CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Project title: CDM Project of Moinho and Barracão Small Hydropower Plant (hereafter referred to as "SHPs Moinho and Barracão Project").

PDD Version number: 2.

Date: September 08th, 2008.

A.2. Description of the project activity:

The project activity consists on the supply of clean hydroelectric energy to the Brazilian National Interconnected System (SIN) through the implantation and operation of Small Hydropower Plants (SHPs) Moinho and Barracão, located in the state of Rio Grande do Sul, Southern Region of Brazil, with an installed capacity of 25.7 MW, using a small reservoir, with low environmental impact.

The main objective of the SHPs Moinho and Barracão is to help attend the growing demand for energy in Brazil, due to the country's economical and population growth, supplying clean and renewable energy, 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 project activity reduces the emissions of green house gases (GHG), avoiding the generation of electricity through sources of fossil fuels with consequent CO_2 emissions, which would be produced if the project did not exist. The supply of clean and renewable electricity will bring and important contribution to environmental sustainability, reducing the emissions of carbon dioxide taking place in the absence of this project.

SHPs Moinho and Barracão are entrepreneurship of Desenvix S.A, which was created in 1995 to develop new businesses, especially in the area of electric energy generation in three states of Brazil (Rio Grande do Sul, Santa Catarina and Rio de Janeiro) through its controlled companies.

Desenvix S.A. is controlled by Engevix Engenharia S.A, which holds 100% of the social capital and its directors are the same shareholders of the controller company. The history of Desenvix S.A., despite recent, reflects more than four decades of development and growth of its controller company.

Engevix is a Brazilian company, specialized in the services of advisory engineering, responsible for the elaboration of projects, integration and management of entrepreneurships in the area of energy, industry and infrastructure. It has more than 42 years of history and has a strong action in and outside Brazil in the sector of hydraulic, thermal and nuclear and through alternative sources of energy generation; transmission and distribution of energy, construction on urban transportation and sanitation, among others sectors. Engevix operates with 1,4 thousand collaborators and has offices in Brazil in the cities of Florianopolis, São Paulo, Rio de Janeiro, Brasília and Curitiba, as well as abroad, in countries such as Angola and Mexico.

Proof of its capacity of realization are the participation in huge projects as the hydroelectric plants of Itaipu, Tucuruí, Capivara, Volta Grande, Salto Caxias, Canoas I and II; Nuclear Plant Angra II; Metropolitan trains in São Paulo, Rio de Janeiro, Belo Horizonte and Porto Alegre, Subways in São Paulo, Baghdad and Rio de Janeiro; Expansion projects of the steel companies COSIPA, Usiminas, Açominas and CST; Railway in Carajás; Alunorte factory in Barcarena; Airports in São Paulo and Rio de Janeiro (second phase); Bandeirantes, Ayrton Senna and Carvalho Pinto Highways.

A great part of the company's growth history is related to its performance in the energy sector and, this way, Desenvix S.A was created to make the participation of Engevix S.A. in energetic generation projects possible. Acting as a holding, the company develops its activities through its controlled companies that exercise the function of independent producers of energy in the national electrical sector. In the case of SHPs Moinho and Barracão, Desenvix S.A. will act as exclusive owner of the entrepreunership.

SHPs Moinho and Barracão contribute to the sustainable development 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].

The sustainable development is obtained through the following actions:

(a) Through SHPs Moinho and Barracão, clean and renewable energy will be dispatched to the Brazilian National Interconnected System, displacing possible entrepreneurships that would generate energy through the burning of fossil fuels, avoiding, thus, the emission of poluent gases to the atmosphere and preserving the environment to future generations.

(b) Through the generation of approximately 350 direct jobs, about 500 indirect jobs and through the boosting of economics activities aggregated to the implementation of each entrepreneurship, SHPs Moinho and Barracão will promote the region economic development, which happens through the generation of income to the community of the municipalities involved and to its collaborators. Through the taxes and tributes generated by its activities to the cities involved and to the Union, SHPs Moinho and Barracão Project provides financial resources which will be reverted into benefits to the region's population and for the country as a whole. It is estimated that around R$ 131 millions will be invested in the entrepreneurship, which will provide an addition in the collection of R$ 220 thousand of ISS[2], only during the construction.

(c) The construction of small hydroelectric power plants similar to SHP Moinho and Barracão boosts the local economy, once it provides a technological chain that influences the social-economical activities of the region where the project is located. The operation and the maintenance of the Project require the support of the region's service providers, working in the most diverse areas such as: engineers, professionals related to the environment, professionals in the area of health, administrative and juridical area, mechanics, vise operators, technicians, etc. It is fomented, therefore, the economy related to the third sector, contributing once more to the generation of jobs, collection of taxes and economic growth of the region.

(d) The generation of energy of the SHPs Moinho and Barracão provides the basic conditions for the installation of new businesses and entrepreneurships in the region that will make possible the generation of new jobs and revenue for the municipalities involved, besides providing a greater trust in the electrical

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[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.

[2] ISS: Imposto sobre serviços (Tax on Services).

system of Rio Grande do Sul and, consequently, being less dependent on the electric generation of other states in the country.

(e) Besides SHPs Moinho and Barracão present low environmental impacts, with the formation of a small reservoir and elevated power density, Desenvix S.A. will make considerable investments in environmental programs and actions. It will be developed environmental programs on the physical, biotic and anthropic environment to mitigate possible project's environmental impacts. It can be highlighted the program of environmental education that will contribute to the awareness of the population in the municipalities involved in the entrepreneurships about environmental and ecological issues.

(f) Since the SHPs Moinho and Barracão are located in the rural area of Rio Grande do Sul, 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 an environmental education program, activities along with the scholar community of the municipalities within the area of direct influence of the project will be realized, besides activities to capacitate sub-hired companies, and educational activities with residents of the reservoir's surroundings. Moreover, Desenvix S.A. has a human resources politics that aims at the qualification of all the collaborators of the companies in the group, applying also to the collaborators of the SHPs Moinho and Barracão. Through this action, Desenvix S.A 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.

(g) The implantation of the entrepreneurship presupposes the acquisition of high-technology equipment, which will be acquired through the manufacturers settled in the national territory. The use of this equipment demands training and capacity for the local workers, coming from the manufacturers themselves. With this, the companies obtain more experience and the technology becomes more widely divulged and consolidated in the region and in the country as a whole.

Through its performance in several sectors in society and through the investments in the energetic sector, Desenvix S.A. seeks to continue contributing to the sustainable development of the cities where it acts, in the region and in the country as a whole.

A.3. Project participants:

Desenvix S.A. is the owner of Small Hydropower Plants Moinho and Barracão and it is responsible for all activities related to the implementation and operation of the plants.

Enerbio Consultoria Ltda advises Desenvix S.A. to develop CDM Project and to monitor the CERs to be generated from the SHPs Moinho and Barracão Project.

Desenvix S.A. is the Project Focal Point. The table below presents the parties and entities involved in the SHPs Moinho and Barracão Project.

Table 2 – Private and public parties and entities involved in the activity

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Private Entity: Desenvix S.A.	No
	Private Entity: Enerbio Consultoria Ltda	
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Detailed information for contact with the party (ies) and with the public/private entities involved in the project activity are related in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil.

A.4.1.2. Region/State/Province etc.:

Region: South of Brazil

State: Rio Grande do Sul.

A.4.1.3. City/Town/Community etc:

SHP Moinho - Municipalities of Barracão and Pinhal da Serra.

SHP Barracão - Municipalities of Barracão, Pinhal da Serra and Lagoa Vermelha.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The area foreseen to the implantation of the SHP Moinho is located in the state of Rio Grande do Sul, between the municipalities of Barracão and Pinhal da Serra, being situated in South Latitude 27°45’42’’ and West Longitude 51°19’52’’. The SHP Moinho will be implanted in the basin of the rivers Apuaê-Inhandava, in Bernardo José River, tributary to the left margin of Pelotas River.

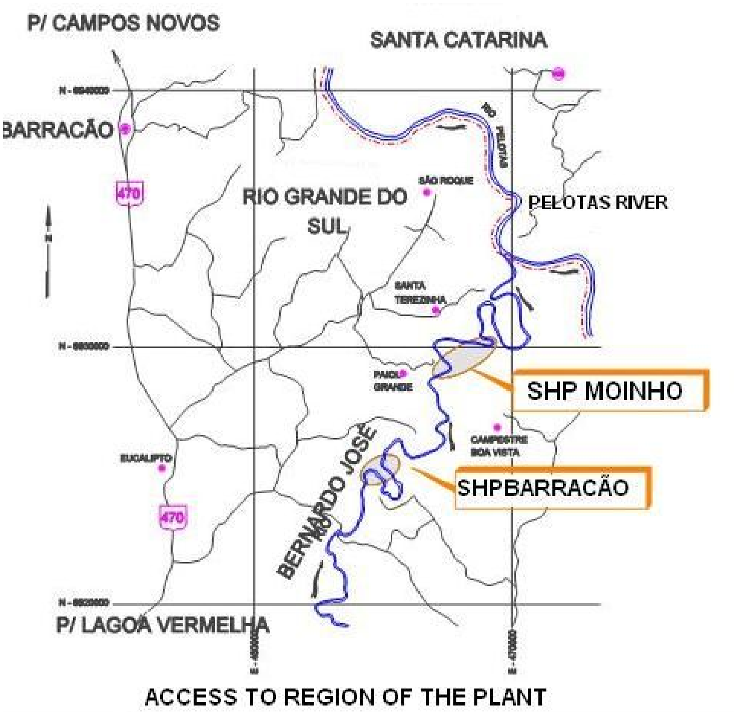
The SHP Barracão will also be constructed between the municipalities of Barracão and Pinhal da Serra, in Bernardo José River, being situated in the coordinates 27°47’53’’ of South Latitude and 51°21’32’’ of

West Longitude. The place of the construction is situated approximately 23 km from Bernardo José's river mouth, in Pelotas River. Part of the reservoir of SHP Barracão reaches the municipality of Lagoa Vermelha.

The local access to both structures is done through BR-470, passing through the interval between the municipalities of Campos Novos, in the state of Santa Catarina, and Lagoa Vermelha in the state of Rio Grande do Sul. In this road, from the city of Barracão, it passes through around 20 km in a secondary road going east, until reaching the place where the SHP Moinho will be located and in order to reach the location of SHP Barracão it passes through approximately 12.5 km in a non-paved road, until kilometer 55, where it takes the left turn to the access to the ferry that takes to the city of Esmeralda. For around 5 more kilometers in this access, it finds a crossroads where it must take the left. After going through around 1 more kilometer, it arrives at another bifurcation, where it should been take the right, going through more 700 meters and finding the Fortaleza farm, where there is a precarious access that takes to the place of the structures.

The map below shows the localization of SHPs Moinho and Barracão:

Map 1 – Localization of SHPs Moinho and Barracão



A.4.2. Category(ies) of project activity:

Sectoral Scope 1 – Energy Industries (Renewable Source)

A.4.3. Technology to be employed by the project activity:

The SHPs Moinho and Barracão will use the hydraulic potential of Bernardo José River to generate electricity with an installed capacity of 25.7 MW. SHPs Moinho and Barracão are run-of-river hydroelectric power plant with a small reservoirs.

The table below presents the main technical parameters of SHPs Moinho and Barracão.

Table 2: Technical Characteristics of SHPs Moinho and Barracão

Technical Characteristics	SHP Moinho	SHP Barracão
Installed Capacity (MW)	13.7	12
Reservoir Area (km^2)	0.117	2.87
Medium Energy (MW)	7.84	6.40
Firm Energy (MW)	7.30	6
Turbines		
Quantity	2	2
Type	Francis	Francis
Nominal Capacity (kW)	7,100	6,190
Maximum Perfomance	92%	91.1%
Generators		
Unit Nominal Capacity (kVA)	7,620	6,660
Power Factor	0.9	0.9
Dam		
Type	Gravity/RCC	RCC
Maximum Height (meters)	33.3	33.3
Power House		
Type	Sheltered	Sheltered

The equipments and technologies to be employed in the project will be developed in Brazil and have already been successfully applied to similar projects in the country and in the world. The technology applied is well established in the sector, since Francis turbine is one of the most widely used in hydropower plants projects in the world. A national company will be responsible for the implantation of the entrepreneurships, since a Engevix S.A. was hired by Desenvix S.A. to the entrepreneurship's complete execution through the EPC (Engineering, Procurement and Construction) modality, being responsible for the whole project elaboration, from feasibility study to construction, electromechanical assembly, works on reservoirs and emergency action plans.

It is important to highlight the differences between Medium Energy and Firm Energy of the plants. **Medium Energy** is the medium value of monthly generation considering all historic data of monthly medium river flow and **Firm Energy** is the medium value of monthly generation along the Critical Hydrological Period. Considering the attendance of the higher possible load, without deficit by the generation units of the system, Critical Hydrological Period is defined as the higher period of historical river flow data, which the reservoir storage varies without total refilling from maximum level to minimum level. For Brazilian Interconnected Grid this period is June/1949 to November/1956.

