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

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Complexo Carreiro II CDM Project.

PDD Version number: 04.

Date: June 17th, 2011.

A.2. Description of the project activity:

Complexo Carreiro II CDM Project activity consists on the supply of clean hydroelectric energy to the Brazilian National Interconnected System (SIN) through the implantation and operation of three Small Hydro Power Plant (SHP) Boa Fé, São Paulo and Autódromo with small reservoir area and installed capacity of 24 MW, 16MW and 24 MW, respectively. SHPs are located on the margins of Carreiro River, state of Rio Grande do Sul, Southern Region of Brazil.

The Ministry of Mines and Energy[1], through the Decennial Plan for Electric Energy Expansion for the period of 2010-2019, projects for the next 10 years a growth of 162.24% and 81.58% in the total installed capacity of oil fuel and coal Thermoelectric Plants, respectively, taken from a 2010 baseline. With that, SHPs Boa Fé, São Paulo and Autódromo have the main objective of helping to fulfill the increasing demand for electricity in Brazil, provided the economic and population growth, contributing for the environmental, social and economical sustainability, supplying clean and renewable electricity to the country.

Complexo Carreiro II project activity will reduce greenhouse gases (GHG) emissions, avoiding generation through sources of fossil fuels. Clean and renewable electricity supply will bring important contribution to environmental sustainability, reducing the carbon dioxide emissions that would occur in the absence of this project.

The baseline scenario is the same scenario that existed before the project activity implementation starting because the electricity that will be supplied to the grid would be generated otherwise by the operation of grid-connected power plants and by the addition of new generation sources, as expressed in the combined margin calculations described in the "Tool to calculate the emission factor for an electric system".

Entrepreneurships construction will contribute for sustainable development of the country and of the region once it provides economic development, without compromising the future generations, being aligned with the concept of Sustainable Development, established by the Brundtland Report, created by the World Commission on Environment and Development, that defines the term as: "the development that satisfies the current needs, without compromising the capacity of the future generations of supplying its own necessities"[2].

Complexo Carreiro II Project contributes for sustainable development by the following actions:

- Through the operation of SHPs Boa Fé, São Paulo and Autódromo, clean and renewable energy will be dispatched to the Brazilian National Interconnected System, displacing enterprises that would generate electricity through fossil fuel burning, preventing, thus, the emission of pollutant gases to the atmosphere.

[1] Decennial Plan for Electric Energy Expansion 2010-2019. Page 82, table 54. Available at: http://www.epe.gov.br/PDEE/Forms/EPEEstudo.aspx. Acessed in June 4th, 2010.

[2] WCED [CMMAD], 1987. Our Commom Future. The World Commission on Environment and Development. Oxford University Press.

- During the implementation, it will be generated 800 direct jobs and 400 indirect jobs and stimulation for economic activities. The project will promote the region's economic development, which occurs through the generation of income to the community of municipalities involved and their collaborators. In addition, through taxes generated by their activities to the cities involved and the Union, among them the ISSQN exceeding R$ 35,000,000.00, the project will provide funds which will revert to the population of the region and the country as a whole.

- SHPs presents low environmental impact, with a small reservoir formation, in addition, project participants will realize considerable investments in environmental programs and actions. It will be developed 29 environmental programs of mitigation actions in the physical, biotic, anthropic environment in order to reduce and monitor the possible impacts of the project. It can be highlighted the reforestation program, which predicts the small branches of native species planting along the ciliar zone and the specific programs of environmental education that will contribute to the awareness of the population of the municipalities involved about environmental and ecological issues.

- The implementation of this kind of enterprise in the region will demand training for collaborators to be hired or sub-hired in the region and for the population in the municipalities involved. Through a environmental education program, it will be developed activities along with the scholar community of the municipalities within the project's direct influence, besides activities to capacitate sub-hired companies, and educational activities with residents of the reservoir's surroundings. In addition, entrepreneurs have a human resources politics that aims at the qualification of all the collaborators of the group's companies, applying also to the collaborators of the sub-contracted companies. Through this action, Hidrotérmica SA seeks to capacitate its collaborators to the market and contribute to the growth of knowledge and to the level of education of the municipalities where it acts.

- Investments in culture and in social and environmental responsibility programs are part of the group's corporate culture and will also take place in the enterprises through local projects support.

A.3. Project participants:

Hidrotérmica S.A. is a member of Group Bolognesi, located in the south region of the country, with private capital exclusively national, which works in the area of construction, real estate and electricity generation from alternative sources. To implement the three SHPs that make up this project, Hidrotérmica created three special purpose companies aiming to build and operate the enterprises. They are: Autódromo Energética S.A., Boa Fé Energética S.A. and São Paulo Energética S.A.

These SPCs will be project participants with Enerbio Consultoria Ltda - ME which assists Hidrotérmica S.A. in developing the CDM project, as well as monitoring of CERs to be generated by the Project.

The table below represents the parties and entities involved in the Complexo Carreiro II Project.

Table 1 – Private and public parties and entities involved in the activity.

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

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

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil.

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

Region: South of Brazil

State: Rio Grande do Sul.

A.4.1.3. City/Town/Community etc:

Municipalities of Guaporé, Serafina Correa, Nova Bassano and Vista Alegre do Prata.

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

The implementation of SHPs Boa Fé, São Paulo and Autódromo will be held in Carreiro River, a tributary on the right margin of the Antas River, sub-basin 86, in the Atlantic Southeast basin, state of Rio Grande do Sul, South region of Brazil.

The locations of the power houses of SHPs Boa Fé, São Paulo and Autódromo are described below. The geographic coordinates are according to the Previous Licenses granted by the State Foundation of Environmental Protection of the State of Rio Grande do Sul (FEPAM).

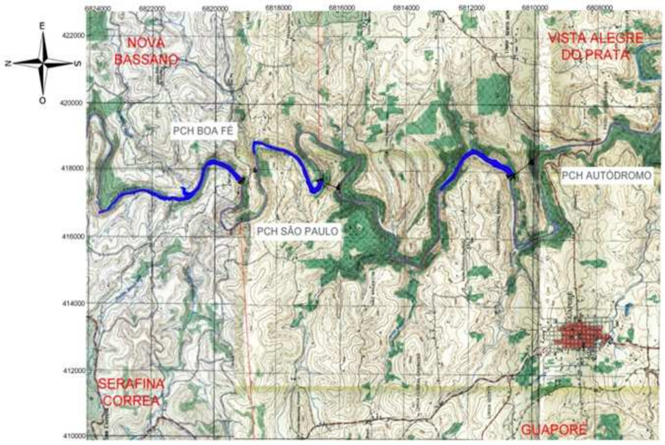
SHP Boa Fé will be implemented between the municipalities of Serafina Corrêa and Nova Bassano. The coordinates of the entrepreneurship's powerhouse are Latitude 28° 44' South and Longitude 51° 50' West.

SHP São Paulo will be located between the municipalities of Guaporé and Nova Bassano. The coordinates of the entrepreneurship's powerhouse are Latitude 28° 46' South and Longitude 51° 50' West.

SHP Autódromo will be implemented between the municipalities of Guaporé and Vista Alegre do Prata. The coordinates of the entrepreneurship's powerhouse are Latitude 28° 49' South and Longitude 51° 50' West.

The map below shows the localization of SHPs Boa Fé, São Paulo and Autódromo.

Map - Localization of the SHPs



The table below shows some socio-economical indicators of the municipalities where the SHPs are located:

Table 2 – Socio-Economical indicators of municipalities where the SHPs Boa Fé, São Paulo and Autódromo are located.

Municipality	Total Population (2008)	Area (km^2) (2008)	Anual GDP per capita (2007)	Illiteracy Rate (2000)	Life Expectancy at Birth (2000)
Guaporé	21,748	297.7	R$ 13,245	6.48%	73.84 years
Nova Bassano	8,808	211.6	R$ 36,384	3.81%	73.84 years
Serafina Corrêa	13,699	163.3	R$ 20,389	5.58%	73.84 years
Vista Alegre do Prata	1,532	119.3	R$ 12,329	4.49%	71.90 years

* Data Source: Foundation of Economics and Statistics, an agency linked to the Department of Planning and Management of the State Government of Rio Grande do Sul. Available at: www.fee.rs.gov.br/sitefee/pt/content/resumo/pg_municipios.php. Acessed in June 2th, 2010.

