ACM0002 methodology, following equation 4. As mentioned previously, LEy is zero. Therefore, emission reduction is calculated as an simplification of equation 4, as described below:

ERy = BEy – PEy

Where:

ERy = Emission Reduction in year y (t CO2e/yr)
BEy = Baseline emissions in year y (t CO2e/yr)
PEy = Project emissions in year y (t CO2e/yr)

Calculation of BEy and PEy follows the described on items 4.2 and 4.3.

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 infra-structure projects whose involves impacts to more than one state.

Aiming at providing a general view on the procedure used in the environmental licensing for a hydroelectric power plant project in Brazil which includes more than one state, it is presented below a section taken from Ibama's website:

> *"The process of environmental licensing has three different phases: Prior Licensing, Installation Licensing and Operation Licensing. Prior License (PL) must be requested to IBAMA in the planning phase of the implantation, alteration or enlargement of the entrepreneurship. This license does not authorize the installation of the project, but approves the environmental viability of the project and authorizes its location and technological conception. Besides, it establishes the conditions to be considered in the development of the executive project. The Installation License (LI) authorizes the start of the work or installation of the entrepreneurship. The deadline for this license is established by the timetable of installation of the project or activity, which cannot be superior to 6 (six) years. The Operation License (LO) must be requested before the entrepreneurship begins its operation, since it is this document that authorizes its function. Its issuance is conditioned to an inspection to verify whether all the demands and technical details described in the project approved were developed and met throughout its installation and whether they are according to what is expected in the LP and LI. During the licensing process, IBAMA listens to the Environmental Organs (EO) involved in the licensing and to the Federal Organs of Management of Historic Patrimony (Órgãos Federais de Gestão do Patrimônio Histórico – IPHAN), to Indian Communities (FUNAI), Communities of Quilombolas (Fundação Palmares), to endemic control (FUNASA), among others. To subsidize the LO phase, the entrepreneur elaborates a group of reports, describing the implantation of the environmental programs and mitigating measures expected in the phases of LP and LI".*[22]

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 is 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) - - nº 447/2005
    - Signed on: 07/04/2005 (mm/dd/yyyy).
    - Renewed on: 01/14/2008 (mm/dd/ yyyy);
    - Valid until: 01/14/2014 (mm/dd/ yyyy)

When renewing BAESA Project Operation License, issued on 01/14/2008, some technical requirements were demanded, being a condition for the maintenance and renewal of the License necessary to the project operation:

[22] http://www.ibama.gov.br/licenciamento/index.php

- Keep the Programs of Technical and Social Assistance and present annual reports on the activities, including a system to attend economic-financial issues of the properties;
- Present, in the Monitoring Reports, evaluation with the checking of indicators of economical and social insertion of the families served by the Program of Technical and Social Assistance;
- Present annual monitoring reports of the impact on the vitality of the surrounding communities, according to programs indicators and others that may infer the revitalization of these communities;
- Continue with actions developed to prevent endemic diseases in the reservoir's area of influence, according to the local and regional health organs;
- Keep the Unity of Service to the Population Affected by the implantation of the entrepreneurship, in an easily accessible place, throughout the period of concession of the Plant, which should be amply divulged to the interested parties;
- Present a report on the programs of local development promotion aimed at the third sector in the municipalities of Anita Garibaldi/SC, Pinhal da Serra/RS and Esmeralda/RS, in which it can be inferred the effective participation of the entrepreneur and effective partnership along with public institutions and non-governmental organizations;
- Conclude, according to the physic-financial timetable and Commitment Terms with the beneficiaries, the construction for collective rural resettlement;
- Continue with the Monitoring of slopes surrounding the reservoir;
- Continue with the Program for Recuperation of Degraded Areas according to the guidelines obtained in the seminar of December 06, 2007 and IBAMA's recommendations;
- Continue the monitoring of *Dyckia distachya* and other relocated rheophytes; work along with research institutions for the development of projects of genetic census of the relocated species, aiming at assessing the genetic variability of *Dyckia distachya* population; and present reports referring to *Dyckia distachya* and to the diagnosis and inventory of species of rheophytes;
- Continue with the Program of Forest Reposition according to the guidelines obtained in the seminar of December 06, 2007 and IBAMA's recommendations; and present reports every semester containing the methodology employed in each area, the seedlings quantitative, the species used, the quantitative of areas recuperated, and aims for the following months;
- Guarantee the monitoring of the Ichthiofauna;
- Continue the Fauna Monitoring using the same methodologies and areas employed in the periods before and during the fillings of the reservoir in order to compare the results obtained;
- Present annual reports on the monitoring of the quality of water.

As it can be seen, the actions required by the environmental licensing organ refer fundamentally to the continuity of the programs and methodologies of mitigation of environmental impacts that were and are being developed in the implantation of BAESA Project, proving the quality and seriousness of the company regarding environmental issues.