To estimate emission reductions that will be provided by SHPs Moinho and Barracão Project, it was considered that both plants will generate Firm Energy as Total Electricity. It is projected that 2% (two per cent) of Firm Energy will be lost by Connection Losses and Internal Consumption. With that, the entrepreneurship has the amount of energy available in the transmission/distribution connection point (without losses). 2% (two per cent) of this amount is projected to be lost during the transmission. Therefore, the amount of energy projected to be commercialized by the entrepreneurships is composed by Firm Energy minus Connection Losses/Internal Consumption and Transmission Losses. Desenvix called this amount as Commercializable energy (the amount of electricity which can be sold). This quantity of electricity was considered to estimate emissions reductions.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

Using the monthly baseline emission factor calculated as presented on the item B.6.1 and Annex 3, the complete implementation of the SHPs Moinho and Barracão Project, connected to the Brazilian Interconnected System, will generate a yearly average estimated reduction of **15,416 tCO_{2e}** and a total reduction of **107,909 tCO_{2e}** during the first 7-year-period, described in the table below:

Table 3: Estimation of emissions reduction of the SHPs Moinho and Barracão Project

Year	Annual estimation of emission reductions (tCO_2e)e
*2010	11,352
**2011	15,875
2012	15,875
2013	15,875
2014	15,875
2015	15,875
2016	15,875
2017	1.305
Total Estimated Reductions (tCO_2e)	107,909
Total Number of Crediting Years	7
Annual average over the crediting period of estimated reductions (tCO2e)	15,416

- *Prevision of operation start of SHP Moinho (with firm energy of 7.3MW and commercializable energy of 7.01 MW) in 01/02/2010
- ** Prevision of operation start of SHP Barracão (with firm energy of 6 MW and commercializable energy of 5.76 MW) in 01/10/2010;
- The estimative of the project's emission reductions presupposes the generation of firm energy as total electricity produced by the plants and the commercializable energy as the electricity to be supplied to the grid by the plants.

A.4.5. Public funding of the project activity:

No public funding for the CDM's project activities was solicited by parties involved in Annex I.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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

- Version 05.2 of Tool for the demonstration and assessment of additionality;

- 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

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The ACM0002 consolidated methodology is applicable to grid-connected renewable power generation that involves electricity capacity additions. The methodology is applicable under the following conditions:

- 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 SHPs Moinho and Barracão Project due to the following aspects:

- SHPs Moinho and Barracão are 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).

- SHPs Moinho and Barracão are project activities which result in new reservoirs and the power densities of the power plants are greater than 4 W/m^2;

B.3. Description of the sources and gases included in the project boundary

The National Interconnected System (from the 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.

According to ACM0002, version 07, the special extension of the project's 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. Small Hydropower Plants Moinho and Barracão are connected to National Interconnected System, more specifically to the South Subsystem.

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

Table 7: Emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	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 in South Subsystem, where SHPs Moinho and Barracão Project is located, would cause emission of GHGs.
		CH_4	Excluded	Minor Emission Source
		N_20	Excluded	Minor Emission Source

	Source	Gas	Included?	Justification / Explanation
Project Activity	Hydropower Electricity Generation	CO_2	Excluded	As described on the item B.6.1, table 18, the power density of SHP Moinho is greater than 10 W/m^2, so the emission of GHGs from SHP Moinho are equal to zero (PE_y=0). However, the power density of SHP Barracão is greater than 4 W/m^2 and less than 10 W/m^2, therefore, the
		CH_4	Included	
		N_20	Excluded	

				emission of CH_4 from the reservoir of this SHP must be included in the Project Boundary.

B.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 energy generated by SHPs Moinho and Barracão 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 activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generating sources, as reflected in the combined margin (CM) described in the “ Tool to calculate the emission factor for an electricity system””.

To use the methodology ACM0002, the CIMGC, Interministerial Comission of Global Climate Change, Designated National Authority of CDM 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 CO_2 used to calculate greenhouse gases emission reduction of CDM Projects of electricity generation connected to the grid.

The calculation of emission factor of CO_2, published by CIMGC, follows the methodological tool “Tool to calculate the emission factor for an electricity system” approved by the CDM Executive Board.

The CO_2 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 ONS. The procedures for calculation 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 emissions reduction.

This baseline is perfectly applicable to SHPs Moinho and Barracão.

As additional information, it can be noticed, through the projection established by the Ministry of Mines and Energy (MME) in the Decennial Plan of Electrical Energy Expansion[3] to the period of 2006-2015, that other activities and technologies that propitiate a higher emission of green house gases would occur in the absence of these project.

[3] 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].

Brazilian Decennial Plan for Electric Energy Expansion (2006-2015)

In 2006, the Ministry of Mines and Energy elaborated the Decennial Plan for Electric Energy Expansion to the period of 2006-2015, establishing three possible scenarios, based on the growth projection of the Gross Domestic Product (GDP) of the country. We adopted to this analysis the scenario pointed out by the MME as the most likely to happen, called reference scenario. This reference scenario adopts the premises cited in Annex 3 to estimate the necessity of expansion of the Brazilian electrical sector.

According to MME, the installed capacity existent in Brazil in December 2005 was as presented in the table below:

Table 5: Brazilian Installed Capacity on December/2005

Source	Installed Capacity (MW)
Hydroelectric	69,631
Thermoelectric	19,770
Nuclear	2,007
SHP	1,330
Subtotal	**92,738**
Interligation with Argentina	2,178
Itaipu Portion of ANDE	5,600
Total	**100,516**

Considering MME's projection, based on the assumptions cited in annex 3, 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, based on the following matrix:

Table 6: Estimation of Increase in Offer of Energy to 2006-2015 Period by Source of Energy

Source of Energy	Additional Energy Offer (MW)
Hydroelectric	31,144
Thermoelectric	10,486
Total	**41,630**

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 through the South Subsystem. The thermoelectric plants projected to start their operation through the South Subsystem in the period of 2006-2015 are described below:

Table 7: Thermoelectric Power Plants to be connected to the Brazilian South Subsystem predicted in the Decennial Plan for the Expansion of the Electrical Sector.

Power Plant	Capacity (MW)	Fuel	Start of Operation
Canoas	250	Natural Gas	January/08
Araucária	469	Natural Gás	December/08
Jacuí	350	Mineral Coal	December/08
Candiota III	350	Mineral Coal	December/08
Carvão Indic. S	350	Mineral Coal	December/09
Total	**1,769**		

It is also important to highlight that there are currently 7 thermoelectric plants in Brazil, operating with mineral coal, totalizing an installed capacity of 1,415 MW, according to the table[4] below:

Table 8: Thermoelectric Power Plants in Operation in Brazil

Power Plant	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 electricity from mineral coal burning in the country are situated in the South Region, where SHPs Moinho and Barracão Project are located.

The Energetic Expansion Plan to the period of 2006-2015 predicts a growth of approximately 74% in the offer of electrical energy based on mineral coal in the country, all the projects being located in the South region, connected to the National Interconnected System through the South Subsystem.

It is reasonable to consider that the electric energy generation of SHPs Moinho and Barracão Project can avoid the thermo electrical entrepreneurships that generate energy from the burning of mineral coal, whether they are new or existent, from being activated.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

This item is elaborated based on "Tool for the demonstration an assessment of additionality", version 05.2, available on the website http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html .

This tool describes some steps to be followed to demonstrate and assess the additionality of the project.

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

The following requirements are necessary to demonstrate and assess the additionality of the SHPs Moinho and Barracão Project:

Step 1. Identification of alternatives to the project activity according to current laws and regulation

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

1. The realistic alternatives to the project activity are:

- 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 Brazilian South Subsystem;

- The construction of a new mineral coal thermoelectric power plant, with similar installed capacity to the SHPs Moinho and Barracão;

- The project activity undertaken without being registered as a CDM Project Activity.

Sub-step 1b. Compliment with the applicable laws and norms:

Both the activity project and the alternative scenarios are in accordance to the applicable laws and regulamentations. As exposed in item B.4 of this PDD, it is in the South Subsystem where the only thermoelectric mineral coal plants of the country are located.

Particularly, approximately 38% of thermo electrical coal plants of the country are located in Rio Grande do Sul. Moreover, according to the Brazil's Atlas of Electric Energy[5], 90% of the national reservations of mineral coal are concentrated in Rio Grande do Sul, where SHPs Moinho and Barracão Project are located.

It is also remarkable that according to what was exposed in item B.4, the Ministry of Mines and Energy projects a growth in the offer of energy generation from mineral coal thermoelectric centrals and that this projection indicates that, until 2015, the capacity of electricity generation of the entrepreneurships that dispatch energy from mineral coal in the South Electrical Subsystem will grow approximately 74%.

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 electricity to be hired and the investments to be realized from the participation in auctions of power plants and systems of transmission.

According to MME [6], "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 information of distributors, 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".

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[5] Atlas de Energia Elétrica do Brasil [Atlas of Brazilian Electric Energy], ANEEL, 2002

[6] 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].

This way, it can be noticed that there are no restrictions in the applicable laws and rules to the implantation of the alternative scenarios to CDM's project activity. Furthermore, we can also verify that through the MME projection mentioned before there is even a tendency with great probabilities of occurrence of the alternative scenarios in the absence of projects similar to SHPs Moinho and Barracão 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 project activity and the alternative scenarios fulfil all the Brazilian norms and rules, being plausible according to the tendencies for the Brazilian electrical sector.

Step 2. Investment analysis

Determine whether the proposed project activity is not:

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

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 SHPs Moinho and Barracão Project.

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

It will be used project internal rate of return (IRR) as a financial indicator of SHPs of SHPs Moinho and Barracão Project, due to it is the most commonly and appropriate indicator used to investment analysis of infrastructure projects. As a benchmark, it will be used the Weighted Average Capital Cost (WACC) of the entrepreneurships that compose SHPs Moinho and Barracão 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 capital structure of the company. The Weighted Average Capital Cost of SHPs of SHPs Moinho and Barracão Project were calculated according the equation below:

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

Equation 1

Where:

E/V = Percentage of Equity in Capital Structure of SHP;
Re = Cost of Equity;
D/V = Percentage of Debt in Capital Structure of SHP;
Rd = Cost of Debt

Tc = Income Tax in Brazil

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

$Re = R_f + \beta_i (R_m - R_f)$ **Equation 2**

Where:

Re = Cost of Equity;
R_f = Rate of Return of a Risk Free Asset;
β_i = Beta Coefficient;
$Rm - R_f$ = Risk Premium.
To calculation of the cost of debt was used the cost of lending for each entrepreneurship.

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

Cash flow Spreadsheets of SHP Moinho and SHP Barracão were supplied to DOE. Some clarifications about the assumptions are necessary:

Clarifications about Revenues

- The price of electricity was estimated according the prices established on the results of the last Auction for Alternatives Sources of Electricity organized by ANEEL. The price of R$ 135.00 was the best price of electricity for small hydropower plants in this auction. The electricity to be generated by SHPs Moinho and Barracão has not been sold yet and this price was used for Investment Analysis.
- Desenvix considers for all investment analysis that Firm Energy is the quantity of electricity that the entrepreneurship can generate with high certainty. It is projected that 2% of Firm Energy will be lost by Connection Losses and Internal Consumption. With that, the entrepreneurship has the amount of energy available in the transmission/distribution connection point (without losses). 2% (two per cent) of this amount is projected to be lost during the transmission. Therefore, the amount of energy projected to be commercialized by the entrepreneurships is composed by Firm Energy minus Connection Losses/Internal Consumption and Transmission Losses. This information is reflected in Investment Analysis Spreadsheets.

Clarifications about Amount of Investment

The amount of investment of SHPs Moinho and Barracão considers the expenses with construction, equipments, and engineering, project and management; construction of transmission line and substation; environmental costs; Insurance; Purchase of Lands and other costs. The evidence for this amount was a communication established with the Department of Concession and Authorization of Electricity Generation of ANEEL when Desenvix sent a lot of documents to comply with ANEEL requirements, aiming at obtaining the authorization to start the implantation of this entrepreneurship.

The amount of investment for SHP Barracão considers similar investment types of SHP Moinho and its values were established according what was projected for SHP Moinho, taking into account the energetic differences between them.

Clarifications about Lending Contract and Depreciation

The interest rate of the Lending Contract (Cost of Debt) was estimated according to another Lending Contract firmed in January, 2008, with BNDES, National Bank of Economic and Social Development for other Hydropower Plant of Desenvix S.A. This contract was provided to the DOE Local Auditor.

The interest rate (cost of debt) was estimated on 2.1% per year + TJLP, Long Term Interest Rate of Brazilian Market (From the Portuguese: Taxa de Juros de Longo Prazo) that is the same cost present in the contract firmed in January 2008. Future TJLP was estimated constant on 6.25%[7]. The amortization system is called Constant Amortization System and it was estimated 14 years of amortization period and 6 months of grace period. The contract firmed with BNDES was provided to local auditor of DOE that carried out Validation Process. It was also provided a copy from the website page from BNDES which confirms these commercial conditions.

Depreciation taxes were applied on the value of depreciable items without correction (nominal currency). This fact means that depreciation loses its value along time when comparing with expenses and revenues of the cash flow in constant currency.

Cash flow is presented in constant currency; therefore, interests, amortization and depreciation must be also in a constant currency. To make that, it was used IPCA, National Index of Wide Consumer (from the Portuguese: Índice Nacional de Preços ao Consumidor Amplo), calculated by IBGE, Brazilian Institute of Geography and Statistics (from the Portuguese: Instituto Brasileiro de Geografia e Estatística). It was estimated an IPCA constant of 4% per year. The date base for deflation was determined as the date when the last release of the lending contract.