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

Sectorial Scope 1 – Energy Industries (Renewable Source)

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

SHPs Boa Fé, São Paulo and Autódromo will use the Carreiro River's hydraulic potential to generate electricity with an installed capacity of 24 MW, 16 MW and 24 MW, respectively. According to the methodology ACM0002, if the project activity is the installation of a new renewable grid-connected power generation plant, the baseline scenario is the following:

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

The following number of electricity generation enterprises in operation in Brazil, where the Project is located:

Table 3: Enterprises in operation in Brazil according to ANEEL.

Type	Quantity	Power (kW)	%
Hydro Power Plant Central Generation (HCG)[3]	328	188,118	0.17%
Wind Power Plant (WPP)	50	926,886	0,82%
Small Hydro Power Plant (SHP)[4]	389	3,440,112	3.03%
Hydro Power Plant (HPP)[5]	173	77,022,189	67.90%
Thermal Power Plant (TPP)	1,399	29,856,901	26.32%
Total	2,345	113,441,292	100.00%

SHPs Boa Fé, São Paulo and Autódromo are run-of-river hydroelectric power plant and that have installed capacity 24 MW, 16 MW and 24 MW, respectively. The commercial product of a hydroelectric plant in Brazil is assured energy. The assured energy is formally calculated for commercial purposes by the regulatory agencies (ANEEL and the Ministry of Mines and Energy). As described by the Ministry of Mines and Energy[6] of Brazil, the assured energy of SHPs Boa Fé, São Paulo and Autódromo is 12.23 MW(**107,134 MWh/year)**, 8.63 MW(**75,598 MWh/year)** and 12.25 MW(**107,310 MWh/year)**, respectively. Therefore, the load factor (assured energy/installed capacity) of the SHP's Boa Fé, São Paulo and Autódromo is 50.96%, 53.94% and 51.04% respectively is determined by Brazilian official agents (MME).

The Basic Engineering Project of each SHP provides a dam with an axis perpendicular to the river channel, where are incorporated the threshold slope, the river diversion and the remaining flow structures. Upstream the dam, in the margin next to the flooded area, water intake is located, which leads the river`s water to the powerhouse through a stone excavated tunnel. The SHPs have run-of-river turbines that use natural flow of the river to generate electricity without the need for large reservoirs.

3 Hydro Power Plants Central Generation are Hydropower Plants with installed capacity less than 1 MW

4 Small Hydro Power Plants are Hydropower Plants with installed capacity higher that 1 MW and equal to or less than 30 MW

5 Hydro Power Plants are power plants with installed capacity higher than 30 MW

6 Ordinance Ministry of Mines and Energy, number 100, May, 31th 2007. Page. 4. Annex III.

The following table presents the main technical parameters of the SHPs.

Table 4: Technical characteristics of SHPs Boa Fé, São Paulo and Autódromo.

Technical characteristics / SHPs	Boa Fé	São Paulo	Autódromo
1. ELECTRICITY DATA			
Installed Capacity (W)	24,000,000W	16,000,000 W	24,000,000 W
Assured Energy (MW)	12.23 MW	8.63 MW	12.25 MW
2. RESERVOIR			
Reservoir Area (m^2)	580,000 m^2	370,000 m^2	410,000 m^2
3. DAM			
Type	Gravity CCR	Gravity CCR	Gravity CCR
Maximum Height (meters)	26 m	11 m	18 m
4. SPILLWAY			
Type	Threshold slope	Threshold slope	Threshold slope
Total Length (meters)	166 m	170 m	130 m
5. POWER HOUSE			
Type	Sheltered	Semi-Sheltered	Sheltered
Number of Generators	3	2	3
6. TURBINES			
Type	Francis, horizontal axis	Francis, vertical axis	Francis simple, horizontal axis
Number of units	3	2	3
Nominal Unitary Flow	25.05 m^3/s	34.08 m^3/s	29.00 m^3/s
Nominal Unit Power	8,272 kW	8,273 kW	8,272 kW
7. GENERATORS			
Number of units	3	2	3
Nominal Power	8,000 kW	8,000 kW	8,000 kW
Rated speed synchronous	360 rpm	360 rpm	300 rpm
Nominal voltage between phases	13.8 kV	6.9 kV	13.8 kV
8. EFFICIENCY			
Turbine	92 %	92%	92%
Generator	96.71%	96.70%	96.74%

The Turbine/Generator average lifetime is about 30 years, according to manufacturer's specification. Item B.7.2 presents with details all meters and electricity measurement process. SHPs are located in sequence. SHP Boa Fé is the first plant. There are 2 meters (one principal and one rear) located in SHP São Paulo (the next plant) that measure the gross electricity of SHP Boa Fé. In the SHP Autodromo, there are two groups of 2 meters: 2 meters (each group have one principal meter and one rear) measure gross electricity of SHPs Boa Fé e São Paulo and 2 other meters (one principal and one rear) that measure the gross electricity of SHP Autodromo. In the substation, there are two meters (one principal and one rear) that measure net electricity generated to the grid by all three plants.

Equipment and technologies to be used in the project were developed in Brazil and have already been successfully applied in similar projects in the country and around the world. The implementation of the project will be responsibility of a national company, thereby providing development and employment of national workforce.

CO_2 is a greenhouse gas involved in the project activity. The CO_2 emissions arising from electricity generation in fossil fuel power plants are the emissions sources that will be replaced due to the project activity.

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

Using the baseline emission factor calculated as presented on the item B.6.1, the complete implementation of the Complexo Carreiro II Project connected to the Brazilian Interconnected System will generate an estimated average annual reduction of **46,618 tCO_2e** and a total reduction of **326,324 tCO_2e** during the first 7-year-period, described in the table below:

Table 5: Estimation of Complexo Carreiro II Project emissions reduction.

Year	Annual estimation of emission reductions in tonnes of CO_2e
2011	22,079
2012	47,415
2013	47,415
2014	47,415
2015	47,415
2016	47,415
2017	47,415
2018	19,755
Total Estimated Reductions (tCO_2e)	**326,324**
Total Number of Crediting Years	**7**
Annual average of the estimated reductions over the crediting period (tCO2e)	**46,618**

Notes:

- EGy and EGbaseline projections were made assuming power plant operation during 8,760 hour per year;
- Electricity generation is projected according to the assured energy
- The projection assumed as the starting date of the first crediting period from the date of 01/06/2011 which is the predicted date for operation starting of SHP Autódromo[7].

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

- Approved consolidated baseline and monitoring methodology ACM0002, version 12.1 –
- "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

[7] The schedule provides SHP Autódromo commercial operation beginning in 23/05/2011. For projection purposes, it was considered the start of commercial operation on 01/06/2011, which it is the first of three SHP to get operational. SHPs Boa Fé and São Paulo have as an expected commercial operation date 18/06/2011 and 21/09/2011 respectively. For emission reduction projection, was considered the dates 1/07/2011 and 1/10/2011 respectively.

- Tool for the Demonstration and Assessment of Additionality, Version 5.2.
- Tool to calculate the emission factor for an electricity system, version 2.1

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

ACM0002 consolidated methodology is applicable to grid-connected renewable power generation project activities that install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity.

- In case of hydro power plants, one of the following conditions must apply:
    - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir;
    - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emission section, is greater than 4 W/m^2;
    - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.

The ACM0002 methodology can be applicable to Complexo Carreiro II Project due to the following aspects:

- SHPs Boa Fé, São Paulo and Autódromo are an installation of a new hydro power plant/unit;
- Complexo Carreiro II Project does not involve switching from fossil fuel to renewable energy sources;
- Complexo Carreiro II Project does Not involve biomass fired power plants;
- SHPs Boa Fé, São Paulo and Autódromo are a project activity which result in new reservoirs and the power density of the power plant is greater than 4 W/m^2 (and it is also greater than 10 W/m^2), as described in the table 6.