In Environmental Basic Project (from the Portuguese: Projeto Básico Ambiental - PBA) of HPP Barra Grande, it was elaborated 6 programs and 26 projects with the objective of providing the minimum possible environmental impact on the region. Throughout the period of construction and beginning of operation, it was invested by BAESA approximately R$209 millions on this PBA projects and conditions of the environmental licensing, as it is demonstrated in the summary-table below:

Table 21 – Financial Resources Invested in the Programs of Environmental Basic Project

PROGRAMS OF ENVIRONMENTAL BASIC PROJECT	**R$ (thousand)**
Social-economic and cultural program	**129,761**
Rearrangement and compensation of population	116,501
Restructure and Revitalization of surrounding communities	2,980
Recuperation and Preservation of Historical and Cultural Patrimony	437
Recuperation and Preservation of Landscape Patrimony	127
Recuperation and preservation of Archeological Patrimony	2,597

Adequacy of the infra-structure of Municipal Services	6,446
Environmental Education	673
Hydrology, climatology and water quality Program	**5,180**
Observation of Hydrological Conditions	520
Observation of Climatological Conditions	450
Observation of Limnological and of water quality conditions	1,200
Monitoring of Aquatic Macrophytes	250
Monitoring and handling of the Ichthiofauna	2,000
Observation of Hydrosedimentological Conditions	250
Integrated Actions of Soil and Water	510
Geotechnology Program	**10,371**
Seismic Monitoring	500
Monitoring of the exploitation of Mineral Resources	8
Monitoring of aquifers	450
Monitoring of marginal slopes	230
Handling and recuperation of flora and fauna	2,500
Reforestation	3,700
Partnership with Embrapa Recursos Genéticos (Embrapa Genetic Resources)	1,500
Monitoring of *Dyckia*	650
Application of Resources on Units of Conservation	833
Physical environment programs	**15,784**
Cleanness of the Accumulation Basin	15,481
Management and Recomposition of the construction areas	303
Management program	**3,730**
Management of the reservoir	803
Monitoring and assessment of Environmental Basic Project	827
Social communication	**2,100**
Conditions of ASV	**23,706**
Social Agreement	**19,885**
Total	**208,417**

All investments on 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. As mentioned previously, 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.

Among the prizes received by the company for its outstanding socio-environmental action, we can mention: Mário Henrique Simonsen Award – Excellence in Social Balance (promoted by the National Foundation of Management Support); Fitz Muller Award – category of environmental education (promoted by the Environmental Foundation of Santa Catarina) won for 2 years; and Empresa Cidadã (Citizen Company) – category of environmental preservation (promoted by Association of Sales and Market Directors of Brazil – Division of Santa Catarina).

Furthermore, other indicator of the success of the Environment Programs developed by the company, it can be mentioned the poll carried out by the company Lupi & Associados with 621 inhabitants of the municipalities covered by the Power Plant, which points that 88.3% of them have favorable opinions about the entrepreneurship.

The pictures presented on item 9 show the seriousness of the socio-environmental work that has been executed in the implantation of BAESA Project.

6 Stakeholders comments:

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 your licensing process.

Furthermore, Project Proponents sent letters to stakeholders, inviting them to make comments about the project. 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.

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 were received.

7 Schedule:

As presented on table 6 of item 1.16, the revenues from selling assets related to emission reductions of green house gases were seriously considered since the project beginning. The main steps of the project evolution are described on that table.

Below, it is described the project schedule, according the VCS criteria and according the GHG project cycle.

Event	**Period (mm/dd/yyyy)**
Project Start Date	11/01/2005
Starting date of Crediting Period	01/01/2006
Verification of the period: 01/01/2006 to 12/31/2008	Initial Date - 09/01/2008 Final Date Expected: 03/15/2009.
Verification of the period: 01/01/2009 to 12/31/2009	Until 05/ 30/2010
Verification of the period: 01/01/2010 to 12/31/2010	Until 05/ 30/2011
Verification of the period: 01/01/2011 to 12/31/2011	Until 05/ 30/2012
Verification of the period: 01/01/2012 to 12/31/2012	Until 05/ 30/2013
Verification of the period: 01/01/2013 to 12/31/2013	Until 05/ 30/2014
Verification of the period: 01/01/2014 to 12/31/2014	Until 05/ 30/2015
Verification of the period: 01/01/2015 to 12/31/2015	Until 05/ 30/2016

8 Ownership:

8.1 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.

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

BAESA Project still does not take part in any activity included in an Emission Trading Program. Moreover, the Project is not developed in any place with mandatory limits of greenhouse gases emission reduction. BAESA Project is under validation in the CDM.

9 Photos:

SOME PHOTOS OF ENVIRONMENTAL PROGRAMS DEVELOPED BY BAESA

- Residence of families relocated by BAESA Project

Before the Project:

After the Project:

- Residence of families relocated by BAESA Project

Before the Project:

After the Project:

- Churches and multifunctional gymnasium built by BAESA

- Multifunctional gymnasium built by BAESA

- Social Assistance Program

Meeting with Rural Workers

Educational Program for Young People

Delivery of limestone to the Population

Delivery of Seedlings to the Population