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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

SHPPs Jorge Dreher and Henrique Kotzian CDM Project
Version: 4
Date: 26/06/2012

A.2. Description of the project activity:

The project activity consists in electricity generation by renewable source (hydro), through the construction of small hydropower plants (SHPs) located in the Júlio de Castilhos and Salto do Jacuí municipalities, both in Rio Grande do Sul state – south region of Brazil.

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

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

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

The project activity purpose is to provide electric power to the National Interconnected System - *SIN* (from Portuguese – *Sistema Interconectado Nacional*), displacing the thermal generation from fossil fuels presents in the system with the generation of renewable sources of energy. Moreover, the SHPs construction helps to meet the growing energy demand on Rio Grande do Sul state, to decrease the external energy dependency and contributes to the environmental sustainability, as it increases the share of renewable energy in relation to the total consumption of electricity of Brazil.

In regard to the contribution of project activity to reduce the global warming effects caused by greenhouse gas emissions, the project activity reduces these gas emissions, as well reduces the host country dependence of a matrix with large participation of thermoelectricity. As stated in the Generation Information Bank (from portuguese *Banco de Informações de Geração-BIG*) of National Electric Energy Agency, 26.2% of the generated energy in Brazil comes from thermoelectric plants (that uses fossil fuels as energy source)[1] connected to the National Interconnected System.

The project activity is also aligned with the specific requirements of CDM, because:

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

- It contributes to environmental sustainability once it reduces the use of fossil energy (non-renewable sources). Thus, the project contributes to the best use of natural resources and makes use of clean and efficient technologies;
- It enlarges the opportunity for employment in areas where the project is located;
- It contributes to better conditions of the local economy, because the use of renewable energy reduces the dependence on fossil fuels, reduces the amount of pollution related to the fossil fuel emissions and the social costs related to it.

Furthermore, the project activity diversifies the electricity generation sources and decentralizes the energy generation, promoting advantages as:

- Increased reliability, less frequent and extensive interruptions;
- Lower requirements on the reserve margin;
- Power of better quality for the region;
- Reduced losses on the lines;
- Control of reactive power;
- Mitigation of the congestion in the transmission and distribution grid.

The project activity is the installation of a new grid-connected renewable power plants/units. The baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants or by the addition of new generation sources. More details about the baseline in the Section B.4.

A.3. Project participants:

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 Country)	BME Rincão do Ivaí Energia S.A. (private entity)	No
	BME Capão da Convenção Energia S.A. (private entity)	
	Carbotrader Assessoria e Consultoria em Energia Eireli. (private entity)	
(*) 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.		

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.:

Rio Grande do Sul state – RS.

A.4.1.3. City/Town/Community etc.:

Júlio de Castilhos and Salto do Jacuí municipalities.

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

At the pictures below is it possible to verify the regional position of both municipalities where the hydro plants are located in Rio Grande do Sul state, region South of Brazil. The municipalities are Júlio de Castilhos (figure 1) and Salto Jacuí (figure 2). The stretch of Ivaí river, where the power plants of the project activity are located on, flows between these two municipalities, being one of their geographical limits. The Engenheiro Ernesto Jorge Dreher SHP is located at 29º07'13"S and 53º22'04"W, and the Engenheiro Henrique Kotzian SHP is located at 29°07'34"S and 53°19'06"W.

Figure 1: Localization of Júlio de Castilhos city.

Figure 2: Localization of Salto do Jacuí city.

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

Large-scale project activity
Type 1: Renewable energy project
Category: Renewable electricity generation for a grid.

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

(a) The scenario existing prior to the start of the implementation of the project activity:

Prior to implementation of the proposed project, the electricity was generated by the operational power plant matrix that has a strong participation of fossil fuel power plants. The project activity reduces GHG emissions avoiding the operating entrance of thermoelectric power plants that use fossil fuel. In the absence of the project activity, fossil fuel would be burned in thermoelectric plants which are interconnected to the grid.

(b) The scope of the activities/measures that are being implemented within the project activity:

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

The Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs are ventures classified as Small Hydro Power Plants because, according to the Brazilian Resolution number 652, issued on 9th December 2003, from National Electric Energy Agency (ANEEL), to be considered a SHP the reservoir area of a hydropower plant must be lower than 3 Km^2 (300 ha) and its total installed capacity must be between 1 MW and 30 MW. The plants of the project activity are in agreement with this range as described on the tables 1 and 2.

The ventures are also called “run of river” plants which do not include significant water storage, and must therefore make complete use of the water flow. A typical run-of-river scheme involves a low-level diversion dam and is usually uses an unevenness accent on a river.

The project activity`s power plants will dispatch generated energy to the National Interconnected Grid through the connection bay located on 138kV Substation Salto do Jacuí (installed on the Salto do Jacuí city, Rio Grande do Sul state) that belongs to the State Company of Electric Energy - CEEE (from Portuguese *Companhia Estadual de Energia Elétrica*), which is 16.36 km far from the project activity (to the SHP Jorge Dreher are 5.25 Km until the SHP Engenheiro Henrique Kotzian´substation and from this point the projects are interconnected for more 11.11 Km until substation Salto do Jacui). . The *RGE* (from Portuguese *Rio Grande Energia*) is the local energy concessionary.

The monitoring equipments shall be installed on the SHPs Power House and in the substation Salto do Jacuí. Better explanation is provided in the B.7.2 Section.

The technology and equipment to be used in the project activity are developed and manufactured in Brazil and therefore is not expected transfer of know-how or technology to the host country. The emissions sources and GHGs involved are CO_2 emissions from electricity generation in fossil fuel fired power plants and emissions of CH_4 from the reservoir of new large hydropower plants that would be implanted to complement the availability of energy in the country in case of no additional energy input had occurred.

The technical characteristics of equipment installed in the SHPs can be seen in tables below:

Table 1: Engenheiro Ernesto Jorge Dreher SHP technical characteristics.

Generator	Characteristics	Source
Type	Synchronous	Equipment plaque data
Quantity	5	Equipment plaque data
Power (kW)	3 x 5,715 / 1 x 326.3 / 1 x 480	Equipment plaque data
Nominal Power (kVA)	3 x 6,350 / 1 x 375 / 1 x 592.6	Equipment plaque data
Voltage (kV)	3 x 6.9 / 1 x 0.38 / 1 x 0.38	Equipment plaque data
Frequency (Hz)	60	Equipment plaque data
Turbines	**Characteristics**	**Source**
Type	Francis / Kaplan	

Quantity	5	Equipment plaque data
Power (kW)	3 x 5,912 / 1 x 315.43 / 1 x 480	Equipment plaque data
Nominal Flow (m^3/s)	3 x 11.40 / 1 x 2.36 / 1 x 3.40	Equipment plaque data
Water head (m)	3 x 57.5 / 1 x 15 / 1 x 15.42	Equipment plaque data
Other Information	**Characteristics**	**Source**
Reservoir Area (Km²)	0.83	LO_2968/2009-DL
Power Density (W/m²)	21.63	Based on ACM0002 – v.12.3.0
Assured Energy[2] (MWaverage) (PLF =68.18%)	12.24	ANEEL database

Table 2: Engenheiro Henrique Kotzian SHP technical characteristics.

Generator	Characteristics	Source
Type	Synchronous	
Quantity	3	Equipment plaque data
Power (kW)	3 x 4,410	Equipment plaque data
Nominal Power (kVA)	3 x 4,900	Equipment plaque data
Voltage (kV)	3 x 6.9	Equipment plaque data
Frequency (Hz)	60	Equipment plaque data
Turbines	**Characteristics**	**Source**
Type	Francis	
Quantity	3	Equipment plaque data
Power (kW)	3 x 4,529	Equipment plaque data
Nominal Flow (m^3/s)	3 x 16.08	Equipment plaque data
Water head (m)	31.21	Equipment plaque data

[2] Assured energy is considered a long term average generation discounting programmed and unprogrammed stops for maintenance and other related parameters.

Other Information	Characteristics	Source
Reservoir Area (Km²)	0.66	LO N° 2211/2011-DL
Power Density (W/m²)	20.05	Based on ACM0002 – v.12.3.0
Assured Energy (MWaverage) (PLF = 65.53%)	8.67	ANEEL database

(c) The baseline scenario:

The baseline scenario to the project activity is the same as the scenario existing prior to the start of implementation of the project activity.

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

Table 3: Estimated emission reductions.

Year	Estimation of annual emission reductions in tonnes of CO2 e
2013	56,691
2014	56,691
2015	56,691
2016	56,691
2017	56,691
2018	56,691
2019	56,691
Total estimated reductions (tonnes of CO_2e)	**396,836**
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period	**56,691**

A.4.5. Public funding of the project activity:

There is no public funding provided by Annex I parts so the carbon credits revenue are the option chosen.

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:

The project uses the methodology: ACM0002 – “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (Version 12.3.0).

The ACM0002 also refers to the following tools:

 Tool to calculate the emission factor for an electricity system (version 02.2.1);

 Tool for the demonstration and assessment of additionality (version 06.0.0);

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

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

This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

In this case is (a) the installation of a new power plants at a site where no renewable power plants was operated prior to the implementation of the project activity (Greenfield plants)

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

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

The project activity is the installation of a new hydro power plant/unit.

• *In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;*

Not applicable to the project activity as it consists of a new hydro power plant.

In case of hydro power plants, at least one of the following conditions must apply:

o *The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or*

Not applicable to the project activity.

o *The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir the project activity, as per the definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity; or*

Not applicable to the project activity.

o *The project activity results in new single or multiple reservoirs and the power density of each reservoir the power plant, as per the definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity.*

The project activity results in new reservoir and the power density is above 4W/m2, as described in the calculations in section B.6.

In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m2 after the implementation of the project activity all of the following conditions must apply:

• The power density calculated for the entire project activity using equation 5 is greater than 4 W/m2;
• All reservoirs and hydro power plants are located at the same river and were designed together to function as an integrated project1 that collectively constitutes the generation capacity of the combined power plant;
• The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;
• The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m2, is lower than 15 MW;
• The total installed capacity of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.

Not applicable to this project activity (not multiple reservoirs)

The methodology is not applicable to the following:

• Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site (not applicable);
• Biomass fired power plants (not applicable);
• Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2 (not applicable).

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

Also, the Engenheiro Ernesto Jorge Dreher installed capacity is 17.95 MW, greater than 15 MW (as can be verified in tables 1 and 2), thus the project activity is included in the large scale project category considering the CDM standards.