The project activity`s power density, according ACM0002 methodology, is calculated as demonstrated below:

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

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

The table below evidences that SHPs Boa Fé, São Paulo and Autódromo have a power density greater than 4 W/m^2 and also greater than 10 W/m^2.

Table 6: Power Density.

Item	SHP Boa Fé	SHP São Paulo	SHP Autódromo
Cap_{PJ} (W)	24,000,000	16,000,000	24,000,000
Cap_{BL}	0	0	0
A_{PJ} (m^2)	580,000	370,000	410,000
A_{BL}	0	0	0
PD (W/m^2)	41.38	43.24	58.54

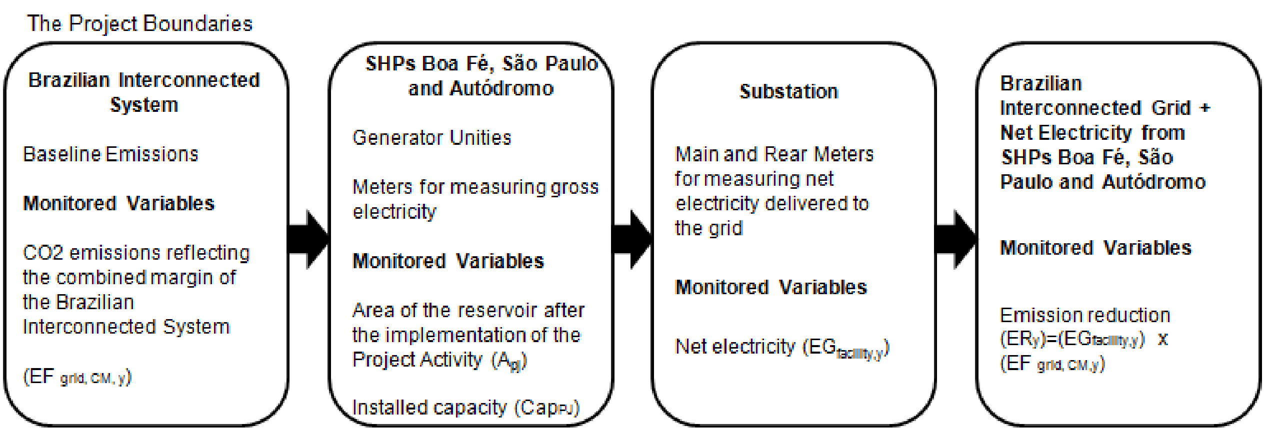
B.3. Description of the sources and gases included in the project boundary

The National Interconnected System will be considered as the project`s electricity system. The National Interconnected System (from Portuguese Sistema Interligado Nacional - SIN) is managed by Electric National System Operator (from Portuguese Operador Nacional do Sistema - ONS), which is responsible for all activities related to the operation's planning. ONS traditionally subdivides the National Interconnected System into four Subsystems interconnected: the South, Southeast/Midwest Subsystem, the North and Northeast Subsystem. These Subsystems are related to the Brazilian geographic regions: South, Southeast / Midwest, North and the Northeast Region, respectively.

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

According to ACM0002, version 12.1, the (spatial extent) of the project boundary includes the project power plant and all power plants physically to the electricity system[8] that the CDM project power plant is connected to. The SHPs Boa Fé, São Paulo and Autódromo are connected to National Interconnected System. SHPs of the project have 3, 2 and 3 generating units respectively.

It follows below the flow diagram of the project boundaries:



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

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[8] Refer to the latest approved version of the " Tool to calculate the emission factor for an electricity system" for definition of an electricity system.

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

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Main Emission Source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	No	Methodology ACM0002 expresses that this is a Main Emission Source. However, as the Power Density of the three SHP of the project are greater than 10 W/m^2, project activity does not provide any emission.
		N_20	No	Minor emission source

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

In the absence of the project activity, the clean electricity generated by SHPs Boa Fé, São Paulo and Autódromo, dispatched to the Brazilian National Interconnected System (SIN) would have been generated through non-renewable sources from Power Plants connected to the interconnected grid, causing the emission of greater quantities of greenhouse gases.

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

“Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

The combined margin emission factor of National Interconnected System will be calculated, according to the “*Tool to calculate the emission factor for an electricity system*” approved by the CDM Executive Board.

The combined margin emission factor for electricity generation of the National Interconnected System, necessary to Combined Margin (CM) calculation, are calculated based on the generation record of plants centrally dispatched by the **National Operator of the System** (From the Portuguese: Operador Nacional do Sistema - ONS). The calculus systematic was developed through a joint work of the ONS, the Ministry of Mines and Energy (MME) and the Ministry of Science and Technology (MCT).

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

This baseline is perfectly applicable to SHPs Boa Fé, São Paulo and Autódromo.

As additional information, it can be noticed, through the projection established by the Ministry of Mines and Energy (MME) in the Decennial Plan of Electrical Energy Expansion[9] to the period of 2010-2019, that other activities and technologies that propitiate a higher emission of greenhouse gases would occur in the absence of this project.

Brazilian Decennial Plan for Electric Energy Expansion (2010-2019)

In 2010, the Ministry of Mines and Energy (MME) elaborated the Decennial Plan of Electric Energy Expansion for the period of 2010-2019. MME foresees a significant increase in the renewable energies offers, and shows concern to implement them. However the Decennial Plan for Electric Energy Expansion for the period 2010-2019[10] projects an increase of approximately 81% in the offer of electric energy based on the mineral coal and 162% based on the oil fuel for the country. The increase predicted for thermoelectric power plant that use fossil fuel is approximately 49%.

Is important to point out that, exists nowadays in Brazil, 9 thermoelectric plants, operating from mineral coal, totalizing an installed capacity of 1,944 MW, according to the following table[11]:

Table 8: Mineral Coal Thermoelectric Power Plants in Brazil

Plant	Power (MW)	State
Figueira	20	Paraná
Charqueadas	72	Rio Grande do Sul
Pres. Médici A e B	446	Rio Grande do Sul
São Jerônimo	20	Rio Grande do Sul
Jorge Lacerda I e II	232	Santa Catarina
Jorge Lacerda III	262	Santa Catarina
Jorge Lacerda IV	363	Santa Catarina
Alunorte	103.854	Pará
Alumar	75.2	Maranhão
Candiota III	350	Rio Grande do Sul
Total	**1,944**	

As shows the table, only 2 thermoelectric enterprises that generate energy from burning mineral coal are not located in Brazil´s south region (Alumar and Alunorte plants), where the Complexo Carreiro II Project is located.

Therefore, there is the real possibility for thermoelectric power plants to be activated in the case of the hydropower plants do not fulfill the energy demand, due to electricity peak or lack of raining. Thus, Complexo Carreiro II Project can be a collaborator to avoid one of the thermoelectric power plants to be active, or the construction of related enterprises.

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

This item is elaborated based on "Tool for the demonstration an assessment of additionality", version 5.2, available on the website http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html .

[9] Source: Ministry of Mines and Energy (MME). Decennial Plan of Electrical Energy Expansion 2010-2019. Available at: http://www.epe.gov.br/PDEE/Forms/EPEEstudo.aspx

[10] Source: Ministry of Mines and Energy (MME). Decennial Plan of Electrical Energy Expansion 2010-2019. Page 82, table 54.

[11] Source: http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2 - Accessed in:February, 1st 2011.

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

Before the demonstration of additionality through the application of “Tool for the demonstration an assessment of additionality”, as the starting date of the project activity is prior to the validation date, project participants demonstrates with the evidence below that the CDM was seriously considered in the decision to proceed with the project activity.

Table 9: Evidences of the CDM Project Elaboration.