Clarifications about Operational Expenses and Industry Taxes

Desenvix S.A. has invested in others small hydro power plants projects. This experience was used for estimation of the cash flows. Some clarification about operational expenses and Sectorial Taxes are provided below:

- Operation and Maintenance Cost (O&M Cost) – It was estimated according O&M Contract for SHP Esmeralda (other SHP of the Group). Personnel costs are included in O&M Cost. This contract was provided to Local Auditor of the DOE which executed validation process;
- TUSD - Tariff of Distribution System Use (from the Portuguese: Tarifa pelo Uso do Sistema de Distribuição) – This tariff was determined by CELESC, State Electric Company of Santa Catarina (Centrais Elétricas Santa Catarina), through the Resolution 529, nº 529 of 06th August 2007. This resolution was provided to Local Auditor of the DOE which executed validation process;
- TFSEE - Supervision Tax of Electricity Services (from the Portuguese: Taxa de Fiscalização dos Servicos de Energia Elétrica – TFSEE). This tax must be paid to ANEEL (National Agency of Electrical Energy). The value of TFSEE (R$ 303.78/kWh installed) used on cash flow spreadsheets were based on ANEEL Resolution nº 3.731 of 27th December 2007. This resolution was also provided to Local Auditor of the DOE which executed validation process.
- CCEE Tax – This tax is paid to CCEE, entity responsible for measurements, accounting and settlement on Brazilian electric energy market. This tax is based on TFSEE. It is estimated as 25% of TFSEE;

[7]Source: http://www.bndes.gov.br/produtos/custos/juros/tjlp.asp

- Operational Insurance – It was estimated expenses with operational insurance based on others experiences of Desenvix with entrepreneurships of electricity generation. This expense was estimated as 1% of the Net Operational Revenue.

Clarifications about Taxes

Brazilian Law 10,637 of 30th December 2002 and Brazilian Law 9,718 of 27th of November 1998 defined that companies with Annual Gross Revenue less than R$ 48 million can apply Brazilian Tax System called "Presumed Profit"(from the Portuguese: "Lucro Presumido").

SHP Moinho and SHP Barracão will have annual revenue less than R$ 48 million. Therefore, under Brazilian Law, they can be taxed by Presumed Profit. Therefore, the following taxes will be applied directly over Gross Revenue:

- COFINS (Contribution for Funding of Social Security) – 3% over Gross Revenue
- PIS/PASEP (Social Integration Program/ Program of Public Server Heritage Formation) – 0,65% over Gross Revenue;
- Income Tax – 25% over 8% of Gross Revenue;
- Social Contribution – 9% over 12% of Gross Revenue.

These taxes were established by the following Brazilian Laws:

- COFINS – Complementary Law 70/91; Law 9,718/98 and Temporary Measure (from the Portuguese: Medida Provisória) 2,158/01.
- PIS/PASEP - Complementary Laws 7/70 and 8/70; Law 9,718/98 and Temporary Measure 2,037/00.
- Income Tax - Law 8,981/95 and Act 3,000/99.
- Social Contribution – Laws 7,689/98 and 10,637/02 and Temporary Measure 2,158-25/01.

A summary of the main assumptions are described below:

Table 9: Assumptions used at the cash flow of SHPs Moinho and Barracão Project

Plant	**Moinho**	**Barracão**
Commercializable Energy	7.01 MW	5.76 MW
Electricity Price	R$ 135 / MWh	R$ 135 / MWh
Operational Expenses and Sectorial Taxes		
Operational Insurance	1% over Net Operational Revenue	1% over Net Operational Revenue
Operation and Maintenance	R$ 60,000 per month	R$ 60,000 per month
TUSD Tax	R$ 204,612 per year	R$ 179,222 per year
TFSEE Tax	R$ 20,808 per year	R$ 18,227 per year
CCEE Tax	25% over TFSEE	25% over TFSEE
Total Investment	R$ 70,040,000	R$ 61,200,000
Capital Structure		
Equity	R$ 21,012,000	R$ 18,360,000
Debt	R$ 49,028,000	R$ 42,840,000
Lending		
Cost of Debt	8.35% per year	8.35% per year
Grace Period	6 months	6 months
Amortization	14 years	14 years
Amortization System	Constant Amortization System	Constant Amortization System
Taxes		
PIS	0.65% over Gross Revenue	0.65% over Gross Revenue
COFINS	3% over Gross Revenue	3% over Gross Revenue
Income Tax	25% over 8% of Gross Revenue	25% over 8% of Gross Revenue
Social Contribution	9% over 12% of Gross Revenue	9% over 12% of Gross Revenue

The project internal rates of return resulting from the cash flows elaborated according to assumptions above are 8.64% for SHP Moinho and 7.72% for SHP Barracão. The period of assessment was 30 years for each SHP.

Weighted Average Capital Cost

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

Cost of Equity:

To calculate the cost of equity, using the equation 2, the parameters adopted were the following:

Re = Cost of Equity;
R*f* = Annual Average of Selic Rate between 2002 to 2007[8];
β*i* = Sectorial Beta (Beta Average of electricity generation companies in emerging markets[9] between 2002 and 2007).
Rm - RF = Spread required by the Equity Investment Fund Infra Brazil (from the portuguese: Fundo de Investimento em Participações Infra Brasil[10]) administered and managed by Bank ABN AMRO Real S.A.

Clarifications about Assumptions Adopted to Calculate Cost of Equity

- Risk Free Average Rate of Return (Rf) – Brazilian Investors consider the investment of Brazilian Public Titles as a Risk Free Asset. Brazilian Public Titles are usually indexed to Selic Rate. Therefore, it was used an average of Selic Rate between 2002 and 2007. Selic Rate is the tax which remunerates the investors in the business of selling and buying Brazilian public titles.
- Sectorial Beta (β*i*) – Betas of electricity generation companies in emerging market was calculated by teacher Aswat Damodaran based on Data of Standard&Poors. It was calculated an average of these Betas between 2002 and 2007. This average was considered as the project beta.
- Risk Premium (Rm - R*f*) – The Equity Investment Fund Infra Brazil is a private equity that invests in infrastructure projects, including electricity generation and renewable energy. The spread used as Risk Premium of the Market is the return required by this fund to invest in this kind of project.

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

[8] Source: www.bcb.gov.br

[9] Betas of electricity generation companies in emerging market were calculated by teacher Aswat Damodaran's team and they are available on: http://pages.stern.nyu.edu/~adamodar/.

[10] The Equity Investment Fund Infra Brazil is a private equity that invests in infrastructure projects, including electricity generation. The spread used as Risk Premium of the Market is on page 19 of the Fund Prospect, available on
http://www.bancoreal.com.br/index_internas.htm?sUrl=http://www.bancoreal.com.br/quem_somos/private_equity/tpl_private_equity.shtm

Table 10: Values Used on Calculation of Cost of Equity

Years	β of Electricity Generation Sector of Emerging Countries*	Risk Premium**	Risk Free Average Rate of Return***
2002	0.83		19.52%
2003	0.91		23.08%
2004	0.97		16.44%
2005	1.39		19.15%
2006	1.25		15.09%
2007	1.34		11.94%
Period Average	**1.12**	9.2%	**17.54%**

*Source: http://pages.stern.nyu.edu/~adamodar/
**Source: Page 19 of the Prospect of Equity Investment Fund Infra Brazil, available on: http://www.bancoreal.com.br/index_internas.htm?sUrl=http://www.bancoreal.com.br/quem_somos/private_equity/tpl_private_equity.shtm
***Source: Central Bank of Brazil, available on: www.bcb.gov.br

Applying the average of values presented on the table 10, expressed on line "Period Average", the cost of equity is 27.80% per year.

Cost of Debt

The cost of debt for SHPs Moinho and Barracão is based on the cost of lending practiced for Small Hydropower Plants Projects through loan from National Bank of Economic and Social Development, BNDES. The cost of debt for infrastructure entrepreneurship, similar to SHPs Moinho and Barracão, are usually based on TJLP, Interest Rate of Long Term of Brazilian Market, (called TJLP in Portuguese) plus 2.1% as banking spread. To financial and economic modeling effects, TJLP was considered uniform during all lending period, with a value of 6.25%[11] per year. The cost of debt is formed, thus, by TJLP plus 2.1% per year as banking spread, constituting a total cost of 8.35% per year. As it was mentioned previously, the cost of debt considered a Lending Contract established by Desenvix with BNDES in the beginning of the year for other entrepreneurship of the Group.

Weighted Average Capital Cost

As both SHPs have the same capital structure, the same cost of capital (cost of debt and equity) and the same income tax, WACC is equal for both entrepreneurships. The table below presents the composition of capital structure of the entrepreneurships of the SHPs Moinho and Barracão Project, the costs for each source of capital and the weighted average capital cost each entrepreneurship.

[11] Source: http://www.bndes.gov.br/produtos/custos/juros/tjlp.asp

Table 11: Composition of Weighted Average Capital Cost of SHPs Moinho and Barracão Project

Items	SHP Moinho and Barracão
% of Equity	30%
Cost of Equity	27.80%
% of Debt	70%
Cost of Debt	8.35
Income Tax	25%
WACC	**12.72%**

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

Table 12: Project Internal Rate of Return x Benchmarks

Project IRR – SHP Moinho	Project IRR – SHP Barracão	WACC – SHPs Moinho e Barracão
8.64%	7.72%	12.72%

The benchmark analysis was used (Option III) and it showed that indicators of the SHPs of the Project are less favourable than benchmark, then, it can be said that the CDM Project Activity is not financially attractive.

Sub-step 2d. Sensitivity analysis

The three main variables that might affect the finance of the project are (i) the electricity price, (ii) the total amount of investment and (iii) the quantity of the electricity marketed. The sensitivity analysis considers just the scenarios which contribute to increase the project financial and economic attractiveness with the objective to confirm how solid the analysis of sub-step 2b and 2c is. The table below presents the results for the main parameters variation which can affect cash flow of the project.

Table 13: Sensitivity Analysis of SHPs Moinho and Barracão Project

VARIATION ON ELECTRICITY PRICE				
Projected Situation	MWh Price - SHP Moinho	MWh Price - SHP Barracão	Project IRR SHP Moinho	Project IRR SHP Barracão
0%	**R$ 135**	**R$ 135**	**8.64%**	**7.72%**
5%	R$ 141.75	R$ 141.75	9.25%	8.32%
8%	R$ 145.8	R$ 145.8	9.61%	8.67%
10%	R$ 148.5	R$ 148.5	9.85%	8.9%
VARIATION ON TOTAL AMOUNT OF INVESTMENT				
Projected Situation	Investment SHP Moinho	Investment SHP Barracão	Project IRR SHP Moinho	Project IRR SHP Barracão
0%	**R$ 70.040.000**	**R$ 61.200.000**	**8.64%**	**7.72%**
-5%	R$ 66,538,000	R$ 58,140,000	9.2%	8.26%
-8%	R$ 64,436,800	R$ 56,304,000	9.56%	8.6%
-10%	R$ 63,036,000	R$ 55,080,000	9.82%	8.84%
VARIATION ON COMMERCIALIZABLE ENERGY				
Projected Situation	Energy Sold- SHP Moinho (MW)	Energy Sold- SHP Barracão (MW)	Project IRR SHP Moinho	Project IRR SHP Barracão
Total Electricity Produced (Firm Energy)	**7.01**	**5,76**	**8.64%**	**7.72%**
Total Electricity Produced (Medium Energy)	7.53	6.15	9.54%	8.51%

The total amount of investment and the electricity price are the main items which can affect the cash flow of the project.

The projection for the investment 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 scenario of reduction of the total amount of investment, presented on sensitivity analysis, is difficult to occur

The electricity price was based on the latest auction (until the moment of elaboration of this PDD) carried out by ANEEL for alternative sources of energy.

The company intends to sign Power Purchase Agreement, the so-called PPA, based on the assured energy that has not yet been calculated. In a conservative way, the cash-flow of the project considers the projection of revenues based on the project's firm energy, which is slightly less than the medium energy. For this reason, in the sensibility analysis, it was elaborated a scenario that considers the generation of medium energy, which may result in an increase in the IRRs of the SHPs.

The sensitivity analysis demonstrates that the SHPs of SHPs Moinho and Barracão Project are not financially attractive once the project internal rates of return are lower than weighted average capital cost of them 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 (as per step 2c -8a) or is unlikely to be financially attractive (as per step 2c – 8b), then proceed to Step 4 (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 fourth step (the analysis of common practices).

SATISFIES/PASSES – Go to Step 3

Step 3. Barrier analysis

This step will not be considered. **Continue to Step 4**

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity

It is observed that there are in Rio Grande do Sul, state where the SHPs of SHPs Moinho and Barracão Project are located, entrepreneurships with activities similar to those of the project being proposed.