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

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

<table>
<tr><th colspan="2">Source</th><th>Gas</th><th>Included?</th><th>Justification / Explanation</th></tr>
<tr><td rowspan="3">Baseline</td><td rowspan="3">CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity.</td><td>CO_2</td><td>Yes</td><td>Main emission source.</td></tr>
<tr><td>CH_4</td><td>No</td><td>Minor emission source.</td></tr>
<tr><td>N_2O</td><td>No</td><td>Minor emission source.</td></tr>
<tr><td rowspan="3">Project activity</td><td rowspan="3">For hydro power plants, emissions of CH_4 from the reservoir.</td><td>CO_2</td><td>No</td><td>Minor emission source.</td></tr>
<tr><td>CH_4</td><td>No</td><td>The methane emission for the project activity is considered null once that the power densities of the plants are 21.63 and 20.05 W/m^2 and, therefore, greater than 10 W/m^2.</td></tr>
<tr><td>N_2O</td><td>No</td><td>Minor emission source.</td></tr>
</table>

The diagram below shows the project boundary, main equipments, monitored parameters and included gases:

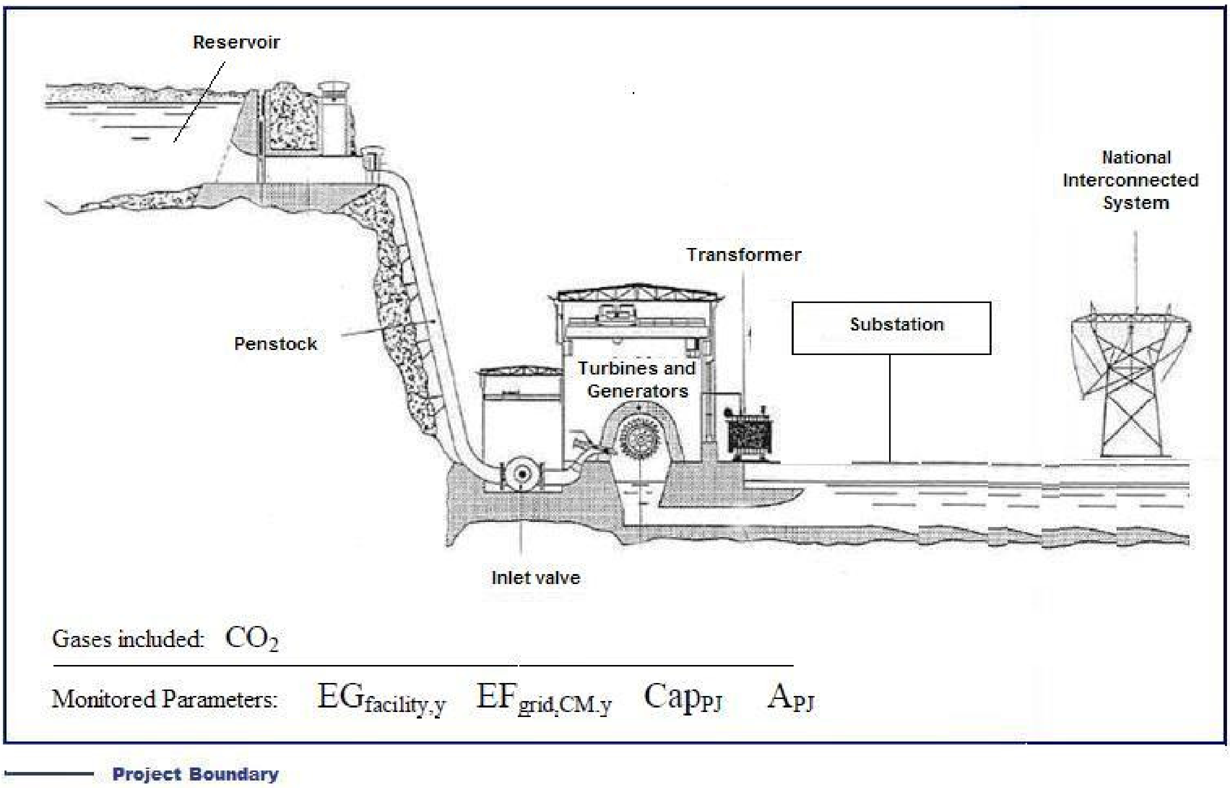


Figure 3: Diagram about project activity boundaries, monitored parameters and included gases.

B.4. **Description of how the baseline scenario is identified and description of the identified baseline scenario:**

According to the **Version 12.3.0 of CDM methodology ACM0002**, "*if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*"

"*Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generating sources, as reflected in the combined margin (CM) from 'Tool to calculate the emission factor for an electricity system"*.

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

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

In the project activity absence (baseline scenario), the electricity would continue to be provided by other grid-connected power plants, included fossil fuel based power plants (more details about the Brazilian National Interconnected Grid in section B.6.3).

Also, the project activity uses as data source for the Emission Factor calculation of National Interconnected System (SIN), the operating margin and the build margin coefficients provided by the Designated National Authority (DNA) of the host country, publicly available. The CO_2 Emission Factor resulting from the electric energy generation in the National Interconnected System (SIN) in Brazil is calculated based on generating records from plants centrally operated by the National Electric System Operator (*ONS* from the Portuguese *Operador Nacional do Sistema*).

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

The data resultant from the work of the ONS, of the Ministry of Mines and Energy (MME) and the Ministry of Science and Technology, are available to the CDM project proponents. Thus, they can be applied in calculating ex-ante emissions avoided by the project activity, where the emission reduction will be calculated ex-post.

Further details of the development of the project baseline can be viewed through the link: http://www.mct.gov.br/index.php/content/view/73318.html.

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):

Table 4: Timeline of Engenheiro Ernesto Jorge Dreher SHPP.

Date	Event	Evidence
30/01/2004	Previous License Issuance	LP_108/2004-DL
11/04/2005	ANEEL SHP Authorization	Rea_ANEEL_134/2005
31/05/2005	Installation License Issuance	LI_406/2005-DL
04/10/2006	CDM consultant company contact.	E-mail between SHP Project Owner and CDM Consultant
17/10/2006	Message proposing to gather information about the project activity, in order to allow a CDM feasibility study.	E-mail between SHP Project Owner and CDM Consultant
10/11/2006	Foundation of the BME Rincão do Ivaí Energia S.A: Special Purpose Entity responsible for the SHP construction and operation	Foundation record
06/08/2007	CDM Prior Consideration	BME Rincão do Ivaí Meeting Minute signed by the Board of Directors
20/08/2007	Signature of PPA between COPREL and BME Rincão do Ivaí Energia S/A – Management/Investment Decision	Contract 001/2007
04/12/2007	Signature of the contract between BME Rincão do Ivaí Energia S/A and Bee indústria e comércio de equipamentos Ltda to supply a turbine – Starting Date of Project Activity	Supply contract
06/12/2007	Signature of the contract with HISA (equipment suplier)	Supply contract

11/12/2007	ANEEL transference of the SHP ownership	Rea_ANEEL_1144/2007
13/12/2007	Signature of the contract with WEG Equipamentos Elétricos S.A (equipment suplier)	Supply contract
19/12/2007	Contract between BME Rincão do Ivaí Energia S/A and Caixa Econômica Federal (financial agent)	Contract 0215.684-14
22/04/2008	Installation License Issuance revalidation	LI_372/2008-DL
15/07/2008	Negotiation with CDM Consultants for Validation services	E-mail between SHP Project Owner and CDM Consultant
12/05/2009	CDM Consultancy Company hiring decision	Meeting Minute of BME Rincão do Ivaí Director Board
18/06/2009	Operation License Issuance	LO_2968/2009-DL
02/10/2009	Allowance of generating unit 1 for commercial operations	Dsp_ANEEL_3756/2009
30/10/2009	Allowance of generating unit 2 for commercial operations	Dsp_ANEEL_4068/2009
11/11/2009	Enlargement of installed capacity from 17.725MW to 17.87MW	Dsp_ANEEL_4188/2009
11/11/2009	Allowance of generating unit 4 for commercial operations	Dsp_ANEEL_4189/2009
25/11/2009	Allowance of generating unit 3 for commercial operations	Dsp_ANEEL_4383/2009
05/03/2010	Meeting scheduling to raise information to be used for submission of the Project activity to CDM.	E-mail between SHP Project Owner and CDM Consultant
22/12/2010	Proposal request for a qualified DOE to validate the Project on CDM	E-mail between SHP Project Owner and DOE
18/08/2011	BRTUV proposal issuance for project validation on CDM	Proposal Nº: 11CDMBR080406
03/10/2011	Allowance of generating unit 5 for commercial operations	Dsp_ANEEL_3938/2011

Table 5: Timeline of Engenheiro Henrique Kotzian SHPP.

Date	Event	Evidence
18/04/2005	ANEEL SHP Authorization	Rea_ANEEL_142/2005
24/06/2005	Previous License issuance	LP_455/2005-DL
17/05/2006	Installation License issuance	LI_356/2006-DL
04/10/2006	CDM consultant company contact	E-mail between SHP Project Owner and CDM Consultant
17/10/2006	Message proposing to gather information about the project activity, in order to allow a CDM feasibility study	E-mail between SHP Project Owner and CDM Consultant
17/11/2006	Foundation of BME Capão da Convenção Energia S.A Special: Purpose Entity responsible for the SHP construction and operation	Foundation record
18/04/2007	Approval of basic Project of the plant	Dsp_ANEEL_1180/2007
20/08/2007	Signature of PPA between COPREL and BME Capão da Convenção Energia S/A – Management/Investment Decision	Contract 001/2007
06/08/2007	CDM Prior Consideration	BME Capão da Convenção Meeting Minute signed by

		the Board of Directors
04/12/2007	Signature of the contract between BME Rincão do Ivaí Energia S/A and Bee indústria e comércio de equipamentos Ltda to supply a turbine – Starting Date of Project Activity	Supply contract
06/12/2007	Signature of the contract with HISA (equipment supplier)	Supply contract
11/12/2007	ANEEL transference of the SHP ownership	Rea_ANEEL_1145/2007
13/12/2007	Signature of the contract with WEG Equipamentos Elétricos S.A (equipment suplier)	Supply contract
19/12/2007	Contract between BME Capão da Convenção Energia S/A and Caixa Econômica Federal (financial agent)	Contract 0215.685-29
15/07/2008	Negotiation with CDM Consultants for Validation services	E-mail between SHP Project Owner and CDM Consultant
16/02/2009	Ratification of basic Project parameters	Dsp_ANEEL_602/2009
12/05/2009	CDM Consultancy Company hiring decision	Meeting Minute of BME Capão da Convenção Director Board
07/05/2010	Installation License issuance revalidation	LI_495/2010-DL
05/03/2010	Meeting scheduling to raise information to be used for submission of the Project activity to CDM.	E-mail between SHP Project Owner and CDM Consultant
22/12/2010	Proposal request for a qualified DOE to validate the Project on CDM	E-mail between SHP Project Owner and DOE
02/03/2011	Operation License issuance	LO_1122/2011-DL
04/03/2011	Allowance of generating units 1, 2 and 3 for commercial operations	Dsp_ANEEL_1063/2011
18/08/2011	BRTUV proposal issuance for project validation on CDM	Proposal Nº: 11CDMBR080406

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

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

The realistic alternatives to the project activity are:

1 - The proposed project activity undertaken without being registered as a CDM project activity;

2 - The continuity of the present scenario, with electricity generation happening according to the current generation composition of the National Interconnected System which has a high participation of fossil fuel plants.

Outcome of Sub-step 1a: Identified realistic and credible alternative scenario(s) to the project activity

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

The implantation of the project activity is not being mandated by any enforced law, statute or other regulatory framework and it is in compliance with all regulations according the following entities: National Electric System Operator – O*NS* (from Portuguese *Operador Nacional do Sistema*), Electricity Regulatory Agency - *ANEEL* (from Portuguese *Agência Nacional de Energia Elétrica*), State Environmental Protection Foundation - *FEPAM* (from Portuguese *Fundação Estadual de Proteção Ambiental*) which are the responsible for to analyze energy generation projects and to issue the licenses when they are in accordance with the state and federal regulations.

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

Step 2: Investment Analysis

The investment analysis shall be performed in order to 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).

For the proposed project activity, the investment analysis determinates if the proposed project activity is not economically/financially feasible without the revenues from the Certified Emission Reductions (CERs).