Evidence	Date	Subject
E-mails sent to the UNFCCC Secretariat about the intention to make SHPs Boa Fé, São Paulo and Autódromo CDM project activities.	12/05/2009	SHPs Boa Fé, São Paulo and Autódromo communication of the intention to become a CDM project activity.
Letter sent to the Executive Secretary of the Interministerial Commission of Global Climate Change – Brazilian DNA	27/07/2009	SHPs Boa Fé, São Paulo and Autódromo communication of the intention to become a CDM project activity.
CT BF 047/2009 CT AUT 046/2009	01/11/2009	Contract for construction beginning of SHPs Boa Fé and Autódromo Projects.
Proposal to develop CDM project submitted by the company Enerbio Consultoria	23/03/2010	Commercial and Technical proposal for Complexo Carreiro II CDM Project development sent by Enerbio Consultoria SA to Hidrotérmica SA
Service Contract established between Hidrotérmica SA and Enerbio Consultoria.	15/04/2010	Signature of the service contract established between Hidrotérmica S.A. and Enerbio Consultoria for CDM project implementation.
SHP Autódromo Schedule	23/05/2011	SHP Autódromo commercial operation prevision.
SHP Boa Fé Schedule	18/06/2011	SHP Boa Fé commercial operation prevision.
SHP São Paulo Schedule	21/09/2011	SHP São Paulo commercial operation prevision

It is important to say that Project Owners sent one communication of the prior consideration of the CDM for each small hydropower plant. At the time of the communication, Project Owners did not know about the possibility to develop the CDM Project with the three hydropower plants together.

When the consulting company was hired, project owners and consulting company decided to develop one unique PDD for the three small hydropower plants. This decision was taken to save time and financial resources during the CDM cycle. As Project Owners had informed UNFCCC and Brazilian DNA about the prior consideration of each SHP, PP’s believe that the fulfilled their obligations regarding prior consideration.

The following requirements are necessary to demonstrate and assess the Complexo Carreiro II Project additionality:

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

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

1. The realistic alternatives to the project activity are:

- The continuity of the present scenario, with electricity being generated according to the current generation composition of the National Interconnected System;

- The construction of new electricity enterprises, with similar installed capacity to the SHPs Boa Fé, São Paulo and Autódromo;

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

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

Both the project activity and the alternative scenarios are in accordance to the applicable laws and regulations. Decennial Plan shows that there will be an increase in the electricity offer of the country in general. There is also an increase of the installed capacity of plant that generate electricity through fossil fuel as coal. According to the Atlas of Electric Power in Brazil[12], the largest Brazilian coal deposits are located in the states of Rio Grande do Sul (89.25%) and Santa Catarina (10.41%). Only the Candiota coal deposit, in Rio Grande do Sul, region where Complexo Carreiro II Project is located, has 38% of the reserve volume of all domestic coal, which demonstrates the possibility of building new coal plants in the state. As exposed in item B.4 of this PDD, it is in South region where 7 of the 9 coal thermoelectric of the country are located.

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

According to MME [13], "it is the agents of distribution that decide and compromise themselves to pay, through contracts resulting from auctions, amounts of electrical energy provided from new installations of electric energy generation to be delivered (…). With the distributors' information, the generators may then decide which new entrepreneurships of generation they wish to build, presenting in the auctions proposals of selling prices of their electric energy, competing for contracts of energy purchase from distributors. Additionally, the generators may also hire directly and freely with free consumers".

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

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

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

Step 2. Investment analysis

Determine whether the proposed project activity is not:

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

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[12] Atlas of Electric Power in Brazil, ANEEL, 3th edition, 2008. Page 136. Available at: http://www.aneel.gov.br/visualizar_texto.cfm?idtxt=1689. Accessed in: June, 30th 2010.

[13] Ministry of Mines and Energy (MME). Decennial Plan for Energy Expansion 2006-2015.

To conduct the investment analysis, it must be used the following steps:

Sub-step 2a. Determine appropriate analysis method

The project generates other economic and financial benefits, in addition to revenues from the CDM. Thus, it will be used the benchmarking analysis for Complexo Carreiro II Project activity.

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

It will be used the equity internal rate of return (IRR) as financial indicator of the project, because it is one of the indicators most commonly used and most appropriate in the investment analysis of infrastructure projects. The equity IRR calculation of each project follows what it is indicated by the Guidance on the Assessment of Investment Analysis present in the Tool for the Demonstration and Assessment of Additionality.

As benchmarking, it will be used the expected return on equity.

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

The cash flow of each small hydroelectric plant that comprises this project will be fully presented to the Designated Operational Entity that will perform validation and to any entity linked to the CDM that the request it for the purpose of proving the project additionality. The period considered in the context of this project activity is 30 years as determined by the authorizations for each Small Hydropower Plant.

It was adopted common assumptions for three SHPs cash flow, respecting their electricity differences and size.

It is described below the assumptions adopted:

SHP Boa Fé

1 – Revenue

- **Assured Energy** of 12.23 MW as Ministry of Mines and Energy Ordinance, N^{o}. 100. May 31th , 2007. Available at: http://www.mme.gov.br/mme/galerias/arquivos/legislacao/portaria/Portaria_n_100-2007.pdf
- It was considered that the power plant will provide electricity 8760 hours per year;
- **Price of electricity**: R$ 144.00 R$/MWh as price cap disclosed in the ANEEL Announcement 02/2009 of the 8th New Energy Auction (A-3), conducted in 2009[14].

2 – Investment

- **Total Investment:** R$ 108,021,295.96, as Letter HT-390-2009 of 18th September 2009 and consultation letter sent to the National Bank of Economic and Social Development, BNDES.

3 – Expenditure

- **O & M (Operation and Maintenance)**: As the company does not have any O&M service contract signed, the O&M costs were budgeted in accordance with business proposals submitted for two

[14] According to the Auction No. 2 / 2009 available at: http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/022009-Edital_A-3%20_27-7-9_APOS%20AP-APORTE%20ON-LINE_V14.pdf

other SHPs of the Group (SHPs Criúva and Palanquinho) with similar size. Value of R$ 1,050,000.00 per year.

- **Distribution System Usage Rate (TUSD):** According to ANEEL Resolution N°. 636, dated April 17th, 2008, the TUSD for generation projects connected to Rio Grande Energia (RGE) is R$ 3.20/kW installed. Small hydropower projects should discount this rate by 50% in accordance with Normative Resolution N°. 77, August 18th, 2004. Thus, R$ 1.60 x 24,000 kW x 12 = R$ 460,800.00 per year.
- **ANEEL Inspection Fee:** 0.5% over annual gross revenue (R$ 74,822.94) as National Decree N°. 2410, November 28th, 1997.
- **Administration Cost:** It was budgeted according expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP Boa Fé. Value of R$ 134,220 per year. This budget was based on costs of SHP Da Ilha which already has two years of operation history, between June 2008 and May 2009.
- **Insurance:** It was budgeted expenses with insurance against civil and operational risk. The budget was based on costs incurred for other SHP of the group (SHP da Ilha) that has similar size. Annual value: R$ 269,497.
- **Environment:** It was budgeted expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP Boa Fé. Value of R$ 268,843. This budget was based on SHP Da Ilha which already has two years of operation history, between June 2008 and May 2009.
- **Other operational expenses:** It was budgeted as expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP Boa Fé, between June 2008 and May 2009. Value of R$ 969,042.

SHP São Paulo

1 – Revenue

- **Assured Energy** of 8.63 MW as Ministry of Mines and Energy Ordinance, N°. 100. May 31, 2007. Available at: http://www.mme.gov.br/mme/galerias/arquivos/legislacao/portaria/Portaria_n_100-2007.pdf
- It was considered that the power plant will provide electricity 8760 hours per year;
- **Price of electricity**: R$ 144.00 R$/MWh as price cap disclosed in the ANEEL Announcement 02/2009 of the 8th New Energy Auction (A-3), conducted in 2009[15].

2 – Investment

- **Total Investment:** R$ 89,302,260.06, as Letter HT-392-2009 of 18th September 2009 consultation letter sent to the National Bank of Economic and Social Development, BNDES.

3 – Expenditure

- **O & M (Operation and Maintenance)**: As the company does not have any O&M service contract signed, the O&M costs were budgeted in accordance with business proposals submitted for two other SHPs of the Group (SHPs Criúva and Palanquinho), weighted by installed capacity of SHP São Paulo. Amount of R$ 700,000.00 per year.
- **Distribution System Usage Rate (TUSD):** According to ANEEL Resolution N°. 636, dated April 17th, 2008, the TUSD for generation projects connected to Rio Grande Energia (RGE) is R$ 3.20/kW installed. Small hydropower projects should discount this rate by 50% in accordance with

[15] According to the Auction No. 2 / 2009 available at: http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/022009-Edital_A-3%20_27-7-9_APOS%20AP-APORTE%20ON-LINE_V14.pdf

Normative Resolution N°. 77, August 18th, 2004. Thus, R$ 1.60 x 16,000 kW x 12 = R$ 307,200.00 per year.