It follows below a summary of the entrepreneurships in operation, in construction and granted by ANEEL, in the state of Rio Grande do Sul:

Table 14 – Entrepreneurships in Operation in the state of Rio Grande do Sul (Source: ANEEL[12] – March/2008)

Entrepreneurships in Operation		
Type	**Power (kW)**	**%**
HPPCG	17,524	0.26
WPP	150,000	2.26
SHP	153,716	2.31
HPP	4,673,650	70.38
TPP	1,645,665	24.78
Total	**6,640,555**	**100**

Caption for Tables 14, 15, 16 and 17:

- *HPPCG: Hydro Power Plant Central Generation (Installed capacity minor than 1 MW)*
- *WPP: Wind Power Plant*
- *SHP: Small Hydro Power Plant (Installed capacity greater than 1 MW and less than 30 MW)*
- *HPP: Hydro Power Plant (Installed capacity greater than 30 MW)*
- *TPP: Thermal Power Plant*
- *NTP: Nuclear Thermal Plant*
- *SPP: Solar Power Plant*

Table 15 – Entrepreneurships under construction in the state of Rio Grande do Sul (Source: ANEEL[13] – March/2008)

Entrepreneurships under Construction		
Type	**Power (kW)**	**%**
SHP	115,500	9.09
HPP	1,152,000	90.61
TPP	3,825	0.30
Total	**1,271,325**	**100**

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

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

Table 16 – Granted Entrepreneurships in the state of Rio Grande do Sul which have not started their build (Source: ANEEL – March/2008)[14]

Granted Entrepreneurships between 1998 e 2004 (which have not started their build)		
Type	**Power (kW)**	**%**
HPPCG	5,297	0.19
WPP	1,153,512	41.82
SHP	264,398	9.59
HPP	420,000	15.23
TPP	914,800	33.17
Total	**2,758,007**	**100**

The tables presented show there are similar activities taking place in the state where SHPs Moinho and Barracão Project is located, however, this project activity is not predominant in the region. The following characteristics are viewed on energetic matrix of the state of Rio Grande do Sul:

- 2.31% of the installed capacity of the current energetic matrix (entrepreneurships in operation) in Rio Grande do Sul are Small Hydroelectric Plants, same as entrepreneurships of SHPs Moinho and Barracão Project;
- 9.09% of the installed capacity of entrepreneurships in construction in the state are generated from small hydroelectric plants;
- 9.59% of the installed capacities of granted project that have not yet begun to be constructed are small hydroelectric plants.

As examples of SHPs similar to entrepreneurships of SHPs Moinho and Barracão Project, it can be mentioned SHP Linha Emília, with 19.5 MW of installed capacity and SHP Caçador, with 22.5%.

Sub-step 4b. Discuss similar options that are occurring:

In spite of the existence of projects similar to SHPs Moinho and Barracão Project in operation and under construction in Rio Grande do Sul, it is necessary to establish peculiar characteristics of these entrepreneurships that do not allow them to be configured as a common business scenario in the country.

The fact that projects with this configuration, without the additional income from the commercialization of the certified emission reduction, are not attractive in the financial point of view and are not business as usual in the country can be proved through the creation of the program PROINFA, created by the Federal Government through the Law 10,438 in April 26th, 2002.

PROINFA is a governmental program that seeks to motivate, through the financial point of view, the development of entrepreneurships that make use of renewable technologies, due to the difficulties in financing, in offering guarantees to the finance suppliers and in the necessity of investments considered reasonable to small organizations. This way, the Federal Government tries to motivate projects through differentiated lines of finance, besides the guarantees of minimal revenues through the compromise of establishing Power Purchase Agreements (PPAs), to be firmed with a mixed economy society, Eletrobrás, which will secure to the entrepreneur a minimal revenue of 70% of the energy purchased during the financing period and complete protection to the risks of exposure in the short-term market.

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

The contracts have duration of 20 years and involve selected projects that should start operating until December 2006. The projects of SHPs are one of the types eligible to participate in the PROINFA.

SHPs Moinho and Barracão do not take part into PROINFA and consider the revenues from the commercialization of certified emission reductions as an important factor to make the investment.

With that, the organization has to deal with the difficulties inherent to the small agents of the Brazilian electrical sector, as: (i) the little power of attraction to potential buyers in face of the small quantity of electric energy to be produced and commercialized; (ii) the excess of guarantees demanded by long-term financing banks that compromise the company's financial solvency; (iii) the bureaucracy inherent to the construction process of a small hydroelectric, from its beginning until their effective operation.

Moreover, as it was mentioned in item 4.a of this PDD, the percentage of installed capacity in entrepreneurships similar to SHPs Moinho and Barracão Project in the energetic matrix in Rio Grande do Sul is very small. When analyzing the participation in this kind of activity in the Brazilian energetic matrix, we notice that the participation is even smaller, as suggests the table below:

Table 17 – Entrepreneurships in operation in Brazil (Source: ANEEL[15] – March/2008)

Entrepreneurships in Operation in Brazil		
Type	**Granted Power (kW)***	**%**
HPPCG	113,249	0.11
WPP	249,450	0.25
SHP	1,847,050	1.81
SPP	20	0
HPP	74,442,295	74.65
TPP	21,139,341	21.17
NTP	2,007,000	2
Total	**102,798,405**	**100**

* Granted Power means the power considered in the Concession Act.

The Small Hydroelectric Plants participation forms 1.81% of the installed capacity in the country, due to the difficulties presents in this kind of entrepreneurships mentioned before. This way, the Brazilian energetic matrix is formed predominantly by hydroelectric plants of high performance (74.65%) and in its majority with big reservoirs, besides the important participation of thermoelectric plants (21.17%).

With this, it can be noticed that in spite of the existence of activities similar to the project activities of Project Activity occurring in the country, many of them were made possible through the program of the Federal Government, of which the SHPs of SHPs Moinho and Barracão Project are not part.

SATISFIED/APPROVED – Project is ADDITIONAL

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

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

$ERy = BEy – PEy – LEy$ **Equation 3**

Where:

ERy = Emission Reduction in year y (t CO_2e/yr)
BEy = Baseline emissions in year y (t CO_2e/yr)
PEy = Project emissions in year y (t CO_2e/yr)
LEy = Leakage emissions in year y (t CO_2e/yr)

BEy Calculation (Baseline emissions in year y (t CO_2e/year)

The baseline methodology ACM0002 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 emission is calculated as follows:

$BEy = (EGy – EG_{baseline}) * EF_{grid,CM,y}$ **Equation 4**

Where:

BEy = Baseline Emission in year y (t CO_2e/year)
EGy = Electricity supplied by the project activity to the grid (MWh)
$EG_{baseline}$ = Baseline electricity supplied to the grid in case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”

For the variable EGy it was considered the commercializable energy of SHPs Moinho and Barracão (the amount that can be sold). It is projected that SHPs Moinho and Barracão will generate “firm energy” and that 2% of Firm Energy will be lost by Connection Losses and Internal Consumption. With that, the entrepreneurship has the amount of energy available in the transmission/distribution connection point (without losses) and 2% (two per cent) of this amount is projected to be lost during the transmission.

The SHPs Moinho and Barracão are new power plant to be connected to the interconnected grid, therefore, the $EG_{baseline}$ is 0 (zero).

To calculate $EF_{grid,CM,y}$, it will be used data supplied by the Brazilian BNA which makes available the data of Dispatch data analysis operating margin emission factor and the build margin emission factor through using the “Tool to calculate the emission factor for an electricity system” which suggests the following steps:

Step 1*. Identify the relevant electric power system*

According to the tool to calculate the emission factor for an electricity system, if the DNA of the Host Country has published a delineation of the project electricity system and connected electricity system, these delineations should be used. This way, Brazilian DNA defined that the National Interconnected System must be considered as a unique System and that this configuration will be valid for calculating the emission factor of CO_2 used to calculate the emission reduction of greenhouse gases in CDM Projects of electricity generation connected to the grid. SHPs Moinho and Barracão Project will follow the definition establhished by Brazilian DNA.

***Step 2**. Select an operating margin (OM)method*

The operating margin aims to assess the contribution of the power plants that would be dispatched in the absence of the project activity's generation. The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or
(b) Simple Adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM

The method chosen to calculate the emission factor of SHPs Moinho and Barracão Project was the operation margin by dispatch data analysis. This method was chosen because it is, according to Brazilian DNA, the most accurate and the most recommended if information is available.

***Step 3**. Calculate the operating margin emission factor according to the selected method*

The calculation for the operating margin emission factor through the chosen method follows the methodology described below:

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

The dispatch data analysis OM emission factor is calculated as follows:

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

Equation 5

Where:

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year y (tCO_2e/MWh);
$EG_{PJ,h}$ = Electricity displaced by the project activity in hour *h* of year y (MWh);
$EF_{EL,DD,h}$ = CO_2 emission factor for power units in the top of the dispatch order in hour *h* in year *y* (tCO_2e/MWh);
$EG_{PJ,y}$ = Total electricity displaced by the project activity in year y (MWh);
h = Hours in year y in which the project activity is displacing grid electricity;
y = Year in which the project activity is displacing grid electricity.

If hourly fuel consumption data is available, then, the hourly emissions factor is determined as:

$$EF_{EL,DD,h} = \frac{\sum_{i,n} FC_{i,n,h} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{n} EG_{n,h}}$$

Equation 6

Where:

$EF_{EL,DD,h}$ = CO_2 emission factor for power units in the top of the dispatch order in hour *h* in year *y* (tCO_2e/MWh);

$FC_{i,n,h}$ = Amount of fossil fuel type *i* consumed by power unit *n* in hour *h* (Mass or volume unit);
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y (GJ/*mass or volum unit*);*
$EF_{CO_2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2e/GJ);
$EG_{n,h}$ = Electricity generated and delivered to the grid by power unit *n* in hour *h* (MWh);
n = Power Units in the top of the dispatch;
i = Fossil Fuel types combusted in power unit *n* in year *y;*
h = Hours in year y in which the project activity is displacing grid electricity;
y = Year in which the project activity is displacing grid electricity.

Otherwise, the hourly emissions factor is calculated based on the energy efficiency of the power unit and the fuel type used, as follows:

$$EF_{EL,DD,h} = \frac{\sum_n EG_{n,h} \times EF_{EL,n,y}}{\sum_n EG_{n,h}}$$

Equation 7

Where:

$EF_{EL,DD,h}$ = CO_2 emission factor for power units in the top of the dispatch order in hour *h* in year *y* (tCO_2e/MWh);
$EG_{n,h}$ = Net quantity of electricity generated and delivered to the grid by power unit *n* in hour *h* (MWh);
$EF_{EL,n,y}$ = CO_2 emission factor of power unit *n* in year *y* (tCO_2e/ano)
n = Powers units in the top of the dispatch (as defined below)
h = Hours in year *y* in which the project activity is displacing grid electricity;

The CO_2 emission factor of the power units *n* should be determined as per the guidance for the simple OM.

To determine the set of power units *n* that are in the top of dispatch, obtain from a national dispatch centre:

- The grid system dispatch order of operation for each power unit of the system including power units from which electricity is imported; and
- The amount of power (MWh) that is dispatched from all power units in the system during each hour *h* that the project activity is displacing electricity.

At each hour *h*, it must stack each power unit`s generation using the merit order. The group of power units *n* in the dispatch margin includes the units in the top x% of total electricity dispatched in he hour *h*, where x% is equal or greater of either:

(a) 10% or
(b) The quantity of electricity displaced by the project activity during hour *h* divided by the total electricity generation in the grid during that hour *h.*

The CO_2 emission factors resulting from the power generation in the Brazilian National Interconnected System (SIN) are calculated based on the generation record of plants centrally dispatched by ONS. The procedures for calculation were elaborated in cooperation between ONS, Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT).

Following that procedures, from July of 2008, the operating margin emission factor started to be calculated for the National Interconnected System, considering the System as unique, and it became available to be consulted by the interested public and investors.

The dispatch data OM emission factor are defined as the weighted average of the emission factors of the set of power plants in the top 10% of the grid system dispatch order and is calculated for each hour.

The emission factor for each plant in the system is calculated annually based on values for generation and fuel consumption of the plant in the previous year. For the new thermal plants that come into operation each year, the value for a similar plant in the previous year must be adopted.

Until the preparation of this PDD, it is available information about dispatch data OM emission factor, related to the years of 2006 and 2007 and related to the period from January 2008 to July 2008.

The dispatch data OM emission factor for from the year of 2007 will be used for an ex-ante estimation of CERs generation, because they are the latest data available. All data used to calculate ex-ante estimation of CERs regarding operating margin emission factor are available in the Annex 3 of this PDD.

Step 4*. Identify the cohort of power units to be included in the building margin*

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The build emission factor is calculated by Brazilian DNA based on the generation record of plants centrally dispatched by ONS. Build Margin Emission Factor will be calculated ex-post through Brazilian DNA Data by Project Participants. Brazilian DNA uses option (a) the five power units that have been built most recently to calculate the build margin emission factor.

As a general guidance, a power unit is considered to have been built at the date when it started to supply electricity to the grid.

Power plants registered as CDM project activities should be excluded from the sample group *m*. However, if group of power units, not registered as CDM project activities, identified for estimating the build margin emission factor includes power unit(s) that is(are) built more than 10 years ago then:

(i) Exclude power unit(s) that is(are) built more than 10 years ago from the group;
(ii) To include grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system.

Capacity additions from retrofits of power plants should not be included on the calculation of the build margin emission factor.

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

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

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

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

Step 5. *Calculate the build margin emission factor*

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

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

Equation 8

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2e/MWh);
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2e/MWh);
m = Power units included in the build margin;
y = Most recent historical year for which power generation data is available.

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the guidance in step 3(a) for the simple OM, using options B1, B2 or B3, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

The CO_2 emission factors resulted from the electricity generation in the National Interconnected System (SIN) are calculated based on the generation records of plants centrally dispatched by ONS. The procedure for calculation was elaborated in cooperation between ONS, Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT).

Following that procedures, from July of 2008, the build margin emission factor started to be calculated for the National Interconnected System, considering the System as unique, and it became available to be consulted by the interested public and investors.

The build margin emission factor for 2007 was used for an ex-ante estimation of CERs generation, since they are the latest data available. The data used to calculate the ex-ante build margin emission factor are available in the Annex 3 of this PDD.

Step 6. *Calculate the combined margin emission factor*

The combined margin emission factor is calculated as follows:

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

Equation 9

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2e/ MWh)
$EF_{grid,OM,y}$ = 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 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 SHPs Moinho and Barracão Project, it was adopted the following weights: W_{OM} = 0.50 and W_{BM} = 0.50.