Sub-step 2a: Determine appropriate analysis method

In order to determine the appropriate analysis method, the following options are available to be used in the additionality analysis:

- Option I - Apply simple cost analysis,
- Option II - Apply investment comparison analysis,
- Option III - Apply benchmark analysis

According to the version 06.0.0 o the “Tool to demonstration and assessment of additionality”, if the CDM project activity and the alternatives identified in Step 1 generate financial or economic benefits other than CDM related income, then the investment comparison analysis (Option II) or the benchmark analysis (Option III) shall be used. The benchmark analysis will be applied, because it is most appropriated for this type of activity in Brazil. Moreover, the Option II shall be applied when there are credible alternative scenarios to the project activity. As there are no alternative to compare with the project’s indicator (Internal Rate of Return) the Option III shall be applied.

Therefore, the III option was chosen.

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

The financial indicator most appropriate for this type of project is the Internal Rate of Return (Project’s

IRR), because it is the compound rate of return annualized effective that can be obtained on invested capital.

The analysis of the financial/economic indicator is based on parameters that are standard in the energy market in Brazil and around the world, considering the specific characteristics of the project type – investments in energy projects.

The benchmark analysis is performed comparing the project's IRR with a benchmark. The established benchmark for this comparison is the **Basic Discount Rate set up by the Brazilian government (SELIC rate),** which is the main reference for Public Debt instruments traded in the market (this benchmark is the most common in Brazil in order to check the project viability). The details are described below:

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

The SELIC Rate

The *SELIC* rate is set up by the Special System for Settlement and Custody (from Portuguese *Sistema Especial de Liquidação e Custódia*). It is obtained by the calculation of the overnight average weighted rate for financing operations, secured by federal public debt instruments and traded in the same system and in clearing houses as committed operations[3]. The institution responsible for setting this rate is the Monetary Policy Committee (COPOM), whose main objective is to set up monetary policy and the underlying interest rate. The COPOM has been following adequate procedures mirroring the examples of the US Federal Reserve Board´s Federal Open Market Committee and (FOMC) and by Germany´s Central Bank Council.

The interest rate set when the COPOM meets is the goal for the SELIC rate (average rate for overnight financing secured by federal public debt securities), in force in the period between regular Committee meetings. Another COPOM function is to release the "Inflation Report" analyzing the country´s economic and financial outlook as well as inflation projections.

Federal public debt securities main purpose is to collect resources for the financing of the public debts, as well as finance the Federal Government´s activities, such as education, health and infra-structure. These fixed income assets are the main conservative investment options and are mostly indexed by the SELIC.
The Brazilian economy has withstood several phases of instability oftentimes caused by the international scenario. International economic uncertainties created severe fluctuations in Brazilian monetary policy, mainly in the setting of the Brazilian basic interest rate. The fluctuations at the end of the 1990´s and between 2000 and 2002 were caused by external factors (Asian crisis in 1999 and the presidential election in Brazil in 2002).

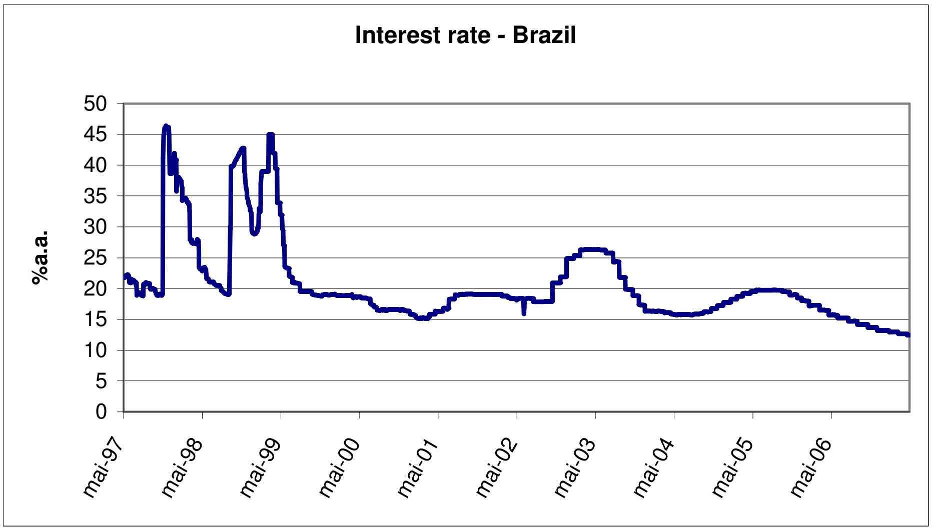
As an emerging country, Brazil has always had high interest rates, which from an investment point of view makes public debt securities quite attractive when compared with developed countries. At the present time the Brazilian economy has enjoyed economic growth, relative expansion, high level of

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

international reserves, which has facilitated capturing foreign resources, resulting in smoothing SELIC rate fluctuations as shown in Graph 1.

In the same graph we can see that in the last 6 years, the SELIC rate has been "stable" considering that the fluctuations have occurred at a high level.

Graphic 1: Selic rate historic.



Source: Central Bank of Brazil.

The Brazilian basic interest rate is used as a base for market financing as well as an index for public investment by government public debt securities.

So it is not possible direct investment in the Selic rate, but through the Brazilian Treasury Bonds of the type LFT bonds (from Portuguese: *Letra Financeira do Tesouro*[4]) would be possible for an investor to obtain the desired returns from this index (the Bonds´ profitability is the Selic value). To avoid the choice of one or other specific Bond, the Selic rate shall be monitored as the Benchmark for the Proposed project activity.

In this scenario the SELIC rate makes Brazilian government public debt securities attractive as relatively conservative or risk-free investment.The cash-flow information will be presented integrally in a separated document (spreadsheet).

The cash-flow was elaborated for the operational life of the project activity (30 years), getting an Internal Return Rate (IRR) equal 15.30% per year for Eng. Ernesto Jorge Dreher, without revenues of the Certified Emissions Reductions (CERs) sales, and 17.25% per year with the sales of the CERs.

[4] http://www.tesouro.fazenda.gov.br/tesouro_direto/consulta_titulos/download/Caracteristicas.pdf

To Eng. Henrique Kotzian SHP, the IRR is equal 9.80% per year, without prescriptions of the Certified Emission Reductions sales, and 11.23% per year with the sales of the CERs.

The cash flow has as main Input Values the following:

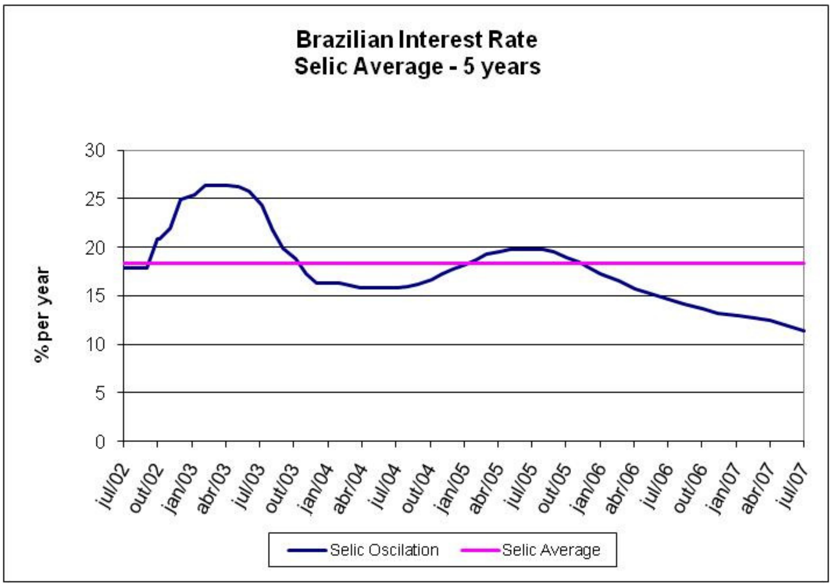
Table 6: Main Inputs Values of cash flow.

Parameter	Eng. Ernesto Jorge Dreher	Eng. Henrique Kotzian
Investment (R$)	55,275,144.46	54,633,910.20
Net Power (MW)	12.24	8.67
Energy Price (R$/MWh)	143.22	143.22
Operation (R$/month) and	15,300.00	12,240.00
Maintenance (R$/month)	165,900	112,100

The parameters Operation and Maintenance are listed as independent in the IRR spreadsheet, so the O&M (Operation and Maintenance) variation should be done on both simultaneously. Also is important to highlight that the parameter "Operation" consists on the sum of salaries and charges involved to employment of operational team.

In order to have a non-point benchmark, was calculated the average values of benchmarks covering the range from July 2002 until July 2007, thus totalizing 5 whole years of observations before the investment decision date. The average value calculated can be found in graphic 2.

Graphic 2: SELIC Average Rate (July 2002 to July 2007).



Source: Brazilian Central Bank.

Below, the table 7 summarizes the calculated values:

Table 7: Comparative frame between IRR of project activity power plants and the project benchmark.

SHPs	Benchmark (% year)	IRR Jorge Dreher (% year)	IRR Henrique Kotzian (% year)
	18.29	15.30	9.80

The project's IRRs have stayed below the average SELIC rate. The analysis shows that the project activity is not economically/financially feasible without the revenues from the Certified Emission Reductions (CERs).

.

The CER are highly significant instruments for entrepreneurs in overcoming barriers, improving investment quality and hence stimulating future investments in clean energy generation.

To better understand the investment barrier was also performed a **sensitivity analysis** in which were varied the following parameters: (1) Energy Price, (2) Investment, (3) Assured Energy and (4) Annual operation cost, in order to check the financial impact of these on the project.
The analysis was performed in order to check the financial impacts of a 10% variation over the critical parameters of project activity above listed. The results are demonstrated in the tables and graphics below:

Table 8: Outcome of Engenheiro Ernesto Jorge Dreher SHP sensitivity analysis.

Sensitivity Analisys

No.	Item	Value	+10%	0%	-10%	Obs
1	Energy Price (R$/MWh)	143.22	157.54	143.22	128.90	without CERs Revenue
	IRR		17.52%	15.30%	13.03%	
2	Investment (R$)	55,275,144.46	60,802,658.92	55,275,144.46	49,747,630.02	
	IRR		13.89%	15.30%	16.99%	
3	Assured Energy (MWaverage)	12.24	13.46	12.24	11.02	
	IRR		17.52%	15.30%	13.03%	
4	O&M (R$/MWh)	165,900.00	182,490.00	165,900.00	149,310.00	
	IRR		14.95%	15.30%	15.64%	

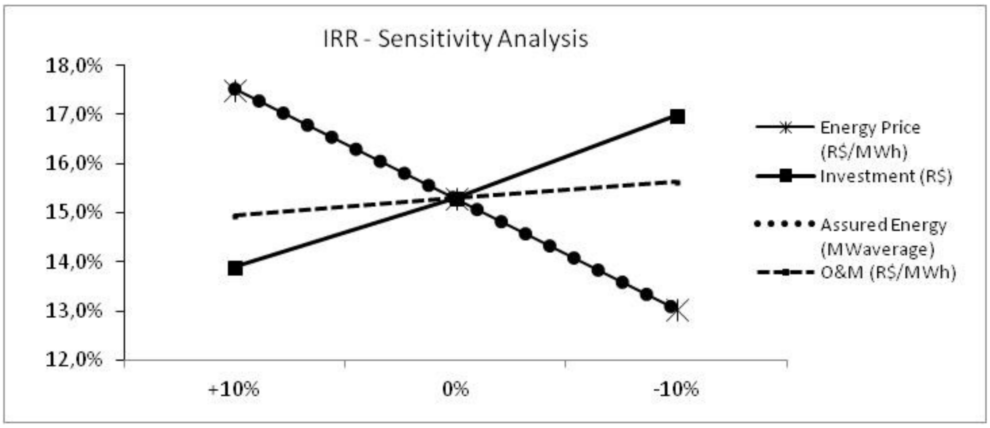
Table 9: Outcome of Engenheiro Henrique Kotzian SHP sensitivity analysis.