- **ANEEL Inspection Fee:** 0.5% over annual gross revenue (R$ 52,798.20) as National Decree N°. 2410, November 28th, 1997.
- **Administration Cost:** It was budgeted as expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP São Paulo. Value of R$ 89,480 per year. This budget was based on cost of SHP Da Ilha, which already has two years of operation history, between June 2008 and May 2009.
- **Insurance:** It was budgeted expenses with insurance against civil and operational risk. The budget was based on costs incurred for other SHP of the group (SHP da Ilha) that has similar size Annual value: R$ 179,665.
- **Environment:** It was budgeted expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP São Paulo. Value of R$ 179,229. This budget was based on costs of SHP Da Ilha which already has two years of operation history, between June 2008 and May 2009.
- **Other operational expenses:** it was budgeted as expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) between June 2008 and May 2009 weighted by installed capacity of SHP São Paulo. Value of R$ 646,028.

SHP Autódromo

1 – Revenue

- **Energy Assured** of 12.25 MW as Ministry of Mines and Energy Ordinance, N°. 100. May 31, 2007. May 31, 2007. Available at: http://www.mme.gov.br/mme/galerias/arquivos/legislacao/portaria/Portaria_n_100-2007.pdf
- It was considered that the power plant will provide electricity 8760 hours per year;
- **Price of energy**: R$ 144.00 R$/MWh as price cap disclosed in the ANEEL Announcement 02/2009 of the 8th New Energy Auction (A-3), conducted in 2009[16].

2 – Investment

- **Total Investment:** R$ 114,055,180, as Letter HT-391-2009 of 18th September 2009 and consultation letter to be sent to the National Bank of Economic and Social Development, BNDES.

3 – Expenditure

- **O & M (Operation and Maintenance)**: As the company does not have any O&M service contract signed, the O&M costs were budgeted in accordance with business proposals submitted for two other SHPs of the Group (SHPs Criúva and Palanquinho), with similar size. Amount of R$ 1,050,000.00 per year.
- **Distribution System Usage Rate (TUSD):** According to ANEEL Resolution N°. 636, dated April 17th, 2008, the TUSD for generation projects connected to Rio Grande Energia (RGE) is R$ 3.20/kW installed. Small hydropower projects should discount this rate by 50% in accordance with Normative Resolution N°. 77, August 18th, 2004. Thus, R$ 1.60 x 24,000 kW x 12 = R$ 460,800.00 per year.
- **ANEEL Inspection Fee:** 0.5% over annual gross revenue (R$ 77,876.24) as National Decree N°. 2410, November 28th, 1997.
- **Administration Cost:** It was budgeted as expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP Autódromo. Value of R$

[16] According to the Auction No. 2 / 2009 available at: http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/022009-Edital_A-3%20_27-7-9_APOS%20AP-APORTE%20ON-LINE_V14.pdf

134,220 per year. This budget was based on SHP Da Ilha which already has two years of operation history, between June 2008 and May 2009

- **Insurance:** It was budgeted expenses with insurance against civil and operational risk. The budget was based on costs incurred for other SHP of the group (SHP da Ilha) that has similar size. Annual value: R$ 269,497.
- **Environment:** It was budgeted expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP Autódromo. Value of R$ 268,843. This budget was based on costs of SHP Da Ilha, which already has two years of operation history, between June 2008 and May 2009.
- **Other operational expenses:** it was budgeted as expenses incurred in another SHP of the Group already in operation (SHP Da Ilha) weighted by installed capacity of SHP Autódromo, between June 2008 and May 2009. Value of R$ 969,042.

Financing and taxation were budgeted on the same assumptions for the three SHPs.

Taxation

- Taxes (PIS / COFINS / CSSL / IR) follow the Brazilian taxation regime of presumed income tax;

Financing

- None of the SHPs has financing contract. A consultation was made to the National Bank of Economic and Social Development, BNDES, which has not yet provided answers. Thus, the cost of third party capital of Complexo Carreiro II Project is based on the financing costs charged for small hydroelectric projects in Brazil through funding from BNDES. The cost of loan financing from BNDES is usually indexed to the Interest Rate Term (6.00% % p.a.[17]), plus a basic remuneration of BNDES (0.9% p.a.) plus the Risk of Credit from BNDES (3.0% p.a.). The maximum risk credit rate charged by the BNDES for renewable energy projects is 3.57% per year according to information presented in Bank's[18] website. Conservatively, an estimated rate of 3.0% per year. The estimated rate for financing is then 9.90% per year with an amortization period of 14 years as indicated by information in BNDES website.
- This funding cost calculation methodology is indicated by BNDES, as its website: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energias_renovaveis.html. The company estimates that **70%** of the amount needed for total investment will be financed by BNDES. The maximum funding for renewable energy projects is 80% of total investment.

Benchmarking - Cost of Equity

The expected return on equity (or cost of equity) was calculated using the following equation.

$K_e = GB + PE_g$ **Equation 2**

Where:

- Ke = Cost of equity.
- GB = Risk Free Rate (Rf) + Country Risk Premium (ERP)
- PE_g = *Global Equity Risk Premium*

[17] http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Custos_Financeiros/Taxa_de_Juros_de_Longo_Prazo_TJLP/index.html. Accessed in 20/07/2010.

[18] The risk rate charged by the BNDES maximum credit for renewable energy projects is 3.57% p.a. as information in the Bank's website: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energias_renovaveis.html

Adopted equation corresponds to equation 03 of the option 4B of the *"Draft tool to determine the weighted average cost of capital (WACC)"*. Although this tool is not approved at the time of preparing the PDD, it corresponds to a calculation method accepted by financial models and as it is suggested by the UNFCCC in a draft methodological, it is understood that it represents an appropriate way to calculate the cost of equity according to the Executive Board.

To calculate the cost of equity using equation 2, the parameters used were as follows:

- GB = 3..36% +7.50% = 10.86%.
    - R*f* = 3.36% => Average Rate of Return of U.S. Treasury bond (T-Bond) of 30 years[19] in the past 03 years (2007, 2008 and 2009) prior to preparation of the PDD;
    - ERP = 7.50% => Risk Premium in Brazil, based on data from Moody's, as calculated by Professor Aswath Damodaran[20].
- PE_g = 4.1% => Global Equity Risk Premium is provided by the article "The worldwide equity premium: A smaller puzzle Elroy Dimson, Paul Marsh and Mike Stautun of London Business School[21].

The expected return on equity of the three SHPs, in nominal terms, then, is 14.96%. Discounted rate of inflation of 2.70%[22], the cost of equity is 11.93%.

In 03[th] June 2011, after the validation beginning, UNFCCC published version 04 of the guidance of the investment analysis where an approximate expected return on equity for different project types and host countries is published. These values can also be used as default values. The expected return on equity for electricity projects in Brazil, in real terms, is 11.75% accordingly this guidance. As this is an indication provided by UNFCCC, it was also added to the PDD, despite being published after the PDD publication.

The following table shows a summary comparison between the project financial indicators and the benchmarkings:

Table 12: Equity Internal Rate of Return Return x Benchmarking

Benchmarking	Expected Return on Equity – UNFCCC	Equity IRR SHP Boa Fé	Equity IRR SHP São Paulo	Equity IRR SHP Autódromo
11.93%	11.75%	8.44%	6.05%	7.52%

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

Sub-step 2d. Sensitivity analysis

The main variables that may affect the project's finances are (i) the electricity price, (ii) the plant load factor, (iii) the total amount of investment, (iv) the O & M cost and the (v) financing cost. These parameters were chosen to be used in the sensitivity analysis because they are the most important variables that affect the revenues (electricity price and the plant load factor) and the outflows (total amount of investment; O&M Cost and the financing cost). In the case of the revenues, these are the unique parameters

[19] Based on data from Standard & Poors. Available at http://pages.stern.nyu.edu/~adamodar/. To access it, you should enter the link Updated Date and thereafter on the link "Updtaed Data and the option "Historical Returns on Stocks, Bonds and Bills – United States" . Accessed in July, 19[th] 2010.