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 of power plant is greater than 4 W/m2 and less than or equal to 10 W/m2:

$$PEy = \frac{EF_{Res} * TEGy}{1000}$$

Equation 10

Where:

PEy = Emission from reservoir expressed as tCO_2e/ano;
EF_{Res} = 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.

The power density of project activities, according ACM0002 methodology, version 07, is calculated as demonstrated below:

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

Equation 11

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 below presents the power density of SHPs Moinho and Barracão.

Table 18: Power Density of SHPs Moinho and Barracão

Item	SHP Moinho	SHP Barracão
Cap_{PJ}	13,700,000	12,000,000
Cap_{BL}	0	0
A_{PJ}	117,000	2,870,000
A_{BL}	0	0
PD	**117.09**	**4.18**

As described on the table above, the power density of SHP Moinho is greater than 10 W/m2 and, therefore, for this SHP, PEy = 0. However, SHP Barracão has power density greater than 4 W/m^2 and less than 10 W/m^2, then for this SHP the emission project will be calculated according equation 10.

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 SHPs Moinho and Barracão Project, the leakage emissions represented by LEy is 0 (zero).

Project Emissions Reductions

Summarizing, the project emission reductions are calculated based on equation 3 of this PDD, which PEy will be calculated according equation 10 and LEy is zero. For calculation of BEy, it will be used the combined margin emission factor with the operating margin emission factor being calculated according to dispatch data analysis OM and the build margin emission factor will be calculated through the option 2 which considers that this emission factor must be updated ex-post. Besides it will be considered 50% for the weights that forms the Combined Margin Emission Factor. It is also valid to highlight that, as SHPs Moinho and Barracão are new power plants, $EG_{baseline}$ is zero.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	EF_{Res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emission from reservoirs.

Source of data used:	-
Value applied	90 $kgCO_2e/MWh$
Justification of the choice of data or description of measurement methods and procedures actually applied	The default value as per EB23 is 90 $kgCO_2e/MWh$.
Any comment :	

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plant, this value is zero.
Source of data used:	Project Site
Value applied	0
Justification of the choice of data or description of measurement methods and procedures actually applied	As SHPs Moinho and Barracão are new power plant, this value is 0 (zero).
Any comment :	

Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.
Source of data used:	Project Site
Value applied	0
Justification of the choice of data or description of measurement methods and procedures actually applied	As SHPs Moinho and Barracão are new power plant, this value is 0 (zero).
Any comment :	

B.6.3 Ex-ante calculation of emission reductions:

As described on the item B.6.1, the project emissions reduction will be calculated based on equation 3, using the equation 10 for PEy calculation as 0 (zero) and considering LEy as 0 (zero). Therefore, the project emissions reduction is calculated as follows:

ERy = BEy – PEy – LEy **Equation 3**

Where:

ERy = Emission Reduction in year y (t CO_2e/yr)
BEy = Baseline emissions in year y (t CO_2e/yr)
PEy = Project emissions in year y (t CO_2e/yr)
LEy = Leakage emissions in year y (t CO_2e/yr)

It follows below the description about emissions reduction provided by SHPs Moinho and Barracão Project.

BEy Calculation

For BEy Calculation it was apllied the equation as follows:

$BEy = (EGy – EG_{baseline}) * EF_{grid,CM,y}$ **Equation 4**

Tables below shows step by step the components of equation applied for BEy Calculation.

(EGy – EGbaseline) Calculation

Table 19 – (EGy – EGbaseline) Calculation

Period	SHP Moinho		SHP Barracão		Total		
	EGy	EGbaseline	EGy	EGbaseline	EGy	EGbaseline	EGy-EGbaseline
2010	55.519	-	12.442	-	67.961	-	67.961
2011	61.408	-	50.458	-	111.865	-	111.865
2012	61.408	-	50.458	-	111.865	-	111.865
2013	61.408	-	50.458	-	111.865	-	111.865
2014	61.408	-	50.458	-	111.865	-	111.865
2015	61.408	-	50.458	-	111.865	-	111.865
2016	61.408	-	50.458	-	111.865	-	111.865
2017	5.047		4.147		9.194		9.194
Total	**429.012**	-	**319.334**	-	**748.346**	-	**748.346**

Assumptions:

- EGy and EGbaseline projections were made assuming power plant operation during 24 hours per day, 365 days per year;
- For 2010 and 2017, it was assumed that each month has 30 days.
- Prevision of operation start of SHP Moinho in 01/02/2010 and of SHP Barracão in 01/10/2010;

Table 20 – EFgrid,CM, 2007 Calculation

Emission Factor	January-07	February-07	March-07	April-07	May-07	June-07	July-07	August-07	September-07	October-07	November-07	December-07
$EF_{grid,OM*}$	0,2292	0,1954	0,1948	0,1965	0,1606	0,2559	0,3096	0,3240	0,3550	0,3774	0,4059	0,4865
$EF_{grid,BM*}$	0,0775	0,0775	0,0775	0,0775	0,0775	0,0775	0,0775	0,0775	0,0775	0,0775	0,0775	0,0775
W_{OM}	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
W_{BM}	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
$EF_{grid,CM*}$	0,1533	0,1365	0,1361	0,1370	0,1190	0,1667	0,1935	0,2008	0,2163	0,2275	0,2417	0,2820

The emission factor which will be used for ex-ante estimation of emission reduction of SHPs Moinho and Barracão Project is 0.1842 which was obtained from simple arithmetic average of National Interconnected System monthly EFgrid,CM,2007.

Observations:

- The most recent information available by Brazilian Designated National Authority for a complete year refers to 2007;
- The daily data for Operating Margin Emission Factor is available on Annex 3;
- The hourly data for Operating Margin Emission Factor are available on the link: http://www.mct.gov.br/index.php/content/view/73962.html;

<u>PEy Calculation</u>

As described on table 18 of this PDD, SHP Moinho presents power density of 117.09 MW/km^2, being greater than 10 MW/km^2 and for that reason, according to methodology ACM0002, presents PEy is equal to zero.

However, SHP Barracão presents power density of 4.18 MW/km^2 and, according to methodology ACM0002, version 07, the reservoir presents emissions which must be accounted as equation 10 below:

$$PE_y = \frac{EF_{Res} * TEG_y}{1000}$$ **Equation 10**

Where:

PEy = Emission from reservoir expressed as tCO_2e/ano;
EF_{Res} = 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). This total electricity is based on **Firm Energy** of SHP Barracão.

Table below presents the emission of SHP Barracão which corresponds to the SHPs Moinho and Barracão Project as a whole.

Table 21 – Project Emissions (PEy)

Year	Estimation of project activity emissions (tonnes of CO2 e)
2010	1.166
2011	4.730
2012	4.730
2013	4.730
2014	4.730
2015	4.730
2016	4.730
2017	389
Total (tCO2 e)	**29.938**

LEy Calculation

As described on item B.6.1, there is no leakage for SHPs Moinho and Barracão Project and, therefore, PEy is 0 (zero).

With that, the ex-ante estimation of certified emission reduction can be view through the table below:

Table 22 – Ex-ante estimation of Emissions Reduction (tCO_2 e) of SHPs Moinho and Barracão Project

Year	Estimation of overall emission reductions (tonnes of CO2 e)
2010	11.352
2011	15.875
2012	15.875
2013	15.875
2014	15.875
2015	15.875
2016	15.875
2017	1.305
Total (tCO2 e)	**107.909**

B.6.4 Summary of the ex-ante estimation of emission reductions:

Table 23 – Summary of the ex-ante estimation 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)
2010	1.166	12.518	0	11.352
2011	4.730	20.606	0	15.875
2012	4.730	20.606	0	15.875
2013	4.730	20.606	0	15.875
2014	4.730	20.606	0	15.875
2015	4.730	20.606	0	15.875
2016	4.730	20.606	0	15.875
2017	389	1.694	0	1.305
Total (tCO2 e)	**29.938**	**137.847**	**0**	**107.909**

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Based on the applied methodology and based on what was described on the item B.6.1, there is no leakage for project activity. However project presents emission (through the reservoir of SHP Barracão) that must be monitored according to the default emission factor for emission from reservoirs determined by the CDM Executive Board. Therefore, the parameters to be monitored are just the baseline emissions through the project activity, the installed capacity of the project, the electricity generation of the project, the emission factors of the Brazilian National Interconnected System and the reservoirs area of the plants that compose the project activity.

The energy measurement is essential to verify and monitor the GHGs emission reduction. It is necessary, therefore, the use of meter equipment to register and check the electricity generated by the unit. Each SHP will have two electricity meters located on Powerhouse of SHP Moinho. These meters will measure the total electricity generated by each SHP. Furthermore, there will be one more electricity meter located on the substation. The information of net electricity generated by both SHPs is obtained through this meter.

All data collected as part of monitoring will be archived and be kept at least for 2 years after the end of the last crediting period. All measurements will be conducted with calibrated measurement equipment according to Brazilian industry standards.

The following data and parameters will be monitored:

Data / Parameter:	**Electricity Generated (*EG_y*)**
Data unit:	MWh
Description:	Electricity supplied by the project activity to the grid
Source of data to be used	Project Activity Site
Value of data applied for the purpose of calculating expected emission reduction in section B.5	.7.01 for SHP Moinho and 5.76 for SHP Barracão.
Description of measurement methods and procedures to be applied (if any)	Spreadsheets will be used, obtained directly from the meters with information generated hourly or within every 15 minutes. Monthly, the information will be checked with the generation reports provided by CCEE or by a measurement report emitted by an Measurement Outsourced Agent. Besides, information of generation can be checked by receipt of sales, if it is necessary to do so. It will be generated monthly reports that will be consolidated and recorded annually.
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 reports provided by (1) CCEE or by (2) a measurement report emitted by a Measurement Outsourced Agent Or (3) by receipt of sales.
Any comment:	*CCEE - Entity responsible for measurements, accounting and settlement on Brazilian electric energy market.

Data / Parameter:	**Total Electricity Generated (T*EG*$_y$)**
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 reduction in section B.5	This data was used to calculate the expected emission reduction just for the effects of calculation of Project Emissions, more specifically for the calculation of the emission of the reservoir of SHP Barracão. The value used corresponds to the value of **Firm Energy** of SHP Barracão, 6.0 MW, present on table 2 of this PDD. It will be generated monthly reports that will be consolidated and recorded annually.
Description of measurement methods and procedures to be applied (if any)	Spreadsheets will be used, obtained directly from the meters with information generated hourly or within every 15 minutes. This information can be obtained directly from the meters by Measurement Outsourced Agent or by the Special Measurement Area.
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:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	Project Site
Value of data applied for the purpose of calculating expected emission reduction in section B.5	This data was not used to calculate the expected emission reduction but it was used to calculate power density of SHPs which makes influence on expected emission reduction calculation. It was used the values of 13.7 MW for the Installed Capacity of SHP Moinho and 12 MW for SHP Barracão.
Description of measurement methods and procedures to be applied (if any)	The installed capacity will be monitored annually by Aneel, or by sub-hired companies, according recognized standards.
QA/QC procedures to be applied:	The uncertainty level for these data is low. The installed capacity is determined on the project's beginning and it will be monitored by the Regulator Agent.
Any comment:	

Data / Parameter:	**($EF_{grid,CM,y}$) Combined Margin CO_2 Emission Factor**
Data unit:	tCO_2/MWh
Description:	The combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system". The combined margin CO_2 emission factor to be used on SHPs Moinho and Barracão Project will be calculated based on data supplied for the National Interconnected System by Brazilian DNA.
Source of data to be	Ex-post emission factor will be calculated by MCT with the ONS data. The

used:	variables $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$, necessary for $EF_{grid,CM,y}$ 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 reduction in section B.5	The values of ($EF_{grid,CM,y}$) Combined Margin CO_2 Emission Factor which were used for ex-ante estimation of emission reduction of SHPs Moinho and Barracão Project is 0.1842 which was obtained from simple arithmetic average of National Interconnected System monthly EFgrid,CM,2007 as described on table 20 on the item B.6.3 and as described on the Annex 3.
Description of measurement methods and procedures to be applied (if any)	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:	

Data / Parameter:	**Area of the reservoir (A_{PJ})**
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Project Site
Value of data applied for the purpose of calculating expected emission reduction in section B.5	The area of the reservoir of SHPs Moinho and Barracão were used for the purpose of calculating expected emission reduction in section B.5. It was used the values of 117,000 m^2 for the reservoir of SHP Moinho and the 2,870,000 m^2 for SHP Barracão.
Description of measurement methods and procedures to be applied (if any)	Before filling the reservoirs, the area to be flooded is demarcated by pickets. Each picket has precise geographical coordinates which generate a faithful reference to the future area to be flooded. After the fulfillment of the reservoir, the water levels will get the base of each picket that will be monitored systematically during the plants operation. The level of water near to the pickets assures that the area of the reservoir is not changed. Annually, project participants will report the situation of water levels related to the pickets. It is important to clarify that in Brazil to change the area of the reservoir, the entrepreneur need an authorization by ANEEL and the unique reason for that change would be the necessity of changes in the Project that would require more investment in construction. This is not necessary for SHPs of this project. It is also important to say that it will be performed a topographical measurement to measure the area of the reservoir after it is completely full.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**$FC_{i,n,h}$**

Data unit:	Mass or Volume Unit
Description:	Amount of fossil fuel type *i* consumed by power plant / unit *j* in year y or hour h
Source of data to be used:	Brazilian DNA through ONS data.
Measurements procedures (if any):	
Monitoring Frequency:	• Dispatch Data OM: If available by Brazilian DNA, hourly, otherwise annually for the year *y* in which the project activity is displacing grid electricity or, if available, hourly. • BM: For the first crediting period, annually ex-post following the guidance included in step 4 of the "Tool to calculate the emission factor for an electricity system". For the second and third crediting period, only once *ex-ante* at the start of the second crediting period.
QA/QC procedures:	
Any comment:	Applicable in the following cases: • Calculation of power *unit* emission factors ($FE_{EL,n,y}$), as per equation (3) of the "Tool to calculate the emission factor for an electricity system", if the fuel consumption data for the power unit is available by Brazilian DNA. • Calculation of the hourly emission factor of plants in the top of dispatch where hourly fuel consumption data is available, as per equation (9).