Sensitivity Analysis

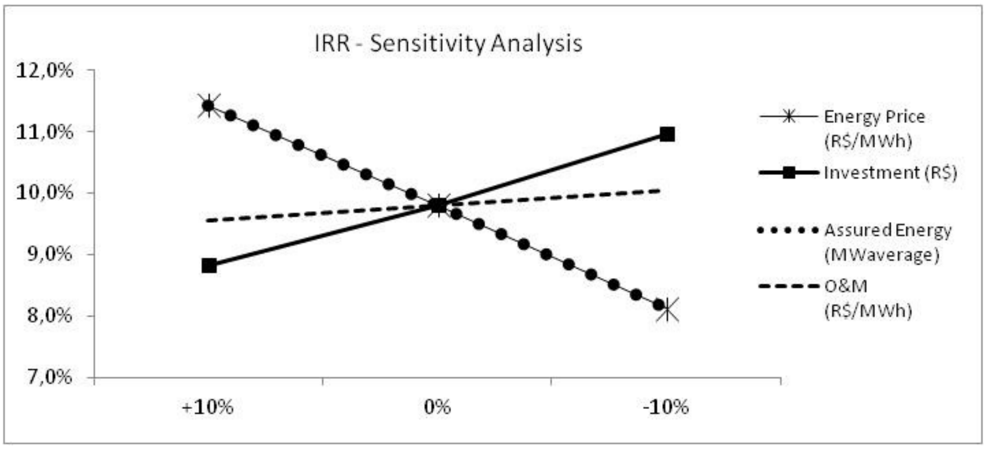
No.	Item	Value	+10%	0%	-10%	Obs
1	Energy Price (R$/MWh)	143.22	157.54	143.22	128.90	without CERs Revenue
	IRR		11.43%	9.80%	8.12%	
2	Investment (R$)	54,633,910.20	60,097,301.22	54,633,910.20	49,170,519.18	
	IRR		8.82%	9.80%	10.96%	

3	Assured Energy (MWaverage)	8.67	9.54	8.67	7.80
	IRR		11.43%	9.80%	8.12%
4	O&M (R$/MWh)	112,100.00	123,310.00	112,100.00	100,890.00
	IRR		9.56%	9.80%	10.04%

Graphic 3: Graphic outcome of Engenheiro Ernesto Jorge Dreher SHP sensitivity analysis.



Graphic 4: Graphic outcome of Engenheiro Henrique Kotzian SHP sensitivity analysis.



With the sensitivity analysis presented above, after +/-10% variation on the crucial parameters, the project remains additional.

Although the sensitivity analysis has already shown that the benchmark cannot be overcome by the project´s IRR, another analysis was prepared in order to find the breakeven point between the project´s IRR and the established benchmark. This will strengthen the project activity is not an investment scenario, where there is a possibility of becoming financially/economically attractive through changes in the input values (in other words, changes in the parameters used in the financial calculation) of the financial spreadsheet.

The results of the breakeven point analysis are presented below:

The analysis was performed separately to both plants of project activity in order to allow to analyze the different financial characteristics of each one.

The table 10 presents the main results to Eng. Ernesto Jorge Dreher SHP analysis, and the table 11 presents the main results to Eng. Henrique Kotzian SHP analysis:

Table 10: Results of Engenheiro Ernesto Jorge Dreher SHP breakeven point analysis.

Parameter	Original Value	Breakeven point	% of deviation
Investment (R$)	55,275,144.46	47,315,523.66	- 14.40%
Assured Energy (MWaverage)	12.24	13.89	13.48%
Energy Price (R$/MWh)	143.22	162.55	13.49%
Operation (R$/month) and Maintenance (R$/month)	15,300.00 165,900.00	2,952.90 32,018.70	- 80.70% - 80.70%

Table 11: Results of Engenheiro Henrique Kotzian SHP breakeven point analysis.

Parameter	Original Value	Breakeven point	% of deviation
Investment (R$)	54,633,910.20	32,578,200.65	- 40.37%
Assured Energy (MWaverage)	8.67	13.42	54.78%
Energy Price (R$/MWh)	143.22	221.65	54.76%
Operation (R$/month) and Maintenance (R$/month)	12,240.00 112.100,00	Not sensible enough to reach the benchmark	- 100% - 100%

As can be seen above, all variations performed overcome the range of +/-10% recommended by version 05 of "Guidelines on the assessment of investment analysis", released by the 62 meeting of CDM Executive Board.

Likelihood of occurrence of breakeven point scenarios

To achieve the Breakeven point is not considered feasible, due to several factors which can be viewed below:

Energy Price (R$/MWh)

The energy price used in the financial calculations is considered adequate because is the value defined in the Power Purchase Agreement (PPA) and reflects the energy market in Brazil.

From the analysis provided above, to Eng. Ernesto Jorge Dreher SHP, the scenario which would make the project's IRRs overcome the benchmark was estimated as being R$162.55/MWh, i.e. 13.49% higher than the original energy price (R$143.22/MWh).

To Eng. Henrique Kotzian SHP, this same scenario was estimated as being R$221.65/MWh, i.e. 54.76% higher than the original energy price (R$143.22/MWh).

Other important information that corroborates along the argumentation is that the validated energy price is above the average prices practiced in the first Auction of Alternative Sources of energy, which occurred in 18 June 2007. The auction promoted by entities from the Brazilian government aims to stimulate the development of generation projects based on renewable energy in Brazil. The results of the auction can be viewed in the following link:
http://www.ccee.org.br/StaticFile/Arquivo/biblioteca_virtual/Leiloes/1_leilao_fontes_alternativas/Resultados/resumo_vendedor.pdf
As can be verified, the energy commercialized ranged from 134.97 to 135.00 (R$/MWh) for Small Hydro Power Plants. The energy prices in the same auction for other renewable sources (such as biomass cogeneration) ranged from 138.50 to 139.12 (R$/MWh).

So considering the information provided above, the energy price (input value) is considered adequate as well conservative.

Investment (R$)

Regarding the Investment costs, the input values come from the *Quadro de Usos e Fontes – QUF* (Uses and Sources Table in free translation), that can be cross checked with the financing contract with Caixa Econômica Federal which later became the financial agent of project activity. The Investment costs to implement the two SHPs were performed above than the one forecasted by project sponsors (R$ 65,652,224.46 to the SHP Engenheiro Ernesto Jorge Dreher and R$ 79,967,875.20 to the SHP Engenheiro Henrique Kotzian). So it´s no possible to be performed below than the investment value used in the project IRRs spreadsheet (R$ 55,275,144.46 to the SHP Engenheiro Ernesto Jorge Dreher and R$ 54,633,910.20 to the SHP Engenheiro Henrique Kotzian).

Nevertheless, the sensitivity analysis was carried out to this parameter and indicated that to reach the benchmark, the investment values should had been significantly lower than the previously forecasted to both plants. It should had been 14.40% lower to the SHP Ernesto Jorge Dreher and 40.37% lower to the SHP Henrique Kotzian.

Thus, the input values are adequate as well conservative.

Assured Energy (MWaverage)

The Assured Energy is considered adequate because the data comes from the Information Bank of Generation of ANEEL[5] – the Brazilian regulatory agency for the electric sector.

The ANEEL has a body of technical project reviewers who properly analyses generation projects in different sectors in Brazil. The main technical issues that influence the value of net power are the historical series of hydrological data of a river, climate conditions, topography, flow regularity, among others. The ANEEL's technical body is capable to analyze those conditions and determine the net power of the Brazilian SHP projects.

Is unlikely to occur an increase above the values showed in the tables 1 and 2 (12.24 and 8.67), due to

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

it's determination to be in accordance with historical inflow series including critical periods in hydrological terms.

To led the IRR of project activity to go beyond the applied benchmark, the net power of Eng. Ernesto Jorge Dreher should be 13.48% greater than the established by ANEEL considering all the studies above mentioned. To IRR of Eng. Henrique Kotzian SHP overcome the considered benchmark, its net power value should be greater than its installed capacity of 13.23 MW (54.78% greater than the current value). So it is not possible to occur.

Operational Costs - O&M (R$/month)

As demonstrated in the tables 10 and 11, this parameter (which comprehends the sum of employees salaries and Maintenance costs) cannot affect the project feasibility. To led a IRR increase high enough to achieve the benchmark, the O&M costs should be reduced 80.70% to Eng. Ernesto Jorge Dreher SHP. To Eng. Henrique Kotzian SHP, even reducing the parameter to zero, the IRR of project activity (12.42%) would not achieve the benchmark.

The project of the SPEs BME Rincão do Ivaí Energia S/A and BME Capão da Convenção Energia S/A has taken in consideration the revenues of CERs sales for the implantation. These financial benefits generated in strong currency (euro or dollar) bring to the project a better security against monetary depreciations.

Considering the explanations, information and evidences provided by the PP, the IRR of the project activity without being registered as a CDM project is below than the established benchmark, evidencing that project activity is not the most financially attractive option of investment. The CDM benefits were the key point to go ahead and to implement the project activity.

Therefore, the project activity is y additional.
Outcome of Step 2: After the sensitivity analysis **t**he proposed CDM project activity is not economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs). feasible

Step 3: Barrier analysis

Not necessary. As concluded in the sensitivity analysis, the project activity is not the most financially attractive alternative.

Step 4: Common practice analysis

This analysis is based on the version 06.0.0 of the "Tool for the demonstration and assessment of additionality". The following stepwise approach clearly demonstrates the project activity is not representing common practice.

The list of power plants operating in the country is made available by ANEEL[6].

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

STEP 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The projects to be considered in the analyses must have installed power between 26.925 MW (50% above of Engenheiro Ernesto Jorge Dreher SHP capacity which is 17.95 MW) and 6.615MW (50% below the Engenheiro Henrique Kotzian SHP capacity which is 13.230 MW). Was produced a joint analysis in this step in order to have a more conservative approach.

STEP 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project.

In a conservative approach, was considered the entire host country as a default.

The plants identified in Step 1 deliver the same output within the applicable output range of project activity are presented in the next page[7]:

[7] Were considered the power plants which became operational from July 2004 to December 2007. The approach will be explained on Step 3.

Year	Venture	State
2004		
1	Campo Florido	MG
2	Coinbra-Frutesp	SP
3	Miguel Forte	PR
4	Corn Mogi	SP
5	Iguatemi Bahia	BA
2005		
6	Caeté	AL
7	Vertente	SP
2006		
8	Carlos Gonzatto	RS
9	Esmeralda	RS
10	Piranhas	GO
11	São Bernardo	RS
12	Contagem	MG
13	Agrovale	BA
14	Goianésia	GO
15	Piraí	PR
16	Água Bonita	SP
17	Coruripe	AL
18	Fartura	SP
19	Giasa II	PB
20	Jalles Machado	GO
21	Mandu	SP
22	Winimport	PR
23	Água Doce	SC
2007		
24	Flor do Sertão	SC
25	José Gelásio da Rocha	MT
26	Ponte Alta	MS
27	Rondonópolis	MT
28	Santa Laura	SC
29	Bunge Araxá	MG
30	Itaenga	PE
31	Fartura	SP
32	Usaciga	PR
33	Jitituba Santo Antônio	AL
34	Millennium	PB

N_{all} = 34

<u>Step 3:</u> Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity.

To the common practice analysis, it was done a survey about the activities which became operational between July 2004 (when the New Model of Brazilian Electric Sector started to operate) and project activity starting date, on December 2007 in order to establish a range of projects that can be considered similar to the project activity, like the definition of item 4, in the *"Guidelines on Common Practice"*, version 01.0.