[20] Available at: http://www.stern.nyu.edu/~adamodar/pc/datasets/ctryprem.xls . Accessed in July, 19[th] 2010.

[21] This article is indicated in *Draft tool to determine the weighted average cost of capital (WACC).*

[22] Consumer Price Index (CPI). Available at: ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt . Accessed in 19/07/2010.

that can affect it. In the case of the outflows, parameters used represent the higher expenses. Therefore, they can provide higher impact in the cash flow.

The sensitivity analysis considers only those scenarios that contribute to increase economic and financial attractiveness of the project aiming to confirm how solid is the analysis of sub-steps 2b and 2c.

The electricity price and the plant load factor (assured energy) are the unique parameters that can influence the revenue of the project. The assured energy is determined by regulators and is defined according to Ordinance of Ministry of Mines and Energy of Brazil and it is the electricity that can be marketed by the entrepreneurs.

The electricity price was based on the price-cap of the last auction for renewable energy previous to the starting date of the project activity. The O&M cost (Operation and Maintenance) was estimated as other commercial proposal for other SHPs of the group which have the same installed capacity size.

The total investment represents the most important cash outflow of the project and it is based on consultation letter presented to the most likely lender of the project. Generally, SHPs construction end up costing more than initially budgeted, given the occurrence of unpredictable events. The financing cost was estimated based on information provided by BNDES which it is one of the cheapest financing sources for infrastructure projects in Brazil. It is unlikely that financing costs less than what it was estimated in the scenarios covered by sensitivity analysis.

Thus, it is unlikely that the items included in the sensitivity analysis of SHPs may undergo changes that contribute to an increase in financial and economic attractiveness that is not covered by the range of variation between 0 and 10%. Therefore, the variation range between 0 and 10% covers more than the probable scenarios.

Tables below present the results for the main parameters variations that can affect the shareholder cash flow of each SHPs that compose Complexo Carreiro II.

Table 13: Sensitivity Analysis – SHP Boa Fé

ELECTRICITY PRICE VARIATION

Projected Situation	MWh Price	Equity IRR
0%	**R$ 144,00**	**8,44%**
5%	R$ 151,20	**9,60%**
10%	R$ 158,40	**10,78%**

PLANT LOAD FACTOR VARIATION

Projected Situation	Plant Load Factor	Equity IRR
0%	**12,23**	**8,44%**
5%	12,84	**9,60%**
10%	13,45	**10,78%**

TOTAL INVESTMENT VARIATION

Projected Situation	Investment (R$ Mil)	Equity IRR
0%	**R$ 108.021.296**	**8,44%**
-5%	R$ 102.620.231	**9,39%**
-10%	R$ 97.219.166	**10,47%**

FINANCING COST VARIATION

Projected Situation	Cost of Financing	Equity IRR
0%	**9,90%**	**8,44%**
-5%	9,41%	**8,80%**
-10%	8,91%	**9,18%**

O&M COST VARIATION

Projected Situation	O&M Cost	Equity IRR
0%	**R$ 1.050.000**	**8,44%**
-5%	R$ 997.500	**8,52%**
-10%	R$ 945.000	**8,61%**

Table 14: Sensitivity Analysis – SHP São Paulo

ELECTRICITY PRICE VARIATION

Projected Situation	MWh Price	Equity IRR
0%	R$ 144,00	6,05%
5%	R$ 151,20	7,03%
10%	R$ 158,40	8,02%

PLANT LOAD FACTOR VARIATION

Projected Situation	Plant Load Factor	Equity IRR
0%	8,63	6,05%
5%	9,06	7,03%
10%	9,49	8,02%

TOTAL INVESTMENT VARIATION

Projected Situation	Investment (R$ Mil)	Equity IRR
0%	R$ 89.302.260	6,05%
-5%	R$ 84.837.147	6,87%
-10%	R$ 80.372.034	7,78%

FINANCING COST VARIATION

Projected Situation	Cost of Financing	Equity IRR
0%	9,90%	6,05%
-5%	9,41%	6,37%
-10%	8,91%	6,70%

O&M COST VARIATION

Projected Situation	O&M Cost	Equity IRR
0%	R$ 700.000	6,05%
-5%	R$ 665.000	6,12%
-10%	R$ 630.000	6,19%

Table 15: Sensitivity Analysis – SHP Autódromo

ELECTRICITY PRICE VARIATION

Projected Situation	MWh Price	Equity IRR
0%	R$ 144,00	7,52%
5%	R$ 151,20	8,61%
10%	R$ 158,40	9,72%

PLANT LOAD FACTOR VARIATION

Projected Situation	Plant Load Factor	Equity IRR
0%	12,25	7,52%
5%	12,86	8,61%
10%	13,48	9,72%

TOTAL INVESTMENT VARIATION

Projected Situation	Investment (R$ Mil)	Equity IRR
0%	R$ 114.055.180	7,52%
-5%	R$ 108.352.421	8,42%
-10%	R$ 102.649.662	9,43%

FINANCING COST VARIATION

Projected Situation	Cost of Financing	Equity IRR
0%	9,90%	7,52%
-5%	9,41%	7,87%
-10%	8,91%	8,23%

O&M COST VARIATION

Projected Situation	O&M Cost	Equity IRR
0%	R$ 1.050.000	7,52%
-5%	R$ 997.500	7,60%
-10%	R$ 945.000	7,68%

The sensitivity analysis confirms that the Project is not financially attractive, because its equity internal rate of return is lower than the benchmarking.

The tool for demonstration and assessment of additionality indicates that:

"If after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be the most financially attractive (item 2.c – 8.a) or is unlikely to be financially attractive (item 2c-8b), then proceed to Step 4 (Common practice analysis)."

This way sensitivity analysis showed that the proposed activity is not attractive from a financial point of view, it must proceed for Step 4 (Common practice analysis).

Step 3. Barrier analysis

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

Step 4. Common practice analysis

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

It is observed that there are in Brazil, country where SHPs Boa Fé, São Paulo and Autódromo of Complexo Carreiro II are located, entrepreneurships with similar activities to those of the project being proposed.

It follows a summary of the numbers of electricity generation's entrepreneurships in operation in Brazil, according information present in ANEEL's[23] website:

Table 16 – Number of electricity generation's entrepreneurships in operation in Brazil.

Type	Quantity
Hydro Power Plant Central Generation (Installed Capacity smaller than 1 MW)	328
Wind Power Plant	50
Small Hydro Power Plant (Installed Capacity Greater than 1 MW and Smaller or equal than 30 MW)	388
Hydro Power Plant (Installed Capacity Greater than 30 MW)	173
Thermal Power Plant	1,399
Total	**2,338**

The table shows that there are similar activities occurring in Brazil, however, this project activity is not prevalent in the country's energy matrix, only 3.03% of installed power of the current electricity matrix (enterprises in operation) in Brazil is small hydroelectric plants, as well as the enterprises of this project.

Differences of installed capacity requires different amount of investments and requires different risks profile. Therefore, the range of installed capacity considered for this analysis is from 8 MW (less 50% than the lowest installed capacity of the project) and 30 MW (the threshold for small hydropower plants technology in Brazil).

Among these 388 small hydropower plants existing in Brazil, there are 146 with installed capacity between 8 MW and 30 MW. Enterprises with the operation starting date prior June 2004 were also excluded from analysis because they become operational in a different institutional framework.

The law 10,438 of 26th April 2002[24] created PROINFA. PROINFA is a governmental program that seeks to motivate, through the financial point of view, the development of entrepreneurships that make use of renewable technologies, due to the difficulties in financing, in offering guarantees to the finance suppliers and in the necessity of investments considered reasonable to small organizations. This way, the Federal Government tries to motivate projects through differentiated lines of finance, besides the guarantees of minimal revenues through the compromise of establishing Power Purchase Agreements (PPAs), to be firmed with a mixed economy society, Eletrobrás, which will secure to the entrepreneur a minimal revenue of 70% of the energy purchased during the financing period and complete protection to the risks of exposure in the short-term market. The contracts have duration of 20 years and involve selected projects that should start operating until December 2006. Small hydropower plants projects are one of the types eligible to participate in the PROINFA.