<table>
<tr><td>Data / Parameter:</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Data unit:</td><td>GJ / mass or volume unit</td></tr>
<tr><td>Description:</td><td>Net calorific value (energy content) of fossil fuel type i in year y</td></tr>
<tr><td>Source of data to be used:</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>Values provided by the fuel supplier of the power plants in invoice</td><td>If data is collected from power plant operators (e.g. utilities)</td></tr>
<tr><td>Regional or national average default values</td><td>If values are reliable and documented in regional or national statistics / energy balances</td></tr>
<tr><td>IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.</td><td></td></tr>
</table>
Brazilian DNA will make data available. Data sources for $NC_{i,y}$ will be Energetic Brazilian Balance elaborated by Ministry of Mines and Energy (MME).</td></tr>
<tr><td>Measurements procedures (if any):</td><td></td></tr>
<tr><td>Monitoring Frequency:</td><td>• Dispatch Data OM: annually for the year y in which the project activity is</td></tr>
</table>

	displacing grid electricity or, if available, hourly. • BM: For the first crediting period, annually ex-post following the guidance included in step 4 of the "Tool to calculate the emission factor for an electricity system". For the second and third crediting period, only once *ex-ante* at the start of the second crediting period.
QA/QC procedures:	
Any comment:	Applicable in the following cases: • Calculation of power *unit* emission factors (FEEL,n,y), as per equation (3) of the "Tool to calculate the emission factor for an electricity system", if the fuel consumption data for the power unit is available by Brazilian DNA. • Calculation of the hourly emission factor of plants in the top of dispatch where hourly fuel consumption data is available, as per equation (9). The gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used.

Data / Parameter:	$\mathbf{EF_{CO2,i,y}}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data to be used:	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source**: - Values provided by the fuel supplier of the power plants in invoicec — If data is collected from power plant operators (e.g. utilities) - Regional or national average default values — If values are reliable and documented in regional or national statistics / energy balances - IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. — Brazilian DNA will make data available. Data sources for $\mathbf{EF_{CO2,i,y}}$ will be Energetic Brazilian Balance elaborated by Ministry of Mines and Energy.
Measurements procedures (if any):	
Monitoring Frequency:	• Dispatch Data OM: annually for the year *y* in which the project activity is displacing grid electricity or, if available, hourly. • BM: For the first crediting period, annually ex-post following the guidance included in step 4 of the "Tool to calculate the emission factor for an electricity system". For the second and third crediting period, only once *ex-ante* at the start of the second crediting period.
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EG_{n,h}$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant/unit *n* in year *y* or hour *h*.
Source of data to be used:	Brazilian DNA through ONS data.
Measurements procedures (if any):	
Monitoring Frequency:	• Dispatch Data OM: Hourly. • BM: For the first crediting period, annually ex-post following the guidance included in step 4 of the "Tool to calculate the emission factor for an electricity system". For the second and third crediting period, only once *ex-ante* at the start of the second crediting period.
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EG_{PJ,h}$
Data unit:	MWh
Description:	Electricity displaced by the project activity in hour *h* of year *y*.
Source of data to be used:	As specified by the underlying methodology.
Measurements procedures (if any):	As specified by the underlying methodology.
Monitoring Frequency:	Hourly.
QA/QC procedures:	As specified by the underlying methodology.
Any comment:	

Data / Parameter:	$\eta_{m,y}$
Data unit:	
Description:	Average net energy conversion efficiency of power unit *m* in year *y*
Source of data to be used:	Brazilian DNA through ONS Data(Brazilian National Operator System).
Measurements procedures (if any):	
Monitoring Frequency:	Once for the crediting period.
QA/QC procedures:	
Any comment:	

B.7.2 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 ACM0002, version 07.

SHPs Moinho and Barracão belong to the same company and they follow the same monitoring plan.

Responsibilities

- Operation and Maintenance Board: responsible for activities related to the plant's operation and maintenance.

- Special Measurement Area, linked to Operation and Maintenance Board: responsible for collecting information directly from the meters of SHPs Moinho and Barracão and for sending it to Electric Power Commercialization Chamber (CCEE). The Special Measurement Area is also responsible for the consolidation and analysis of monthly generation spreadsheets and for System of Energy Data Collection (SCDE), through the collected data consistence analysis and software operation monitoring.

- Measurement Outsourced Agent: Part of the responsibility of the Special Measurement Area can be outsourced hiring a Measurement Agent. In this case, the Special Measurement Area is responsible for supervising the work performed by the Measurement Outsourced Agent.

- Electric Power Commercialization Chamber (CCEE): it is responsible for implantation, operation and maintenance of SCDE, to enable the collection of the data of electric energy for the use of Accounting and Settlement System (SCL), aiming at assuring the accuracy of the amounts measured, as well as the meeting of the required deadlines

<u>Process Description</u>

I – Procedure of Generation Data Collection

There are two data collection channels in each measurement points. A channel is used by the company for direct collection and the other one is used by CCEE for data sent validation.

In the company, Special Measurement Area is responsible for obtaining data directly from the meters and make available in files on xml format. Data obtained by the company are sent daily to CCEE through SCDE system which makes the collection and treatment of the generation and consumption data of the National Interconnected System measurement points.

The Special Measurement Area is also responsible for generating, at each month in the first working day, based on consultation from a meters database, the spreadsheets with the generation data, consolidated hourly, regarding the previous month. These files are sent to CCEE in TXT format.

The procedure quoted above might be outsourced through hiring a Measurement Agent. In this case, the Special Measurement Area is responsible for supervising the work performed by the Measurement Outsourced Agent

In CCEE, the collected data, through SCDE, are transferred to the software SCL to accounting and financial clearance based on the Rules and Procedures for Commercialization of CCEE.

II – Data Consolidation Procedure:

CCEE compares data available and if an inconsistency occurs, it will be generated a non-conformity report that will verify with CCEE the cause for the disagreement between the information

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.

III – Data Storage:

The generation information, both the internally generated and the spreadsheets generated through the CCEE website, are electronically stored by the Operation and Maintenance Board.

Periodically, the Information Technology Area accomplishes an insurance backup for all company's data through a Data Server *backup.*

IV – Confronting of the internal generation data with the third part reports

The internal information might be confronted with (1) reports provided by CCEE or with (2) a measurement report emitted by a Measurement Outsourced Agent or (3) by receipt of sales.

V – Calibration of Meters (measuring tools):

The calibration of meters will follow what was described on the document elaborated by ONS – Sub module 12.3 - Maintenance of the measurement system for billing, which establishes that:

(a) The periodicity for the responsible agent's preventive maintenance for Measurement System for Billing (SMF) is of 2 (two) years at the most. That periodicity can be altered in function of the occurrence history observed for all facilities.

(b) The preventive maintenance can be postponed by the period of up to 2 (two) years, in the case of happening inspection in the measurement point. The postponement of that maintenance starts to apply from the inspection date.

Emission Factors

The emission factors will be calculated each year as described on the item B.6.1. 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.

Project Emission Calculation

Project Emissions will be monitored monthly by Enerbio Consultoria and the team of Desenvix S.A., linked to Operation and Maintenance Board, together. Project Emission will be calculated according equation 10 of this PDD, as indicated by Methodology ACM0002, version 07.

Period of Archiving

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.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The baseline study and monitoring methodology for the project activity were elaborated by Enerbio Consultoria and they were completed on 22/04/2008. Enerbio Consultoria is also a project participant.

Responsible for the project and participant listed on Annex I with the contact information

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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

SHP Moinho: 09/09/2008* (Prevision for beginning of construction)

*Dates are in format DD/MM/YYYY

C.1.2. Expected operational lifetime of the project activity:

30 years and 0 (zero) months.

C.2 Choice of the crediting period and related information:

The project activity will use renewable crediting period.

C.2.1. Renewable crediting period

7 years and it can be renewed at most two times

C.2.1.1. Starting date of the first crediting period:

The date which occurs later between:

- 01/02/2010 (Prevision of operation start of SHP Moinho);
- The date of registration in CDM EB.

C.2.1.2. Length of the first crediting period:

7 years and zero months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The growing global concern on sustainable resources is leading to a requirement for more sensitive environmental management practices. This is increasingly reflected in legislation and policies around the world. In Brazil, the situation is not different. The licensing policies and environmental rules are very demanding, just as the best international practices.

In Brazil, it is required to the sponsor of any project that involves construction, installation, expansion or operation of any polluting or potentially pollutant activity or any other activity that may cause environmental decay, a series of licenses from the pertinent environmental agency (federal and/or local, depending on the project).

To obtain all the environmental licenses, every hydroelectric project must mitigate, when it exists, the following impacts:

- Inundation of indigenous lands and slave historic areas – authorization for that depends on the National Congress resolution;
- Inundation of environmental preservation areas, legally defined as National Parks and Conserve Units;
- Inundation of urban areas or rural communities;
- Reservoirs where future urban expansion will occur;
- Elimination of natural patrimony;
- Expressive losses for other uses of water;
- Inundation of protected historic areas;
- Inundation of cemeteries and other sacred locations.

The process begins with an environmental impact study (which can be simplified, being named as Report of Simplified Analysis - RAS – or in detail, known as Study of Environmental Impact - EIA) undertaken by the entrepreneur and it follows with the previous analysis (preliminary studies) made by the local environmental department. If the entrepreneurship is considered as a project with low environmental impact, the studies of environmental impact will be simplified. Afterwards, if the project is considered environmentally feasible, the sponsors have to prepare an environmental assessment, which is basically composed of the following information:

- Reasons to implement the project;
- Project Description, including information related to the reservoir;
- Preliminary Environmental Diagnosis, mentioning the main physical, biotic and anthropic aspects;
- Preliminary estimation of the project impacts (Environmental Prognosis); and
- Possible mitigating measures and environmental programs.

The result of these evaluations is the Preliminary License (LP), which reflects the positive understanding of the local environmental agency on the project environmental concepts.

To obtain the installation license (LI), it is necessary to present (a) additional information about the previous assessment; (b) a new simplified assessment (RDPA – Report Detailed of Environmental

Programs); or (c) the Environmental Basic Project (PBA) according to the resolution of the environmental agency informed on the LP.

The operation license (LO) is requested during the final phase of the construction and it is obtained after the entrepreneur proves that all exigencies made by the local environmental agency were fulfilled.

Desenvix S.A holds the Prior License to SHP Moinho. In the moment of elaboration of this PDD, the company awaits the liberation of the authorization from ANEEL and of the emission of the Installation License to the beginning of the construction of this SHP.

In relation to SHP Barracão, Desenvix S.A registered on 17/03/2008 the RAS asking the analysis of the information of the project of this SHP, aiming at obtaining the Prior License.

Below, it follows the prior license of SHP Moinho, provided to the Designated Operational Entity in the validation stage

SHP Moinho

- Prior License (LP) 408/2008 – DL
    - Signed on:11/04/2008
    - Valid until: 30/09/2009

- Prior License (LP) 1111/2007 – DL
    - Signed on: 01/10/2007
    - Valid until: 30/09/2009

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The environmental impact of the project activity is considered small. The SHPs of SHPs Moinho and Barracão Project presents little necessity of reservoir's flooded area and it will be implanted satisfying completely the several demands of the environment legislation state – FEPAM – and of the Brazilian electric system – ANEEL, aiming at having and keeping the necessary licenses for its implantation.

The identification of the possible environmental impacts started in the knowledge of the activities that may potentially generate environmental alterations related to the process of planning, implantation and operation of the entrepreneurship. The implantation of the entrepreneurships for the production of hydroelectric electricity is commonly followed by actions that alter the physical conditions of the environment which supports it.

The analysis of the environmental impact in relation to the water resources was carried out from the models of simplified simulation that allowed the qualitative-quantitative approach to environmental impact. The implantation of the SHPs Moinho and Barracão may alter the quality of the water in Bernardo José River within the reservoir and, consequently, to the dam's downstream; eutrophyzation may occur if the accumulation of vegetation in the area of the future lake is not removed. Eutrophyzations occur as a result of the inundation of vegetation masses (phytomass) and the consequent increase in the availability of nutrients (phosphorous and nitrogen), which results in exaggerated algae proliferation.

In relation to the acceleration of erosive processes, it was identified that during the construction phase the erosive processes may be initiated or accelerated due to the installation of supporting structures to the work (construction sites, lodgings, access roads, etc.) in areas susceptible to erosion, as well as a result of exploration of building materials necessary to the entrepreneurship.

The impacts on vegetable cover, derived from the implantation and operation of SHPs Moinho and Barracão, are restricted to the area of direct influence, defined as the parcel inserted between the maximum quote to be reached by dam filling and the current river bed, as well as the areas affected by the implantation of other remaining structures, including access roads and construction sites.