The Thermal and Wind Power Plants were included in the analysis, but due the different **generation technology** (comparing with the CDM project activity) they shall be included on the N_{diff} calculation.

To the Hydro Power Plants (similar **generation technology**) were considerate in the analysis the projects that are similar to the plants of project activity and have or not financial incentives. This is related to the investment climate in the date of the investment decision: Subsidies or other financial flows, Promotional Policies and Legal regulations. Also shall be included on the N_{diff} calculation.

Legal Regulations

History of the Brazilian Electric Sector

In recent decades, the Brazilian Electric Sector has undergone several changes until the current model. The energy sector was composed almost exclusively of government-owned companies, but since 1995, due to an increase in international interest rates and the incapacity of investment, the government was forced to seek for alternatives. The recommended solution was to begin a privatization process and deregulation of the market.

During the years 2003 and 2004 the Federal Government has issued the foundations for a new model of Brazilian Electric Sector, supported by Laws Nº 10,847[8] (which creates the Energetic Research Company – EPE that is responsible for the long term planning of the electrical sector) and Nº 10,848[9], of 15 March 2004 (which establishes the ways of energy commercialization in free regulated ambiences, among other issues), and the Decree Nº 5,163, of 30 July 2004[10] (that rules the energy commercialization and concession procedures to the electricity generation).

The table 12 shows the summary of the main changes between the pre-existing models and the current model, which resulted in changes in the activities of some agents of the sector.

Table 12: Summary of the several changes in the Brazilian Electric Sector

[8] http://www.aneel.gov.br/cedoc/blei200410847.pdf

[9] http://www.aneel.gov.br/cedoc/blei200410848.pdf

[10] http://www.aneel.gov.br/cedoc/dec20045163.pdf

Former Model (until 1995)	Free Market Model (1995 to 2003)	New Model (2004)
Financing using public funds	Financing using public and private funds	Financing using private and public funds
Verticalized Companies	Companies classified by activity: generation, transmission, distribution and commercialization	Companies classified by activity: generation, transmission, distribution, commercialization, imports and exports.
Predominantly State-controlled companies	Opening up of the market and emphasis on the privatization of the Companies.	Coexistence between State-controlled and Private Companies.
Monopolies – No competition	Competition in generation and commercialization.	Competition in generation and commercialization.
Captive Consumers	Both Free and Captive Consumers	Both Free and Captive Consumers
Tariffs regulated throughout all sectors	Prices are freely negotiated for the generation and commercialization.	In a free environment: Prices are freely negotiated for the generation and commercialization. In a regulated environment: auctions and bids for the least tariffs.
Regulated Market	Free Market	Coexistence between Free and Regulated Markets.
Determinative Planning – Coordinator Group for the Planning of Eclectic Systems (GCPS)	Indicative Planning accomplished by the National Council for Energy Policy (CNPE)	Planning accomplished by the Energy Research Company (EPE)

Source: Electric Power Commercialization Chamber - CCEE[11]

As can be seen in the table 12, the current energy model was implemented in 2004, having as legal milestone the Decree number 5,163 issued on 30 July 2004. Before the issuance of this Decree, the investment environment was different from the current, so no similar to the proposed project activity.

Subsidies or other financial flows and promotional policies

It is important to consider that, in the incentive and investment matters, Brazil has two main foment lines to renewable energy projects: the Clean Development Mechanism (CDM), established by the Kyoto Protocol, and the Alternative Electrical Energy Sources Incentive Program (PROINFA), established for the Decree nº 5,025/2004[12].

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[11] Changes occurred in Brazilian electric sector: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=3df6a5c1de88a010VgnVCM100000aa01a8c0RCRD

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

The PROINFA is a governmental program of incentives which was implemented to increase the participation of renewable energy in the SIN. Its target is to diversify the Brazilian Electrical Matrix, creating alternatives to improve the security in the electrical energy supply e to allow the appreciation of local and regional characteristics and potentialities.

The Ministry of Mines and Energy (MME) is the responsible to define the rules, elaborates the Program planning and defines the economical value of each source. The Eletrobrás (Electrical Brazilian Centrals - from Portuguese *Centrais Elétricas Brasileiras S.A.*) is the executor agent, with the mission to do the Contracts of Purchase and Sale of Energy (from Portuguese *Contratos de Compra e Venda de Energia – CCVE)*[13] or, in English, Power Purchase Agreement – PPA.

In PROINFA, the financial incentives provided by the Federal Government are based on differentiated lines of finance, guarantees of minimal revenues through of the PPAs (CCVEs) to be firmed with entrepreneur and Eletrobrás, which assures to the entrepreneur a minimal revenue through the purchase of 70% of the generated energy during the financing period. The PROINFA gives also protection against the risks of exposure in the short-term market besides other benefits of adhesion in the program.

Projects qualified by the PROINFA are eligible to participate in the CDM, agreeing to the decision of the UNFCCC regarding eligibility of project derived from public policies. The legislation that created the PROINFA considered the possible CDM revenues to implement the program.

In Brazil regulatory environments, all the projects of generation, transmission, distribution and commercialization of electric energy are supervised and regulated by ANEEL in compliance with the law 9,427 of 26 of December of 1996, guaranteeing, then, the same regulatory requirements to the similar activities of the project activity.
Others project activities registered in CDM were not included in the common practice analysis [14].

Considering the explanation above and the "Guidelines on Common Practice, from July 2004 to December 2007, **34** similar projects became operational, as listed in the table 13. Also in this table, there is a column highlighting the ventures that made use of the PROINFA incentive to their implementation.

Table 13: Similar Generation Power Plants that became operational from July 2004 to December 2007.

[13] Definition available in the MME page http://www.mme.gov.br/programas/proinfa

[14] The datas public sources utilized were:
UNFCCC website – http://unfccc.int
ANEEL – Fiscalization of Power Services (October 2010) - http://www.aneel.gov.br/area.cfm?id_area=37
ANEEL – SHPs participating in PROINFA program - http://www.aneel.gov.br/area.cfm?id_area=37

Year	Venture	State	Technology	Incetives
2004				
1	Campo Florido	MG	Thermal	
2	Coinbra-Frutesp	SP	Thermal	
3	Miguel Forte	PR	Thermal	
4	Corn Mogi	SP	Thermal	
5	Iguatemi Bahia	BA	Thermal	
2005				
6	Caeté	AL	Thermal	
7	Vertente	SP	Thermal	
2006				
8	Carlos Gonzatto	RS	Hydro	PROINFA
9	Esmeralda	RS	Hydro	PROINFA
10	Piranhas	GO	Hydro	PROINFA
11	São Bernardo	RS	Hydro	PROINFA
12	Contagem	MG	Thermal	
13	Agrovale	BA	Thermal	
14	Goianésia	GO	Thermal	
15	Piraí	PR	Thermal	
16	Água Bonita	SP	Thermal	
17	Coruripe	AL	Thermal	
18	Fartura	SP	Thermal	
19	Giasa II	PB	Thermal	
20	Jalles Machado	GO	Thermal	
21	Mandu	SP	Thermal	
22	Winimport	PR	Thermal	
23	Água Doce	SC	Wind	
2007				
24	Flor do Sertão	SC	Hydro	PROINFA
25	José Gelásio da Rocha	MT	Hydro	PROINFA
26	Ponte Alta	MS	Hydro	PROINFA
27	Rondonópolis	MT	Hydro	PROINFA
28	Santa Laura	SC	Hydro	PROINFA
29	Bunge Araxá	MG	Thermal	
30	Itaenga	PE	Thermal	
31	Fartura	SP	Thermal	
32	Usaciga	PR	Thermal	
33	Jitituba Santo Antônio	AL	Thermal	
34	Millennium	PB	Wind	

Source: Supervision of generation services[15]

Not considering the thermal or wind technologies, among the SHPs listed above that have become operational in this period, **9** of them were implemented under **PROINFA** incentives, so can be considered different from project activity due the investment climate they were subjected to.

Then, $\mathbf{N_{diff}= 34}$

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

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity. The proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3.

According the requirements of the version 01.0 of *"Guidelines on Common Practice"*, the factor F that represents "the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity" must be calculated as follows:

$$F=1-N_{diff}/N_{all}$$

$$F=1-34/34$$

$$F=0.0$$

Outcome of Step 4: In the light of all the explanation provided above and considering the values of factor "F" and "N_{all} - N_{diff}", it is possible to conclude that the implantation of hydropower plants similar to the project activity is not a common practice in Brazil, being therefore eligible to CDM according its requirements.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

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

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

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

According to the methodology ACM0002 Version 12.3.0, for hydro power project activities that result in new reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, estimated as follows:

a) If the power density of project (PD) is higher than $4W/m^2$ and lower than or equal to $10W/m^2$:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where;
$PE_{HP,y}$ Emission from reservoirs of hydro power plants in year y (tCO_2e);

EF_{Res} Default emission factor for emissions from reservoirs of hydro power plants in year y (kgCO2e/MWh).
TEG_y Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

b) If power density of project is greater than $10W/m^2$:

$PE_{HP,,y} = 0$.

The power densities of the project activity are calculated as follows:

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

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

For Engenheiro Ernesto Jorge Dreher SHP, the *PD* value is:

$$PD = \frac{17{,}950{,}000 - 0}{830{,}000 - 0} = 21.63 \text{ W/m}^2$$

For Engenheiro Henrique Kotzian SHP, the *PD* value is:

$$PD = \frac{13{,}230{,}000 - 0}{660{,}000 - 0} = 20.05 \text{ W/m}^2$$

Therefore, the reservoir project emissions ($PE_{HP,y}$) are zero to both hydropower plants of project activity because their Power Densities are higher than $10 W/m^2$.

Baseline Emissions *(BE_y)*

Baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) multiplied by the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh), as follows:

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

Where:

BE_y Baseline emissions in year y (tCO_2e);
$EG_{PJ,y}$ Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh);
$EF_{grid,CM,y}$ Combined margin CO_2 emission factor for grid connected power generation in year y, calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh).

Energy Generated ($EG_{PJ,y}$)

The project activity is the installation of two new grid-connected renewable power plants/units at sites where no renewable power plants were operated prior to the implementation of the project activity, thus classified as a Greenfield renewable energy power plants.

The $EG_{PJ,y}$ is based on the estimative of energy to be inputted annualy into the grid by the Project activity, which considers the net Power of the plants, information provided by ANEEL and the Brazilian Mines and Energy Ministry. Then:

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

Where:

$EG_{PJ,y}$ Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh);
$EG_{facilitiy,y}$ Quantity of net electricity generation supplied by the project plants/units to the grid in year y (MWh).

$$EG_{facilities,y} = EG_{PJ,y} = EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y} + EG_{Engenheiro\ Henrique\ Kotzian,y}$$

$$EG_{PJ,y} = 107{,}222 + 75{,}949 = 183{,}172 \text{ MWh/year}$$

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

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 plants, 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 :	Determine the installed capacity based on recognized standards.
Any comment:	

Data / Parameter:	A_{BL}
Data unit:	m^2

Description:	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.
Source of data used:	Project site.
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measured from topographical surveys and satellite pictures.
Any comment:	

Fixed parameter:

Data / Parameter:	EF_{res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emission from reservoirs of hydro power plants.
Source of data to be used:	Decision by EB 23, annex 5.
Value of data:	90
Measurement procedures (if any):	Standard value.
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	-
Any comment:	Applicable if the power densities of project activity become greater than 4 W/m^2 and less than or equal to 10 W/m^2.