[23] http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp. Accessed in 31/01/2011.

[24] http://www.planalto.gov.br/ccivil_03/Leis/2002/L10438.htm

Proinfa predicted that all plants that participate in the program should celebrate its contracts with Eletrobrás until June 2004. After that, Small Hydropower Plants, Wind Power Plants and Biomass Plants lost the benefits offered by this program. The end of this program changed the institutional framework for renewable electricity in Brazil. The CDM created in 1997 got into operation in 2005 and it brought financial revenues that can replace part of the benefits created by PROINFA that ceased to exist.

Therefore, project participants considered in the common practice analysis just Small Hydropower Plants that gets into operation after June 2004, because these enterprises were developed under the same institutional framework of the Small Hydropower Plants of this project.

Among these 146 SHPs with installed capacity between 8 MW and 30 MW, there are only 121 SHPs in the country that had the starting date after June 2004.

As recommended by the sub-step 4.a of the "Tool for demonstration and assessment of additionality", other CDM project activities (Registered project activities and project activities that have been published on the UNFCCC website for stakeholder's comments as part of validation process) should not be included in this analysis.

Among these 121 SHPs, 68 with installed capacity between 8MW and 30 MW shall be excluded from the analysis because they are CDM project activities (or they are registered or they have been submitted for stakeholders consultation).

From the 53 SHPs remainder, 45 received financial incentives from PROINFA, therefore these SHPs had accessed to a different to finance and they operated with less risks due to the guarantees of the Federal Government. The enterprises of Complexo Carreiro II Projet do not take part into PROINFA and consider, this way, the revenues from the commercialization of certified emission reductions as an important factor to make the investment.

5 other SHPs are self-producers and they don't dispatch energy to the grid, only provide electricity for its investors, or own consumption. They have different characteristics and therefore they cannot be considered similar to the activity of Complexo Carreiro II Project.

Therefore, there are just 3 small hydropower plants similar to the project activities.

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

In spite of the existence of projects similar to Complexo Carreiro II Project's activity in Brazil, it is necessary to establish peculiar characteristics of these entrepreneurships that do not allow them to be configured as a common business scenario in the country.

There are three small hydro plants with similar characteristics to the Project: SHP Sacre 2, SHP Ernesto Jorge Dreher and SHP Salto Três de Maio. The small number of similar activities to the small hydropower plants of this project already shows that without financial incentives these kind of enterprises are not common practice in the country.

SHP Engenheiro Ernesto Jorge Dreher

SHP Engenheiro Ernesto Jorge Dreher has a capacity of 17.47 MW and it is owned by BME – Rincão do Ivaí Energia S / A. This company was founded in 2006 and it is constituted by eight individual investors and three companies, Construtora Metropolitana SA in Rio de Janeiro, Cooperative and Rural Electrification, COPREL in Rio Grande do Sul and Rischbieter Eng. Ind. Ind. Com. Ltda in the state of Santa Catarina. Having three companies as shareholders dilutes financial risk of the project, facilitates credit access and shares the necessity for investment from various investors. The SHPs of Complexo

Carreiro II have a single shareholder/investor which configures a higher risk exposure to the construction and requires less access to capital for investment.

SHP Sacre II

SHP Sacre II is property of big private group called "Bertin Group". Bertin Group has 28 productive units in several economic sectors. The group is active in farming, food, biodiesel, cosmetic, leather, dog toy, individual protection equipments, industrial hygiene and cleaning, energy, transport, sanitation and construction. With participation in different economic sectors, the group can mitigate investments risks and also can have access to higher and better financial sources and conditions, comparing to the project owners of this CDM Project.

SHP Sacre II was submitted for CDM (http://cdm.unfccc.int/Projects/DB/TUEV-SUED1188909182.16/view). The project was validated and approved by Brazilian DNA. However, it was rejected by UNFCCC in 28th June 2008. Despite the project had been rejected, the fact that the project was submitted for CDM Cycle shows that project owners were also considering the CDM.

SHP Salto Três de Maio

Project Participants looked for information about this Small Hydropower Plant. The unique information that it was found about the Small Hydropower Plant was that it is located in the North Region of Brazil (Altamira/ Pará) and its installed capacity is 20 MW. The power plant owner is the company Eletricidade Paraense Ltda. The investor and the enterprise does not have website and ANEEL does not provide more information about the project, so it was impossible to find more information about them. As it is expressed in the Tool for the demonstration and assessment of additionality if necessary data/information of similar projects is not accessible for PPs to conduct this analysis, such project can be excluded. Therefore, this project will be excluded from common practice analyses.

As it was exposed, there are just three Small Hydro Power Plants similar to the project activities that are not (I) CDM Project Activities; (II) do not participate in the PROINFA Programa and (III) do not produce electricity to self-consumption. One of this small hydropower plants was excluded of the analysis because PPs did not have access to its information. For the other two SHPs, PPs described essential distinctions between them and small hydropower plants of this project.

The analysis showed that similar activities are not widely observed and commonly carried out without incentives as CDM or PROINFA.

According the "Tool for demonstration and assessment of additionality", "if Sub-steps 4a and 4b are satisfied, i.e. (i) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional."

SATISFIED/APPROVED – Project is ADDITIONAL

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to ACM0002 methodology (version 12.1), the emission reduction (ER_y) are calculated as follows:

$$ER_y = BE_y – PE_y \qquad \textbf{Equation 3}$$

Where:
ER_y = Emission Reductions in year *y* (tCO_2e/yr)
BE_y = Baseline emissions in year *y* (tCO_2/yr)
PE_y = Project emissions in year *y* (tCO_2e/yr)

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

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

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \qquad \textbf{Equation 4}$$

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

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

$$EG_{PJ,y} = EG_{facility,y} \qquad \textbf{Equation 5}$$

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

For ex-ante estimation, it was considered for the variable $EG_{facility,y}$ assured energy of SHPs Boa Fé, São Paulo and Autódromo.

To calculate $EF_{grid,CM,y}$ it will be used data supplied by Brazilian Designated National Authority (DNA), which makes available the data of Dispatch Data Analysis Operating Margin Emission Factor and the Build Margin Emission Factor through using the steps suggested by the tool to calculate the emission factor for an electricity system.

Step 1: Identify the relevant electricity systems

The Interconnected National System is defined as the relevant electric system of the Project Activity, as recommended by Brazilian DNA[25] through the resolution number 08 of 05/2008.

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

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

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

The option I was chosen, once the OM and BM emission factor is calculated by the Brazilian DNA based in the data from power plants connected to the grid.

Step 3: Select a method to determine the operating margin (OM)

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

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

The method chosen to calculate the emission factor of this Project was the operation margin by dispatch data analysis (c). This method was chosen following the recommendation of the resolution number 8[26] of the Brazilian DNA (Designated National Authority).Thus, the data vintage that was chosen to calculate operating margin (OM) for Complexo Carreiro II CDM Project is ex-post (mandatory for Dispatch data Analysis).

Step 4: Calculate the operating margin emission factor according to the selected method

The calculation of the operation margin emission factor follows the dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) and it is calculated and defined by the Brazilian Designated National Authority in accordance with the dispatch data of the ONS - National System Operator.

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

Following these procedures, from July of 2008, the operating margin emission factor started to be calculated for the National Interconnected System, considering the System as unique, and it became available to be consulted by the interested public and investors[27].

[25] http://www.mct.gov.br/upd_blob/0024/24719.pdf

[26] Source: Designated National Authority. http://www.mct.gov.br/upd_blob/0024/24719.pdf. Accessed on January 2011

[27] Resolution 08/05/2008. Available at: http://www.mct.gov.br/upd_blob/0024/24719.pdf

Until the preparation of this PDD, it is available information about dispatch data OM emission factor, related to the whole year of 2009 and some months of 2010.