Regarding the fauna affected by the implantation of the entrepreneurship, besides the impact that it will propitiate to the ichthyofauna from the alteration of the Fluvial System, it is verified that the influence area of the SHPs is in great part a secluded place with difficult access and few inhabitants. This way, it is configured as a relatively safe location to the various specimens that do not tolerate – or at least avoid – human presence.

With the beginning of the activities and especially, its climax, when employees, machines and equipment will be in operation, it is expected the withdrawal of part of the native fauna. The risk to the fauna is increased with dispersion, whether by the mortality caused by humans and their domestic animals or by the increase in hunting and predation, inanition for the lack of resources and abandonment of the offspring. As the construction develops, the tendency is the rise in dispersion, which will culminate in the cleaning phase of the reservoir, when a considerable contingent of fauna will compulsorily be dislodged.

Through archeological studies (archeological inspections) carried out up to the present, nothing was found. Thus, there must be developed an archeological monitoring during the execution of the construction, once the region as a whole presents some potential and the soil visibility of the flooded area is precarious, bearing in mind the existent vegetable cover.

It will be developed several programs and actions, aiming at minimizing and mitigating the environmental impact of entrepreneurship in the physical, biotic and anthropic fields. All programs and environmental actions will be elaborated according to the latest management techniques of natural and social resources.

The fact that SHPs Moinho and Barracão are located very near each other, in the same river, and that they present similarities in terms of projects and size has propitiated the existence of a planning of environmental programs similar in the implantation of the entrepreneurships. This way, a description of the environmental programs that will be developed in the project of these two SHPs in a similar way, aiming at mitigating the environmental impacts quoted, follows below.

Monitoring program of the quality of superficial and subterraneous waters

In order to avoid eutrophyzations, the contribution basin of the area occupied by the future lake (reservoir area) will be cleaned by taking out up to 80% of the arboreal vegetation existent in the place. Concomitantly, there will be control over fortuitous pollution sources in the Basin of Bernardo José River. The implantation of the reservoir’s protection zone or APP (Permanent Preservation Area) of the reservoir is also constituted of a salutary measurement and may render bland the introduction of diffuse polluting charges of the basin.

The monitoring program of the quality of superficial and subterraneous waters will be developed with the objective of (i) obtaining resources to better coordinate the necessary intervention, seeking to attenuate the possible effects of the entrepreneurship on the quality of water and (ii) creating conditions to the development of actions aiming at the integrated management of the hydrographical basin of the reservoir.

Cleaning Program of the Accumulation Basin

The cleaning program of the accumulation basin will be developed with three basic objectives: (i) avoid the degradation of stored water and eliminate the impediments to the exercise of navigation, fishing and recreation of primary contact; (ii) allow the rational profiting of the forest resources existent in the area; and (iii) contribute to the preservation of the region's landscape values.

General forestation program

The general forestation program in the area of influence of the SHP Moinho and Barracão will have the following basic objectives:

- Propitiate the compensation of deforesting that may be realized in the working field and in the accumulation basin;
- Contribute to the maintenance of the dammed water, once it constitutes an obstacle relatively efficient to the taking of sediments to the inside of the reservoir;
- Generate positive biological effects, through the formation of adequate environments to the alimentary maintenance and protection of the wild fauna and ichthyofauna;
- Make possible the recuperation of degraded areas destined to permanent preservation (APPs);
- Propitiate ecologically adequate destination to the branches rescued from the flooded area; and
- Propitiate a meaningful effect of landscape beauty, valuing the reservoir as a whole.

From these objectives, it will be established targets that will determine specific actions.

Program of Recuperation of degraded areas

This program presents as its main objective the proposition of preventive measures capable of (i) sensibly reducing the level of degradation of soil resources and vegetable cover and (ii) conveniently reintegrating the degraded areas to the typical landscape of the region.

Rescue Program of Wild Flora and Fauna

The rescue program of wild flora and fauna will have the following objectives:

- To plan the removal of the vegetation in the area of influence aiming at inducing the dislodging of the fauna to non-affected areas in the area of influence;
- Capture animals constrained by the cleaning actions in the area of the reservoir and release them in preserved areas, downstream the dam, in the valley of Bernardo José River;
- Promote the collection, the identification and description of epiphytes in the flooded area and preferably re-introduce them in APP;
- Collect tree branches in the flooded area aiming at forest reposition in APP with individuals with genome of those suppressed by the vegetation cutting.

Protection Program of the Aquatic fauna

It will be developed a program for protection of the aquatic fauna with the objective of (i) evaluating the system of operation of the SHP in relation to the minimum flow and the addition of flow from the tributaries and from the spillway in periods of high tide; (ii) monitoring the ichthyofauna to the evaluation of the effects of the reduced flow in the aquatic biota; (iii) implementing along with other programs a system of maintenance of environmental quality and of the diversity of niches to allow the complete development of the aquatic fauna.

Program of Environmental Education

The program of environmental education (PEE) has the objective of disclosure the proposals of the Basic Environmental Project and the awareness of the population involved in SHP Moinho and Barracão. The main target public of this program will be the scholar population in the cities of Barracão and Pinhal da Serra, the residents of the surroundings of the flooded area and the employees of the companies that will work in the implantation and operation of SHPs.

The main goals for the Program of Environmental Education are described below:

- To inform and clarify the population in the area of influence about the environmental action developed by the entrepreneur during the planning, implantation and operation phases, aiming at the safe conduct of the population, at the protection of the local fauna and flora, and at the protection of water and soil;
- Fortify the channels of representation of the community and the City Hall, as mediators in the negotiation of the entrepreneur with the local population in order to better conciliate their respective interests and make the development of educational programs possible;
- Promote the knowledge on proposals of sustainable usage of natural resources and the conservation of the environment as a means for the generation of income to the local population;
- Prepare the work force of the working teams during the implantation and operation phases of SHP Moinho to the execution of premises indicated in the Project.

Program for Rescuing the Pre-historical Archeological Patrimony and Cultural History

The objective of this program is the localization, preservation and rescue of the archeological patrimony to the study and knowledge of the history of the settlement in the area of direct influence of the SHP Moinho and Barracão.

Besides, some programs will be specifically developed to each one of the SHPs; as an example, we may cite, to the SHP Moinho, the Programs of Rescue of the Sylvester Flora and Fauna and the Program of Utilization of the Reservoir and Surrounding Areas; to the SHP Barracão, the Program of Health and Environment and the Program of Environmental Optimization.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

According to Resolution nº 7 of Brazilian DNA, local stakeholder must be invited to comment the CDM Project.

This way, the proponents of the project have sent letters to the Interested Parties, inviting them to elaborate comments about the project. The following Interested Parties were invited to comment about the project:

- City Hall of Barracão;
- Municipal Assembly of Barracão;
- Department of Environment of Barracão's Secretary of Agriculture.
- City Hall of Pinhal da Serra;

- Municipal Assembly of Pinhal da Serra;
- Secretary of Planning of Pinhal da Serra (responsible for issues related to the Environment in the municipality of Barracão);
- Communitary Association of Vila Serra dos Gregórios – municipality of Pinhal da Serra;
- Association of Family Farmers – municipality of Barracão;
- Association of “Operário” (Workers) neighborhood – municipality of Barracão;
- City Hall of Lagoa Vermelha;
- Municipal Assembly of Lagoa Vermelha;
- Secretary of Agriculture and Environment of Lagoa Vermelha;
- Union of Associations of Neighborhoods of Lagoa Vermelha;
- Federal Attorney of Public Interest;
- State of Rio Grande do Sul Attorney of Public Interest;
- Brazilian Fórum of NGO’s and Social Movements for Environment and Development;
- State Secretary of Environment (SEMA);
- State Foundation of Environmental Protection Henrique Luis Roessler (FEPAM).

The call-letters were sent before the validation process and a 30 days term was given for the local stakeholders to make some pronunciation and giving opinions about SHPs Moinho and Barracão Project.

Besides the letters sent to local stakeholders, the PDD was available to public comments for the local stakeholders at the website www.enerbio-rs.com.br.

E.2. Summary of the comments received:

So far, the project has not received any comments.

E.3. Report on how due account was taken of any comments received:

It is not applicable, because so far the project has not received any comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding coming from Annex I countries was used in this project.

Annex 3

BASELINE INFORMATION

Although the baseline information had been discussed on the item B to this PDD, some assumptions taken to draft the baseline scenario were based on the assumptions used by the Ministry of Mines and Energy on the Decennial Plan of Electric Industry Expansion, elaborated by the Ministry of Mines and Energy in 2006. Some assumptions are described in the tables below:

Table 24: Growing Rate of Brazilian GDP (%)

Year	2006	2007-2011	2012-2015	2006-2015
Growing Rate	4.0	4.0	4.5	4.2

Table 25: Growing Rate of Population and Number of Residence in Brazil (%)

Period	Population	Number of Residences
2005-2010	1.13	2.67
2010-2015	0.93	2.62
2005-2015	**1.04**	**2.65**

To estimate the population and Brazilian residences growing rate, data from IBGE – Brazilian Geographic and Statistic Institute – and from the paper "Estimations on Population and Residences for Prevision Studies on Residential Class's Electric Energy Market, 2004-2015 (translated from Portuguese: "Estimativas da População e Domicílios para os Estudos de Previsão do Mercado de Energia Elétrica da Classe Residencial, 2004-2014") were used.

Table 26: Projection of Classic Energetic Self-Production Level (TWh) - Brazil

Discrimination	2005	2010	2015
Big Consumers	17.6	27.5	34.8
Others	9.8	12.5	16.0
Total	**27.4**	**40.0**	**50.8**

The energetic self-production, named classic, means the electric energy generated to supply local unit consumer, without using the transmission and distribution electric grid. It is very relevant to present the classic self-production evolution, particularly for big industrial electric energy consumers, which concentrate great amount of shares of self-production potential.

Table 27: Projection of electric energy demand from big industrial consumers (TWh) - Brazil

Discrimination	2005	2010	2015
Consumption – Electric System	66.1	81.2	98.8
Classic Self-Production	17.6	27.5	34.8
Total	83.7	108.7	133.6
Classic Self-Production/Total (%)	**21.1**	**25.3**	**26.2**

The projection for the total consumption of electricity of big industrial consumers was elaborated based on the installed capacity perspective and on the assumptions related to internal and external sectorial markets dynamics, estimating, in this way, the respective physical volume production.

Table 28: Projection of electric energy consumption per Class and Subsystem – Brazil

Discrimination	Consumption TWh			Variation (% ao ano)		
	2005	**2010**	**2015**	**2005-2010**	**2010-2015**	**2005-2015**
Classe						
Residential	82.3	109.2	142.5	5.8	5.5	5.6
Industrial	161.1	198.4	244.7	4.3	4.3	4.3
Commercial	52.9	73.4	101.9	6.7	6.8	6.8
Others	49.8	62.6	77.8	4.7	4.4	4.6
Total	**346.1**	**443.6**	**566.9**	**5.1**	**5.0**	**5.1**
Subsytem						
North	23.5	30.7	45.5	5.5	8.1	6.8
Northeast	47.5	61.2	78.1	5.2	5.0	5.1
Southeast/Midwest	209.1	266.8	335.1	5.0	4.7	4.8
South	58.8	73.9	92.2	4.7	4.5	4.6
SIN (National Interconnectd System)	**338.9**	**432.6**	**550.9**	**5.0**	**5.0**	**5.0**
Isolated	7.2	10.9	16.0	8.7	8.0	8.3
Total	**346.1**	**443.5**	**566.9**	**5.1**	**5.0**	**5.1**

The projection above indicates a greater increase of residential and commercial consumption until 2015 concentrated mainly in North Subsystem, either in North Subsystem interconnected to SIN, or in the Isolated Systems.

Besides the description about the assumptions used in the baseline delineation, it is necessary to detail some criteria taken for baseline's emission calculation.

From 2006, the MCT in cooperation with the MME and ONS, started to make available the calculation methodology for CO_2 emission factor for grid-connected electricity generation in the Brazilian National Interconnected System according to ACM0002 Methodology using dispatch data analysis. The emission factor started to be widespread for each Subsystem of Brazilian Interconnected System.

In May 2008, the Designated National Authority of CDM in Brazil defined that the National Interconnected System must be considered as an unique System and, this way, this configuration started to be valid for calculating the emission factor of CO_2 used to calculate the emission reduction of greenhouse gases for CDM Projects of electricity generation connected to the grid.