B.6.3. Ex-ante calculation of emission reductions:

The baseline methodology considers the determination of emission factor of the grid which the project activity is connected to as the core data to be determined in the baseline scenario. In Brazil, the grid is interconnected by the National Interconnected System (SIN) in a single system[16]

Emission Factor calculation ($EF_{grid,CM,y}$)

For calculation of the baseline emission factor, the seven steps below should be followed:

STEP 1. Identify the relevant electricity system.

[16] http://www.mct.gov.br/upd_blob/0024/24834.pdf

Considering the stated by the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh), version 02.2.1, and the fact that the Brazilian DNA has published the Resolution nº 8 issued on May 26th, 2008, which defines the Brazilian Interconnected Grid as a single system that covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest), the boundaries of Brazilian electricity system are clearly defined.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).

Since the Brazilian DNA has made available the emission factor calculation based on information of the grid power plants only, the off-grid power plants are not considered.

STEP 3. Select a method to determine the operating margin (OM).

The method adopted to calculate the operating margin is "Dispatch data analysis OM". The calculation is performed by the Brazilian DNA and made publicly available.

The Dispatch Data emission factor (OM), is summarized as follows:

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

Where:
$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year y (tCO_2/MWh);
$EG_{PJ,h}$ = Electricity displaced by the project activity in hour h of year y (MWh);
$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO_2/MWh);
$EG_{PJ,y}$ = Total electricity displaced by the project activity in year y (MWh).

STEP 4. Calculate the operating margin emission factor according to the selected method.

For effect of a good ex-ante estimation to $EF_{grid,OM-DD,y}$ value, was calculated the arithmetic average of the 12 months emission factors of operating margin, published by the DNA (latest data available)[17].

Table 14: Emission Factor of Operating Margin for year 2010.

Average Emission Factor of Operating Margin (tCO_2/ MWh)												
	MONTH											
2010	January	February	March	April	May	June	July	August	September	October	November	December
	0.2111	0.2798	0.2428	0.2379	0.3405	0.4809	0.4347	0.6848	0.7306	0.7320	0.7341	0.6348

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

[17] http://www.mct.gov.br/index.php/content/view/327118.html#ancora

$$EF_{grid,OM\text{-}DD,y} = 0.4787$$

STEP 5. Calculate the build margin (BM) emission factor.

The power units included in the build margin are defined by the Brazilian DNA who is responsible for the operating margin and build margin calculations. The results of these are made publicly available in its web site to consultation.

According to the used methodology, the build margin emission factor (BM) is calculated as follows:

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

For the build margin emission factor $EF_{grid,BM,y}$ also will be adopted the 2010 year values published by the DNA (latest data available)[18].

Table 15: Emission Factor of Build Margin for year 2010.

Average Emission Factor of Build Margin (tCO_2 /MWh) – **ANUAL**	
2010	0.1404

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

$$EF_{grid,BM,y} = 0.1404$$

STEP 6. Calculate the combined margin (CM) emissions factor.

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

$$EF_{grid,CM,y} = 0.4787 \cdot 0.5 + 0.1404 \cdot 0.5 = 0.3095 \text{ (tCO}_2\text{/MWh)}$$

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

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

[18] http://www.mct.gov.br/index.php/content/view/327118.html#ancora

$$\boldsymbol{BE_y} = 0.3095 \cdot 183{,}172 = \mathbf{56{,}691\ (tCO_2)}$$

Returning to the emission reductions of project activity (*ER*), we have the annual ex-ante estimated CO_2 reductions as:

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

$$ER_y = 56{,}691 - 0 = 56{,}691\ (tCO_2e)$$

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

Table 16: Estimated baseline emissions of project activity.

Year	EG_y (MWh)	PE_y (tCO_2)	BE_y (tCO_2)	ER_y (tCO_2/ano)
2013	183,172	0	56,691	56,691
2014	183,172	0	56,691	56,691
2015	183,172	0	56,691	56,691
2016	183,172	0	56,691	56,691
2017	183,172	0	56,691	56,691
2018	183,172	0	56,691	56,691
2019	183,172	0	56,691	56,691
Total	**1,282,204**	**0**	**396,836**	**396,836**
Annual Average	183,172	0	56,691	56,691

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the SHPP Engenheiro Ernesto Jorge Dreher to the grid in year y.
Source of data to be used:	Project activity site (Metering Panel inside the SHP Power House)
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	107,222
Measurement procedures (if any):	The net electricity delivered to the grid will be checked through the electricity bidirectional meters (one main and one back-up installed in Salto do Jacuí Hydropower Substation). The meters must comply with national standards stated by ONS module 12.2 (which can be viewed through the link http://www.ons.org.br/procedimentos/modulo_12.aspx), and industry regulation to ensure the accuracy (class 0.2). For

	safety, the meter will be sealed after calibration.
Monitoring frequency:	Continuous measurement and at least monthly recording.
QA/QC procedures to be applied:	The data will be archived monthly (electronic) and kept archived during the credit period and two years after. The data from the energy meters will be cross checked with the CCEE databank in order to verify the coherency of the data.
Any comment:	Can be accessed through the Meters 90011045 (main) and 90011046 (back-up) on Figure 4 in B.7.2 section. There will not be energy imports for the project.

Data / Parameter:	$EG_{Engenheiro\ Henrique\ Kotzian,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the SHPP Engenheiro Henrique Kotzian to the grid in year y.
Source of data to be used:	Project activity site (Metering Panel inside the SHP Power House)
Value of data applied in section B.5 for the purpose of calculating expected emission reductions	75,949
Measurement procedures (if any):	The net electricity delivered to the grid will be checked through the electricity bidirectional meters (one main and one back-up installed in Salto do Jacuí Hydropower Substation). The meters must comply with national standards stated by ONS module 12.2 (which can be viewed through the link http://www.ons.org.br/procedimentos/modulo_12.aspx), and industry regulation to ensure the accuracy (class 0.2). For safety, the meter will be sealed after calibration.
Monitoring frequency:	Continuous measurement and at least monthly recording
QA/QC procedures to be applied:	The data will be archived monthly (electronic) and kept archived during the credit period and two years after. The data from the energy meters will be cross checked with the CCEE databank in order to verify the coherency of the data.
Any comment:	Can be accessed through the Meters 90011049 (main) and 90011050 (back-up) on Figure 4 in B.7.2 section. There will not be energy imports for the project.

Data / Parameter:	$EG_{Total\ (Engenheiro\ Ernesto\ Jorge\ Dreher/Henrique\ Kotzian),y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by both SHPPs (Engenheiro Ernesto Jorge Dreher and Henrique Kotzian) to the grid in year y. This is the point where both SHPs generations are totalized (in

	the *Salto do Jacuí* Substation). Also this is the quantity of electricity that shall be used to calculate the Emission Reductions since take in account the transmission losses. Be informed that the meters located in the SHPs Power House shall provide the individual participation on the total generation ($EG_{Engenheiro\ Ernesto\ Jorge\ Dreher,y}$ and $EG_{Engenheiro\ Henrique\ Kotzian,y}$).
Source of data to be used:	Metering Panel from the PPs that is located in the Salto do Jacuí Substation (physically distinct from another equipments that don´t belong to this project activity).
Value of data applied in section B.5 for the purpose of calculating expected emission reductions	183,172
Measurement procedures (if any):	Electricity meters.
Monitoring frequency:	Continuous measurement and at least monthly recording.
QA/QC procedures to be applied:	This data will be used to calculate the emission reductions. The data will be archived monthly (electronic) and kept archived during the credit period and two years after. The data from the energy meters will be cross checked with the CCEE databank in order to verify the coherency.
Any comment:	Can be accessed through the Meters 90011047 (main) and 90011048 (back-up) on Figure 4 in B.7.2 section. There will not be energy imports for the project.

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2e/MWh
Description:	Combined Margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.
Source of data to be used:	Based on data provided by DNA (Designated National Authority).
Measurement procedures (if any):	According procedures established by “Tool to calculate the emission factor for an electricity system”, version 2.
Value of data applied in section B.5 for the purpose of calculating expected emission reductions	0.3095
Measurement procedures (if any):	The Combined Margin is calculated through a weighted-average formula, considering the $EF_{grid,OM-DD,y}$ and the $EF_{grid,BM,y}$

	and the weights w_{OM} and w_{BM} default 0.5.
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	As per the "Tool to calculate the emission factor for an electricity system".
Any comment:	To the ex ante estimative of the emission reductions, were used the data related to the year 2010 (more recent data available). Source: http://www.mct.gov.br/index.php/content/view/327118.html#ancora

Data / Parameter:	$EF_{grid,OM-DD,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Operating Margin emission factor of the grid, in a year y
Source of data to be used:	Data provided by DNA (Designated National Authority) to the year y.
Value of data applied in section B.5 for the purpose of calculating expected emission reductions	0.4787
Measurement procedures (if any):	According procedures established by the most recent version of "Tool to calculate the emission factor for an electricity system".
Monitoring frequency:	Monthly.
QA/QC procedures to be applied:	This data will be annually updated to be applied in ex-post calculation of the Emission Factor of Combined Margin.
Any comment:	To the ex ante estimative of the emission reductions, were used the data related to the year 2010 (more recent data available). Source: http://www.mct.gov.br/index.php/content/view/327118.html#ancora

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Build Margin emission factor of the grid, in a year *y*
Source of data to be used:	Data provided by DNA (Designated National Authority) to the year *y*.
Value of data applied in section B.5 for the purpose of calculating expected emission reductions	0.1404
Measurement procedures (if any):	According procedures established by the most recent version of "Tool to calculate the emission factor for an electricity system".
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	This data will be annually updated to be applied in ex-post calculation of the Emission Factor of Combined Margin.
Any comment:	To the ex ante estimative of the emission reductions, were used the data related to the year 2010 (more recent data available).

	Source: http://www.mct.gov.br/index.php/content/view/327118.html#ancora

Data / Parameter:	$Cap_{PJ – Ernesto\ Jorge\ Dreher\ SHP}$
Data unit:	W
Description:	Installed capacity of the SHHP Ernesto Jorge Dreher after the implementation of the project activity.
Source of data to be used:	Plaques of equipments installed at project site.
Measurement procedures (if any):	Determined based on recognized standards.
Value of data applied in section B.5 for the purpose of calculating expected emission reductions	17,950,000
Monitoring frequency:	Annual.
Description of measurement methods and procedures to be applied:	Technical specifications on the installed equipments.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$Cap_{PJ – Henrique\ Kotzian\ SHP}$
Data unit:	W
Description:	Installed capacity of the SHPP Henrique Kotzian after the implementation of the project activity.
Source of data to be used:	Plaques of equipments installed at project site.
Measurement procedures (if any):	Determine the installed capacity based on recognized standards.
Value of data applied in section B.5 for the purpose of calculating expected emission reductions	13,230,000
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$A_{PJ – Ernesto\ Jorge\ Dreher\ SHP}$
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the water

	surface, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Operation Licence issued by FEPAM on 18th June 2009 - LO_2968/2009-DL.
Value of data:	830,000
Measurement procedures (if any):	Measured from topographical surveys or satellite pictures.
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	The preventive erosion environmental measures and the permanent preservation area (APP) recovering program will allow to monitor the slopes` and the reservoirs` margins stability, providing additional data about the reservoir area.
Any comment:	-

Data / Parameter:	$A_{PJ\text{ – Henrique Kotzian SHP}}$
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the water surface, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Operation License issued by FEPAM on 2nd March 2011 - LO_1122/2011-DL.
Value of data:	660,000
Measurement procedures (if any):	Measured from topographical surveys or satellite pictures.
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	The preventive erosion environmental measures and the permanent preservation area (APP) recovering program will allow to monitor the slopes` and the reservoirs` margins stability, providing additional data about the reservoir area.
Any comment:	-

B.7.2. Description of the monitoring plan:

The monitoring plan for the project activity is based on the CDM methodology **ACM0002** - "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*", **Version 12.3.0**, and consists of the monitoring of the electricity generation from the proposed project activity, the surface area of the reservoirs at their full levels, their CO_2 emissions, the installed capacities of the plants and CO_2 emission factors of Brazilian grid.

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

General Characteristics of the Measurement System

The procedures designed for monitoring electricity generation by the project activity follows the parameters and regulations of the Brazilian energy sector. The National Grid Operator (ONS) and the Electric Power Commercialization Chamber (*CCEE* from portuguese *Câmara de Comércio de Energia Elétrica*) are the organs responsible for specification of technical requirements of energy measurement system for billing, i.e, those bodies monitor and approve projects for accurate accounting of energy.

The agent responsible for the measurement system for billing (*SMF* from the Portuguese *Sistema de Medição para Faturamento*) develops the project in accordance with the technical specifications of the measurements for billing, which should include the location of measurement points, panels of measurement, meters and systems for local and remote measurement.

As stated by the sub-module 12.1 of Grid Procedures[19], the SMF is a system composed of main and back-up meters, instrument transformers, communication channels between the agents and CCEE; and data collecting systems to billing measures.

The measurement system measures and records the energy. There are six meters to register the energy generation of project activity (three main meters and three back up). There are one main and one back up meter installed in panels located at the power houses of each plant of project activity. Those meters send generation information to project owners (BMEs), to the operational team (COPREL) and to SINERCOM/CCEE (generation monitoring system of Electric Power Commercialization Chamber). Those information are used by CCEE to establish how much each plant generate (before transmission losses). The measures of energy effectively inputted into the grid are done by the third pair of meters (main and back up) installed at the substation of Salto do Jacuí Hydropower, point where the energy generated by project activity is inputted into the grid. This third pair of meters will record the energy generated by both plants of project activity since the transmission lines which come from the plants are joined at some point before reach this meters. Using the data of meters installed at the power houses of the two plants, the regulatory agency can establish the volume of energy generated by each plant.

Despite being located inside the substation of Salto do Jacuí Hydropower, the pair of meters above referred is independent from the energy generated by the plant. It measures exclusively the energy generated by project activity plants.
For this system is guaranteed the data inviolability. After the calibration, it is sealed for safety.

To an easier understanding, see the figure 4.

The data stored in the meters are collected by the Energy Data Collecting System – SCDE (from Portuguese *Sistema de Coleta de Dados de Energia Elétrica*) of the CCEE, remotely and automatically, through direct access to the agent meters or intermediated for the agent through its Meter Collecting Unit – UCM.

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

Therefore, CCEE is responsible for the monthly readings and keeping the records of the energy dispatched. If any problem happens at the local meter level, the reading lecture corresponding to the

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

amount of energy during the time of the problem will not be lost because of the online reading performed by CCEE.

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

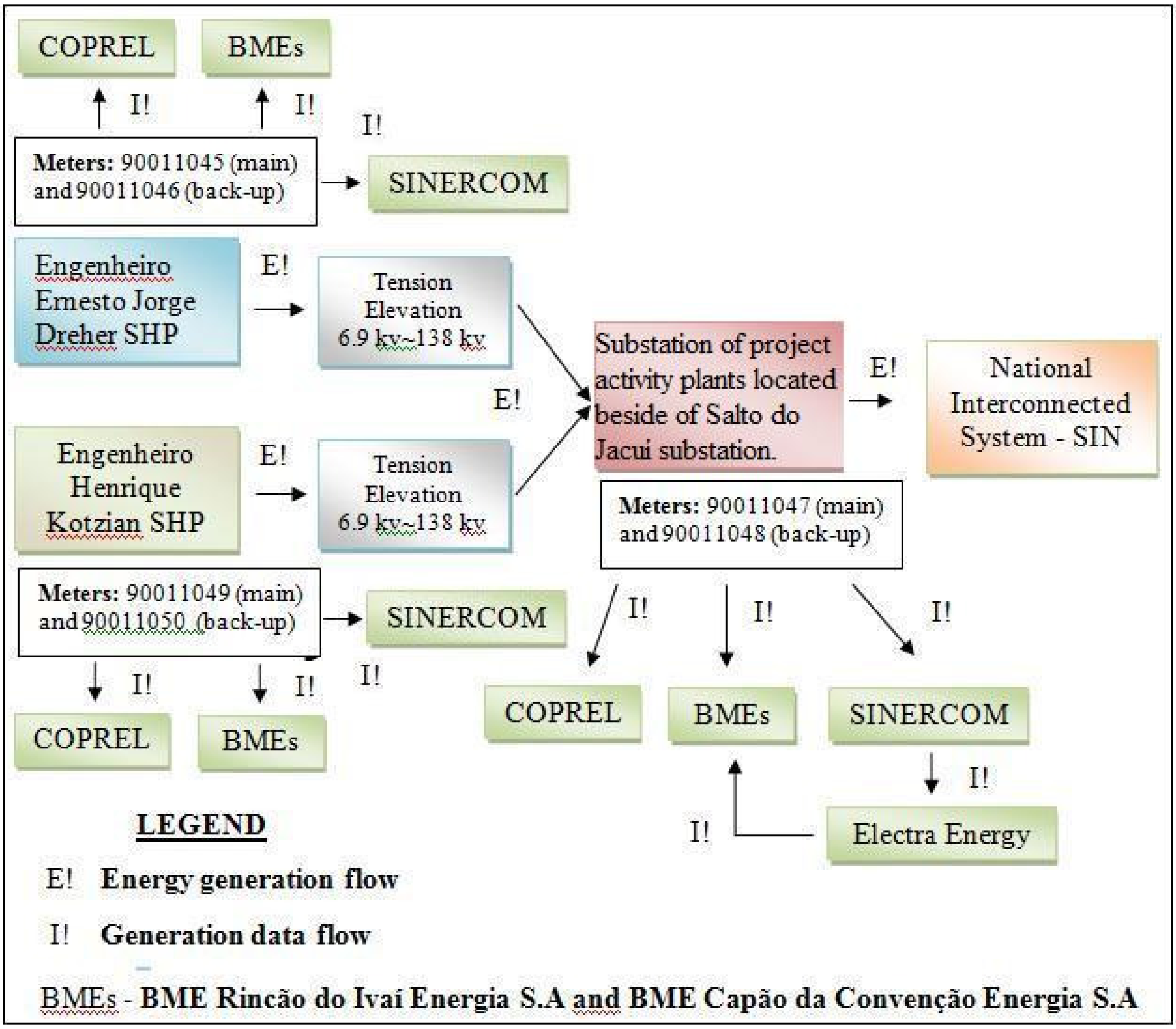

Figure 4: Flow chart of energy and generation data.

Data monitoring:

The readings of meters are used to calculate emission reductions. The monitoring steps are as follow:

(1) The data will be measured continuously and recorded monthly;
(2) Spreadsheets containing the electricity dispatched to the grid will be generated; CCEE data measured (from CCEE databank – SINERCOM - third part) will be used to cross check the monitored data;

(3) The project participants will provide the generation measurement data and the SINERCOM (restricted access website) generation spreadsheets to the DOE, so it can check the authenticity of declared information.
(4) The emission reductions, and any project emissions (if applicable), should be managed by the project manager responsible at Carbotrader;

Quality control:

(1) Calibration of meters:

The calibration of meters shall be conducted at least every two years by a qualified organization that must comply with national standards and industrial regulations to ensure the system accuracy. After calibration, the meters are sealed for safety and the calibration certificates are archived with other monitoring records. The class of accuracy of the equipment that will be used in the project activity is under the national standards (class 0.2) stated in "*Grid Procedures*" from the National Grid Operator: Module 12, submodule12.2[20].

(2) Emergency treatment

In case of unavailability of measures from any point of measurement, due to maintenance, commissioning or for any other reason, will be used the methodology to estimate data as the item 14.3 of the Procedure of Energy Commercialization PdC ME.01[21].

Data Management:

All the project activity issues regarding the SHPs construction will be treated by the responsible Managers / Directors from BME Rincão do Ivaí and BME Capão da Convenção.

The monitoring data will be stored during the project's duration. In this case this means 7 years (one period duration) plus 2 years after it ends according to the methodology. If the project is renewed for another two periods, the data will be stored for 21 years plus 2 years, making up a total of 23 monitoring years.

All data gathered in the monitoring range will be electronically filed and kept for the period above mentioned.
The emission reductions to be generated will be calculated regularly by the project proponents and kept for the verification phase.

Training Procedures:

All training necessary for the plants operational team were provided by equipment suppliers during the their installation and pre operational phases. After the engagement of COPREL Cooperativa de Energia

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

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

as the third party which assumed the operations and maintenance activities of the plants, all the training activities are being undertaken by the engaged company to itself team.

The emergency procedures related to the project activity operation (for instance: workers' safety and health, dam safety related emergency drills/exercises, etc, according to the Brazilian legislation), are included in the training courses that the third party company is supposed to offer.
Furthermore, operation, maintenance and calibration procedures will follow the national guidelines set by the National Grid Operator.

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

The CO_2 emission factors related to this project activity ($EF_{grid,CM,y}$, $EF_{grid,OM-DD,y}$ and $EF_{grid,BM,y}$) as mentioned previously, are the values correspondent to the year 2010 and are made available by the Brazilian DNA. It can be viewed at DNA website (www.mct.gov.br/clima). Thus, the monitoring of this data will be ex-post through periodic access to data provided by DNA.

3) **Installed capacity – Cap_{PJ}:**

The installed capacity of the hydro power plant after the implementation of the project activity will be monitored yearly through one of the following options:
- Technical specifications on the installed equipments;
- Installed plaques in the equipments;
- Factsheets.

In Brazil, the installed capacity of hydropower plants is determined and authorized by the competent regulatory agency. Furthermore, any modification must also be authorized and made available to the public. Thus, any new authorization to increase the installed capacity of the plants will be monitored. It will be used to installed capacity, which is also a recognized standard, to assure the project technical characteristics.

It is also important to highlight that according the ANEEL resolution number 407, issued on 19th October 2000, if the present/real installed capacity is greater than +/- 5 % of the authorized (granted) installed capacity, a revision of the authorized installed capacity should be requested. This revision must not be requested by the responsible for both Engenheiro Ernesto Jorge Dreher SHP and Engenheiro Henrique Kotzian SHPs because the increment in their capacities overwhelm the ANEEL granted values in only 0.44% and 1,76% respectively, so no revision or comunication action should be done accord to the mentioned ANEEL resolution.

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

The area of the reservoir will be measured yearly in the surface of the water, after the implementation of the project activity, when the reservoir is full. To this purpose will be used topographic surveys or satellite pictures.

Authority and Responsibility:

The BME Rincão do Ivaí Energia S.A. and BME Capão da Convenção Energia S.A. are responsible for the maintenance and calibration of the monitoring equipments, compliance to operational requirements and corrective actions related to the functionality of Engenheiro Ernesto Jorge Dreher SHP and Engenheiro Henrique Kotzian SHP respectively. Moreover, the companies have authority and responsibility for registration, monitoring, and measurements as well as managing all the issues related to the project activity and to organize staff training to use appropriated techniques in those procedures.

The baseline project emissions and Emissions Reductions calculations will be performed by Carbotrader Assessoria e Consultoria em Energia Eireli which should report the results in a proper way to the entities related with the CDM process.