The calculation of emission factor of $CO_{2,}$ 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 tables below present the values considered to calculate the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$) which were used for SHPs Moinho and Barracão Project *ex-ante* estimation of emission reduction. All these data were provided by Brazilian DNA

Table 29 – – Monthly Medium Operating Margin Emission Factor of the year of 2007– Brazilian Interconnected System

Medium Emission Factor (tCO2/MWh) - **MONTHLY**													
2007		Month											
		January	February	March	April	May	June	July	August	September	October	November	December
		0,2292	0,1954	0,1948	0,1965	0,1606	0,2559	0,3096	0,3240	0,3550	0,3774	0,4059	0,4865

Table 30 – Daily Medium Operating Margin Emission Factor of the year of 2007– Brazilian Interconnected System

Medium Emission Factor (tCO_2/MWh) - **DAILY**													
2007		Month											
	Day	January	February	March	April	May	June	July	August	September	October	November	December
	1	0,1989	0,1965	0,2466	0,2204	0,2620	0,1409	0,3254	0,2625	0,3402	0,3753	0,3359	0,3831
	2	0,2314	0,2260	0,2102	0,1929	0,1999	0,1634	0,2933	0,2989	0,3854	0,3700	0,4556	0,4286
	3	0,2270	0,2059	0,1878	0,1957	0,1497	0,1975	0,2692	0,3305	0,2882	0,3753	0,4557	0,3761
	4	0,2322	0,2195	0,2205	0,1960	0,1618	0,1898	0,2790	0,3591	0,3042	0,3731	0,5588	0,3791
	5	0,2146	0,1496	0,2252	0,1982	0,1703	0,2706	0,2833	0,3619	0,3491	0,3296	0,4773	0,3884
	6	0,2758	0,1458	0,2346	0,1951	0,1820	0,2478	0,2928	0,2978	0,3467	0,3683	0,3686	0,3935
	7	0,2812	0,1845	0,2334	0,2124	0,1394	0,2747	0,3280	0,2553	0,4455	0,4927	0,3534	0,4359
	8	0,2579	0,1471	0,1923	0,2353	0,1259	0,2484	0,3944	0,2603	0,4297	0,3922	0,3520	0,4885
	9	0,2592	0,1640	0,2040	0,2223	0,1342	0,2983	0,3491	0,2944	0,4108	0,3679	0,3798	0,5143
	10	0,2179	0,1749	0,1860	0,1958	0,1713	0,3292	0,3201	0,3215	0,2859	0,3799	0,4743	0,3831
	11	0,2232	0,2131	0,2033	0,1861	0,1717	0,2817	0,2915	0,3471	0,2579	0,3793	0,5057	0,3245
	12	0,2254	0,1746	0,1804	0,1600	0,1950	0,2592	0,2809	0,3805	0,2480	0,4448	0,3967	0,3439
	13	0,2627	0,1726	0,1767	0,1614	0,2243	0,2613	0,3009	0,3255	0,2836	0,4945	0,3995	0,4192
	14	0,3102	0,1705	0,2027	0,2150	0,1676	0,2616	0,3263	0,3382	0,2845	0,5172	0,3629	0,4146
	15	0,2554	0,1832	0,2215	0,2264	0,1633	0,3048	0,3395	0,3516	0,3674	0,4061	0,4286	0,4129
	16	0,1978	0,1736	0,2156	0,1922	0,1557	0,2904	0,3307	0,3148	0,4407	0,3679	0,4486	0,4935
	17	0,1988	0,1934	0,2324	0,2236	0,1515	0,3182	0,3214	0,3025	0,3677	0,3552	0,4881	0,4501
	18	0,2114	0,2292	0,2553	0,2256	0,1455	0,2640	0,3245	0,3867	0,3491	0,3640	0,5123	0,4570
	19	0,2213	0,2073	0,2199	0,2072	0,1391	0,2324	0,3133	0,4149	0,3758	0,3606	0,4010	0,4710
	20	0,2253	0,2465	0,1924	0,1767	0,1274	0,2380	0,3050	0,3512	0,3577	0,4013	0,3839	0,5208
	21	0,2478	0,2514	0,1809	0,1849	0,1113	0,2341	0,3359	0,3438	0,3395	0,4714	0,3763	0,5127
	22	0,2107	0,2267	0,1727	0,1905	0,1155	0,2434	0,3229	0,3478	0,4127	0,3727	0,3752	0,6000
	23	0,1816	0,2098	0,1450	0,1789	0,1510	0,2615	0,3005	0,3396	0,4503	0,3465	0,3437	0,6587
	24	0,1727	0,1935	0,1415	0,1931	0,1551	0,3127	0,2856	0,3030	0,3525	0,3353	0,4072	0,6614
	25	0,2158	0,2000	0,1167	0,1789	0,1424	0,2790	0,2958	0,3649	0,3931	0,3273	0,4748	0,6913
	26	0,2155	0,1720	0,1466	0,1649	0,1795	0,2413	0,3037	0,3844	0,3710	0,3159	0,3936	0,5878
	27	0,2411	0,2080	0,1703	0,1643	0,2215	0,2454	0,2951	0,3154	0,2954	0,3433	0,3756	0,5647
	28	0,2521	0,2555	0,1530	0,1552	0,1781	0,2622	0,3188	0,2828	0,3486	0,3641	0,3470	0,5873
	29	0,2273		0,1806	0,2464	0,1442	0,2659	0,3472	0,2889	0,4057	0,3375	0,3140	0,6143
	30	0,2360		0,1844	0,2295	0,1416	0,2840	0,2814	0,2785	0,4581	0,3435	0,3407	0,6485
	31	0,2113		0,2113		0,1453		0,2778	0,2934		0,3136		0,6693

The hourly average emission factors are also available on the links: http://www.mct.gov.br/index.php/content/view/73962.html (accessed in September/2008).

The operating margin emission factor is calculated for Brazilian National Interconnected System for each hour based on the value of energy dispatched by each plant, generation cost of each plant (dispatch priority), hourly exchange with neighboring subsystem and emission factors for thermoelectric plants.

The dispatch order for Brazilian Interconnected System is: hydroelectric power plants, wind, nuclear, imports from other systems in ascending order of cost, thermoelectric power plants in ascending order of generation cost.

The tables below present the data concerned to the build margin emission factor ($EF_{grid,BM,y}$) used for project ex-ante emission reduction estimation.

Table 31 – Build Margin Emission Factor of the year 2007 – National Interconnected System

Medium Emission Factor (tCO_2/MWh) - **ANNUAL**	
2007	
	0,0775

*Source: Designated National Authority (*http://www.mct.gov.br/index.php/content/view/73962.html (accessed in September/2008)

The build emission factor is the average emission factor of the most recent plants of the subsystem. This set should comprise at least 5 plants and its installed capacity should be greater than 20% of installed capacity of the subsystem.

Others information about the baseline scenario and baseline emissions are presented on item B.

Annex 4

MONITORING INFORMATION

The “Consolidated monitoring methodology ACM0002” defines the monitoring procedures of the project activities.

All procedures which will be used to monitor the project are described on item B.7.1 and B.7.2. Some additional information is presented below.

Some details about the CCEE (Chamber of Commercialization of Electrical Energy) Energy Measurement Process are described below:

The Commercialization Process

The Electric Power Commercialization Process takes place in accordance to the parameters that have been established by Law 10848/2004, by Decrees 5163/2004 and 5.177/2004 (which instituted CCEE) and by ANEEL Normative Resolution 109/2004, which instituted the Electric Power Commercialization Convention.

The business relationships between the Agents members of the CCEE are predominately regulated by electric power purchase and sale agreements, and all the agreements executed between the Agents within the context of the National Interconnected System must be recorded at CCEE. Such recording includes only the parties involved, the amounts of energy and the period of effectiveness; the prices for the electric power on the agreements are not recorded at CCEE, and they are used specifically by the parties involved during their bilateral settlements.

CCEE posts the differences between what has been produced or consumed and what has been contracted. The positive or negative differences are settled on the Short Term Market and are valued according to the PLD (Price for the Settlement of Differences, from Portuguese: Preço de Liquidação das Diferenças), set weekly for each load level, and for each Subsystem, having as basis the marginal cost to operate the system, which is limited by a minimum and by a maximum price.

Measurement

As set forth by the Commercialization Convention, homologated by ANEEL Resolution 109, dated October 26, 2004, CCEE is responsible for providing the specifications, orientation and determination of aspects pertaining to the adaptation of the Billing Measurement System (SMF), and for the implementation, operation and maintenance of the SCDE system (Electric Power Data Collection System), so as to render viable the garnering of data pertaining to electric power to be used in the Accounting and Settlement System (SCL), aiming at assuring the accuracy of the amounts measured, as well as the meeting of the required time frames.

Accounting Measurement

The National Interconnected System is represented at the CCEE through a structure made-up of the measurement of consumption and generation points, which are defined through the Electric System Modeling, and whose purpose is to obtain the measured net amounts of electric power for each Agent, thus allowing the Posting and Financial Settlement of short term market operations.

In order to obtain such amounts, the Commercialization Rules have established a process for the determination and the treatment of the electric power consumption and generation amounts commercialized by the Agents. The processing of the data is called Accounting Measurement Aggregation (from Portuguese: Agregação Contábil da Medição). There is need for adjustments because losses of electricity occur in the transmission system while the consumption through generation is being accomplished.

At CCEE these losses are apportioned among the Agents which own the consumption and generation measurement points. Through the apportionment of these losses an assurance is given that the total effective generation of the system will be consonant with the total effective load of the system. The virtual point where the losses of the generation and consumption points become even is called the Gravity Point, and at this point all the purchases and sales of electric power at the CCEE are computed. The existence of this virtual point makes it possible to establish a comparison between the measurements taken at different actual points of the SIN.

The points of the SIN that become part of the apportionment process mentioned are those defined by ANEEL as being participants in the apportionment of the losses which occurred within the basic network. The losses of electric power are shared equally between the points of generation and consumption, where half the losses are deducted from the total amount generated and the other half is added to the total amount consumed. The generation and consumption totals of each Agent at the Gravity Point are computed from the measurement values informed by the Agents to CCEE, so as to be used in the process of posting the energy that has been commercialized on the Short-Term Market.

Electric Power Data Collection System – SCDE (from Portuguese: Sistema de Coleta de Dados de Energia Elétrica)

The SCDE is responsible for the daily collection and treatment of measurement data, whereby the acquisition of these data is accomplished automatically, directly from the measuring device or through the Agent's database (UCM).This system allows the carrying out of logical inspections, providing direct access to the measuring devices, and allowing greater reliability and accuracy to the data obtained.

Through the SCDE, market agents achieve greater ease in sending the measurement data to CCEE, as well as they are able to monitor the information sent on a daily basis.

Technical specifications

When is needed the installation/adaptation of the measurement System for Billing (SMF), the constant technical requirements should be observed in the Annex 1 - technical specification of the measurements for billing of the sub module 12.2 - Installation of Measurement for Billing of the Module 12 of the Procedures of Net of ONS.

The use was authorized temporarily by ANEEL Authoritative Resolution 787, of 23/01/2007.

Aiming at establishing the periodicity which the measuring tools of SHPs Moinho and Barracão Project should be calibrated, it follows below the orientation presented in Grid Procedures Sub-Module 12.3, established by ONS.

Preventive maintenance – Meters Calibration

Source: ONS – Sub-Module 12.3 – Maintenance of the measurement system for billing

In order to make the System of Measurement for Billing - SMF effective in its operation, it is necessary periodically accomplished preventive maintenances and, when necessary, corrective maintenances in the involved agents' facilities. Inspections in SMF are also accomplished with the intention of verifying the correct operation of the devices.

The activities to be accomplished by the agents involved in the National Interconnected System - SIN in the maintenances and in the inspections are described in the Annexes 1 and 2 of this sub module.

Annex 1 of ONS Sub-Module 12.3

Activities to be accomplished in the maintenance of the System of Measurement for Billing - SMF

(a) The periodicity for the preventive maintenance of responsible agent for SMF is 2 (two) years at the most. That periodicity can be altered in function of the occurrence report observed for all facilities.

(b) The preventive maintenance can be postponed by the period of up to 2 (two) years, in case an inspection happens in the measurement point. The postponement of that maintenance starts to be applied from the inspection date.

(c) The minimum tests to which the transformers should be submitted for instruments (TI) are the following ones: imposed load and diphase with periodicity of 8 (eight) years at most.

(d) In all maintenance or meters calibration, these should be substituted by another properly programmed and calibrated, when there is not an extra device, in order to minimize the interruption in the registration load

(e) Any changing in the relation of transformation of TI to assist the protection or any operational condition that affects the measurement circuit for billing should be previously communicated to the responsible agent. That agent should make the data registered change in the Electric Power Data Collection System - SCDE and submit it to the approval of the CCEE. After the alterations in the measurement system, the involved agents should program an inspection to restore the sealing waxes.

(f) The verification of the perfect operation of the several functions of the meters should be accomplished, as programming, mass memory, schedule, registrations, aside reading, etc. The mass memory conformity configuration should be verified (Data Record) with the one declared by the supplier and constant on the CCEE website.

(g) The general inspection of the SMF connections should be accomplished to verify the existence of eventual irregularity to affect the measurement.

(h) The calibration of the meter should be made by comparative method of consumption of Wh, with artificial load, single-phase or three-phase tests, in laboratories or in the field, with patterns tracked to the National Institute of Metrology, Normalization and Industrial Quality - INMETRO.

(i) The applied tension for calibration should be equal to the nominal tension of meter.

(j) The pattern used in the calibration should be owned by the responsible agent for SMF or by a hired laboratory for the responsible agent, but, just for comparison, it can be adopted the agent's pattern that accompanies the maintenance. The standard(s) must be accomplished by their calibration certificates valid in the event period.

(k) The standard(s), the artificial load and the meter must, when necessary, be energized before the tests with tension and nominal current, during the necessary time - at least 30 (thirty) minutes or in agreement with the orientations of the manufacturers of the meters and pattern - for the thermal stabilization.

(l) The minimum tests to which each meter should be submitted are the following ones: calibration with nominal load, activates, reactivates inductive and reactivates capacitive, and with small load activates, according to the ABNT 14520 or IEC 687 norms.

(m) The meter in calibration that presents mistakes out of the limits specified by the used norm should be substituted.

(n) The meter identification code supplied by CCEE should be programmed and/or verified.

(o) The currents phasorial, the tensions and the studies of the sequence of phases should be accomplished before and after the maintenance.

(p) In case the connected agent or responsible agent for SMF is late in the arrival to the place, the involved agents should wait 2 (two) hours, when, then, they should cancel the service, except for agreement among the parts regarding the awaiting period.

Annex 5

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