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):

Date of completing the final draft of this baseline section: 15/09/2011.
The entity responsible for its development is:

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E-mail:	carbotrader@carbotrader.com
URL:	www.carbotrader.com
Represented by:	Mr.
First Name:	Arthur
Last Name:	Moraes
Job title:	Managing Director

Carbotrader is also a Project Participant listed in Annex 1.

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:

04/12/2007 - the first acquisition contract of turbine was signed on this date

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

30 years – 0 month

According to the ANEEL authoritative resolutions 134 and 142 issued respectively on 11 April 2005 and 18 April 2005.

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

C.2.1. Renewable crediting period:

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

01/01/2013 or in the CDM registration date, whichever occur later.

C.2.1.2. Length of the first crediting period:

7 years – 0 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 following state and federal laws and resolutions regulate the project activities of electricity generation by hydropower plants to be implemented on Rio Grande do Sul state:

- Federal Law Nº 6938 issued on 31st august 1981 - "States about the National Environmental Policy, its goals, formulating mechanisms and applications";

- CONAMA Resolution Nº 06 issued on 16th September 1987 - "States about the environmental licensing of electric energy generation building sector";

- CONAMA Resolution Nº 237 issued on 22nd December 1997 - "Rules the licensing environmental aspects established on the National Environmental Policy";

- CONAMA Resolution Nº 279 issued on 27th June 2001 - "Establishes the procedures to simplified environmental licensing of small environmental potential impact ventures";

- CONSEMA Resolution Nº 38 issued on 18th July 2003 – "Establishes procedures, technical criteria and Grace periods to licensing activities promoted by FEPAM".

All the potential impacts related to project activity were reported to the regulatory agencies, according their standard procedures, as part of the process of environmental licenses issuance. Its results are comprised in the Environmental Simplified Report - *RAS* (from Portuguese *Relatório Ambiental Simplificado*). These studies comprehend the environmental assessment of the influenced area, moreover, it has contained a group of activities and programs (detailed in the item D.2) which have as main goal to minimize the negative effects and to monitor the influences of the plant installation on local water resources.

The project activity is in compliance with all the laws and regulations required. Thus, the permissions and licenses were issued by the regulatory agencies. The Environmental Protection Agency of Rio Grande do Sul state - *FEPAM* (from portuguese *Fundação Estadual de Proteção Ambiental*), on the basis of the environmental legislation and other pertinent norms, forwarded the following environmental licenses to the Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian SHPs:

Engenheiro Ernesto Jorge Dreher SHP

- LP N° 108/2004-DL – Previous Licence issued on 30th January 2004;
- LI Nº 372/2008-DL – Installation License issued on 22th April 2008;
- LO N° 2968/2009-DL – Operation License issued on 18th June 2009;

Engenheiro Henrique Kotzian SHP

- LP N° 455/2005-DL – Previous License issued on 24th June 2005;
- LI N° 495/2010-DL – Installation License issued on 7th May 2010;
- LO N° 1122/2011-DL – Operation License issued on 2nd March 2011.

Moreover, the Electrical Regulatory Agency - *ANEEL* issued the relevant following documents which demonstrate that the regulations have been being obeyed, allowing the process progress of plants installation.

Engenheiro Ernesto Jorge Dreher SHP

- Dispatch nº 1181 dated 17th April 2007 – Approves the SHP project design;
- Dispatch nº 1805 dated 18th May 2009 – Ratifies basic design parameters of the plant.
- Dispatch nº 3756 dated 2nd October 2009 – Authorizes the commercial operations for the generating unit number 1.
- Dispatch nº 4068 dated 30th October 2009 – Authorizes the commercial operations for the generating unit number 2.
- Dispatch nº 4188 dated 11th November 2009 – Enlarges the installed capacity from 17.725 MW to 17.87 MW.

- Dispatch nº 4189 dated 11th November 2009 – Authorizes the commercial operations for the generating unit number 4.
- Dispatch nº 4383 dated 25th November 2009 – Authorizes the commercial operations for the generating unit number 3.
- Dispatch nº 3507 dated 29th August 2011 – Authorizes the test operations for the generating unit number 5.

Engenheiro Henrique Kotzian SHP

- Dispatch nº 6814 dated 24th April 2006 – Approves the project plant of Engenheiro Ernesto Jorge Dreher SHP.
- Dispatch nº 1180 dated 18th April 2007 – Approves the SHP project design.
- Dispatch nº 602 dated 16th February 2009 – Ratify parameters of the project design.
- Dispatch nº 1063 dated 4th March 2011 – Authorizes commercial operations of the generating units number 1, 2 and 3.

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 Small Hydro Power plants (SHPs) are considered an alternative for the Brazilian electric matrix diversification. One of its characteristics is to present low negative impacts to the place of installation, when compared to the business as usual in Brazil (large hydro power plants), due mainly to the fact of it requires a small reservoir.

Studies related to the promoted impacts were carried out as part of the process of environmental licenses issuance. Its results are comprised in the Environmental Simplified Report - *RAS* (from Portuguese *Relatório Ambiental Simplificado*). These studies comprehend the environmental assessment of the influenced area, moreover, it has contained a group of activities and programs which have as main goal to minimize the negative effects and to monitor the influences of the plant installation on local water resources.

As stated by the National Environmental Council - *CONAMA (*from Portuguese *Conselho Nacional do Meio Ambiente*) on its resolution number 279 dated of 27th June 2001, the *RAS* must be performed by ventures that present non significant environmental impacts. It is performed previously the issuance of the Previous License – LP, and only if the enterprise are in accordance to all legal and environmental requirements, the process of licensing carries on, proceeding the necessary steps to acquiring further licenses (Installation License – LI and Operation License – LO).

As both hydro plants Engenheiro Ernesto Jorge Dreher and Engenheiro Henrique Kotzian have all licenses required to work (LP, LI and LO), it is understood that all the constraints were met, and all the impacts caused by project activities were satisfactorily raised and treated, in order to minimize negative effects.

As main negative impacts identified by the environmental studies, we can highlight the vegetation removal and riparian forest fragmentation, the local loss of threatened species, the temporary diversion of river flow, the inhabitants insecurity feelings promotion and routine alterations, and the reservoir filling associated risks (epidemic risks).

The environmental control plan is composed for several management programs and mitigation measures which target to reduce the impacts of plants installation and operation activities. As spoken above, the satisfactory implementation of all these measures are constraints to operation licenses issuance and renewal and must be in accordance with the state and federal legal requirements.
To minimize the effects of project activity on the local environment, the following programs were installed (among others): maintenance of minimal flow of river (ecologic flow), the clean of reservoir before its filling to avoid vector proliferation, the rescue of terrestris and ichthyofaunal, the recuperation of areas degraded due project activities implantation also riparian and legal forest reservation (including slopes stabilization and erosion control), the conservation and use of reservoir surrounding areas and the environmental education program.

Also programs of water quality monitoring and area monitoring (to avoid the predatory hunting and fishing) must be kept by project participants as part of requirements to operation license renewal.
Regarding to the areas surrounding the plants, some of them were owned by government of Rio Grande do Sul state and others were private proprieties. The areas which had to be acquired by the project participants to plants implementation were those that cover the reservoir areas and the permanent preservation areas. Some of the government owned areas were already used as settlement areas at that time. To reallocate people who lived there to other areas, was made a permutation agreement between project owners and state. The people who lived there were reallocated to other areas bought by project owners and permutated with the government according legal regulations. These areas are located on Cruz Alta, Carazinho and Salto do Jacuí municipalities. In the cases of private proprieties, project owner bought it or it was expropriated according to legal regulations.

SECTION E. Stakeholders' comments

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

In accordance to Ruling nº.1, dated 11 September 2003 and Ruling nº7, of the Inter-Ministry Commission on Global Climate Change (CIMGC), any CDM projects shall send a letter describing the project and request commentaries by local interested parties.

As the project activity do not extend to more than one state of the federation, the invitations of comments should be addressed to the following actors involved and affected by the project activities:

- City Hall and City Councils;
- State environmental body and Municipal environmental body;
- Brazilian Forum of NGOs and Environmental and Development Social Movements - http://www.fboms.org.br;
- Community associations;
- State Prosecutors Office;
- National Prosecutors Office.

In order to satisfy and comply with this ruling the project proponents sent invitation letters describing the project, and requested commentaries by the following interested parties:

- Júlio de Castilhos City Hall;
- Júlio de Castilhos City Council;
- Júlio de Castilhos Environmental Secretary;
- Trade, Culture and Industry Association of Júlio de Castilhos;
- Salto do Jacuí City Hall;
- Salto do Jacuí City Council;
- Salto do Jacuí Agriculture Secretary;
- Trade and Industry Association of Salto do Jacuí;
- FEPAM – Environmental Protection Agency of Rio Grande do Sul state;
- FBOMS - Brazilian Forum of NGOs and social organizations;
- Rio Grande do Sul Prosecutors Office;
- National Prosecutors Office.

Attached to the letters, was sent an Executive Summary with information about project, also the web link: http://www.carbotrader.com/proj_port.htm , were the stakeholders could accesses the Project Design Description (Portuguese version) and the Annex III (according to the DNA requirements). The interested parties above were invited to present their comments on project activity during a period of 15 days after receipt of the invitation letter.

E.2. Summary of the comments received:

Mr. Marcelo Dornelles Helms, Attorney of General's Office for Institutional Affairs, as representative of the Rio Grande do Sul Prosecutors Office answered the query in a letter dated on 14 September 2011. After reviewing the documentation submitted and access documents and others information referred to the Project Activity, stated that their content is consistent with the environmental rules applicable to the SHPs involved in the project activity. And wasn´t has done any objection.

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

Since nothing was requested, no actions were taken.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no Kyoto Protocol Annex 1 country public fund financing this project activity.

Annex 3

BASELINE INFORMATION

The CO_2 emission factors resulting from the generation of electricity verified in Brazil's National Interconnected System (SIN) are calculated from the plants power generation records issued centrally by the National Grid Operator, especially in thermoelectric plants. This information is necessary to renewable energy projects connected to the national grid and implemented in Brazil under the Kyoto Protocol's Clean Development Mechanism (CDM).

The baseline emissions are calculated according to the "Tool to calculate the emission factor for an electricity system" version 02.2.1. With this methodology the National Grid Operator (ONS) is tasked with explaining the SIN´s (National Interconnected System) operational practices regulated by the ANEEL to the work group made up by the Ministry of Science and Technology (MCT) and Ministry of Mines and Energy (MME). According to this system, the CO_2 Emission Factors applicable to the project activity, will be calculated by the National Grid Operator (ONS) for the single system since May 27, 2008.

More details about baseline development of this project can be found through this links:
http://www.mct.gov.br/index.php/content/view/73318.html and
http://www.mct.gov.br/index.php/content/view/13986.html.

Annex 4

MONITORING INFORMATION

The monitoring of the project's activity is based on the baseline methodology and monitoring applicable to this project and, as described in items B 7.1 and B 7.2, measuring equipment of generated energy is used for verification of renewable energy generated by the project's activity.

After energy generation data has been collected, there will be a reconciliation of this data with the reports/data issued by the CCEE or with the sold energy numbers in energy sales invoices. We emphasize that the energy data from CCEE is a passes by auditing and must not contain errors. This procedure will be adopted in order to give consistency to the data.

It should be noted that all collected data in the monitoring scope will be electronically filed and kept for at least 2 years after the last credit period or the last issuance of CERs for this project activity, whichever occurs later.

This monitoring plan is based on the Large Scale Methodology **ACM0002, version12.3.0**, as well as on the "**Tool to calculate the emission factor for an electricity system"** version02.2.1.