Dispatch data OM emission factor for 2009 will be used for an ex-ante estimation of CERs generation, because they are the latest annual data available. All data used to calculate the ex-ante operating margin emission factor are available in the Annex 3 of this PDD.

Step 5: Identify the group of power units to be included in the build margin

The group of power units included in the build margin is based on the generation record of the last plants built, centrally dispatched by ONS.

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

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

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

The option that was chosen by project participants was Option 2. The build margin emission factor will be updated annually, *ex-post.*

Step 6: Calculate the build margin emission factor

The build margin emission factor is calculated by the Brazilian DNA. The procedure for calculation was elaborated in cooperation between ONS, MME and MCT and follows the "Tool to calculate the emission factor for an electricity system"[28]

The data of build margin emission factor by dispatch analysis for the 2009 will be used for an ex-ante estimation of CERs generation, since they are the latest data available. Data used to calculate the ex-ante build margin emission factor are available in the Annex 3 of this PDD.

Step 7: Calculate the combined margin emission factor

The combined margin emission factor is calculated as follows:

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

Equation 6

Where:

$EF_{grid,\,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/ MWh)
$EF_{grid,\,OM,y}$ = Operating margin CO_2 emission in year *y* (tCO_2/ MWh)

[28] http://www.mct.gov.br/index.php/content/view/74689.html

W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

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

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

This way, for Complexo Carreiro II Project, it was adopted the following weights: W_{OM} = 0.50 and W_{BM} = 0.50.

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

According to the methodology adopted, for most renewable power generation project activities, $PE_y = 0$. However some project activities may involve project emissions that can be significant. These emissions shall be accounted as pr oject emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \textbf{Equation 7}$$

Where:
PE_y = Project emissions in year y (tCO_2e/yr)
$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2/yr)
$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr).

For Complexo Carreiro II Project $PE_{FF,y}$ and $PE_{GP,y}$ are zero.

Emissions from water reservoir ($PE_{HP,y}$)

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

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

$$PE_{HP,y} = \frac{EF_{Res} * TEGy}{1000} \quad \textbf{Equation 8}$$

Where:
$PE_{HP,y}$ = Project emissions from water reservoir (tCO_2e/yr);
EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year *y* (Kg CO_2e/MWh);
TEGy = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

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

$PE_{HP,y} = 0$.

The project activity`s power density, according ACM0002 methodology, is calculated as equation 1 of section B.2 and demonstrated again below:

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

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

As described on the table 6 of the item B.2, the power density of SHPs Boa Fé, São Paulo and Autódromo are higher than 10 W/m2 and $P_{HP,y} = 0$. Therefore, for Complexo Carreiro II Project $PE_y = 0$.

Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (extraction. processing. and transport). These emissions sources are neglected.

Project Emissions Reductions

To summarize, the project emission reductions are calculated based on equation 3 of this PDD, in which PEy is zero (0). Therefore, project emission reductions are calculated according to equation 4 of this PDD, where $ER_y = BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y.}$

SHPs Boa Fé, São Paulo and Autódromo will be new small power plant, emission reductions are calculated as the simple product between the quantity of net electricity supplied by the project activity to the grid times the combined margin emission factor, where the operating margin emission factor will be calculated according to the Dispatch Data analysis OM and the build margin emission factor will be calculated through the option 2 which considers that this emission factor must be updated ex-post. Besides it will be considered 50% for the weights that forms the combined margin emission factor.

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 plant, this value is zero.
Source of data used:	Project Site
Value applied	0
Justification of the choice of data or description of measurement methods and procedures actually applied	As SHPs Boa Fé, São Paulo and Autódromo are a new power plant, this value is 0 (zero).
Any comment :	

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

B.6.3 Ex-ante calculation of emission reductions:

As described on the item B.6.1, the project emissions reduction will be calculated based on equation 3, where it must be considered PEy as 0 (zero) and Leakage as 0 (zero). Therefore, the project emissions reduction will be calculated according equation 4, as follows:

$$\mathbf{ERy = BEy} = EG_{PJ,y} \cdot EF_{grid,CM,y} \qquad \textbf{Equation 4}$$

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

It follows below the description about Complexo Carreiro II Project’s emissions reduction calculation.

EG_{PJ}. Calculation

Table 17 – $EG_{PJ,y}$ Calculation

Year	SHP BOA FÉ	SHP SÃO PAULO	SHP AUTÓDROMO	Total
	EGPJ,y	EGPJ,y	EGPJ,y	EGPJ,y
2011	53,567	18,899	62,597	135,063
2012	107,134	75,598	107,310	290,042
2013	107,134	75,598	107,310	290,042
2014	107,134	75,598	107,310	290,042
2015	107,134	75,598	107,310	290,042
2016	107,134	75,598	107,310	290,042
2017	107,134	75,598	107,310	290,042
2018	44,639	31,499	44,712	120,850
Total	**741,010**	**503,986**	**751,169**	**1,996,165**

Assumptions:

- $EG_{PJ,y}$ projection was performed assuming the operation of the plants during 8760 hours per year.
- Electricity generation is projected according to assured energy of the plants..
- The projection assumed as the starting date of the first crediting period the starting operation date of SHP Autódromo: 01/06/2011.

Emission Factor Calculation

Table below shows a summary of the main parameters involved on the emission factor calculation:

Table 18 – $EF_{grid,CM\ 2009}$ Calculation

Values	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
$EF_{grid,OM}$	0.2813	0.2531	0.2639	0.2451	0.4051	0.3664	0.2407	0.1988	0.1622	0.1792	0.1810	0.1940
$EF_{grid,BM}$	0.0794											
W_{OM}	0.50											
W_{BM}	0.50											
$EF_{grid,CM}$	0.1635											

Observations:

- Brazilian DNA publishes information regarding $EF_{grid,OM}$ monthly and information regarding $EF_{grid,BM}$ annually.
- The most recent information available by Brazilian Designated National Authority for complete years refers to the year 2009;
- The daily data for Operating Margin Emission Factor is available on Annex 3;

With that, ex-ante estimation of project emission reduction is shown through the table below:

Table 19 – Ex-ante estimation of Complexo Carreiro II Project's Emissions Reduction ($tCO_2\,e$)

Emission Reduction	Total (tonnes CO2 e)			
Year	SHP Boa Fé	SHP São Paulo	SHP Autódromo	Total (t CO2e)
2011	8,757	3,089	10,233	22,079
2012	17,514	12,358	17,543	47,415
2013	17,514	12,358	17,543	47,415
2014	17,514	12,358	17,543	47,415
2015	17,514	12,358	17,543	47,415
2016	17,514	12,358	17,543	47,415
2017	17,514	12,358	17,543	47,415
2018	7,297	5,149	7,309	19,755
Total	**121,138**	**82,386**	**122,800**	**326,324**

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

Table 20 – Summary of the ex-ante estimation of emission reduction

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
2011	0	22,079	0	22,079
2012	0	47,415	0	47,415
2013	0	47,415	0	47,415
2014	0	47,415	0	47,415
2015	0	47,415	0	47,415
2016	0	47,415	0	47,415
2017	0	47,415	0	47,415
2018	0	19,755	0	19,755
Total (tonnes of CO_2 e)	**0**	**326,324**	**0**	**326,324**

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

B.7.1 Data and parameters monitored:

The consolidated baseline methodology for grid-connected electricity generation from renewable sources, ACM0002 version 12.1, must be applied together with the monitoring methodology present into that methodology.

Based on the applied methodology and on what was described on the item B.6.1, there are neither leakage nor project emissions to be monitored. Therefore, the parameters to be monitored are the project’s installed capacity; the net electricity generation supplied by the project to the grid; the combined margin CO_2 emission factor and the project activity’s power plants reservoirs area.

This energy measurement is essential to verify and monitor the GHGs emission reduction. It is necessary, therefore, to use meter equipment to register and check the electricity generated by the units. The Monitoring Plan (item B.7.2) allows the calculation of GHG emissions generated by the project activity in a direct manner, applying the baseline emissions factor.

All data collected as part of monitoring will be electronically archived and be kept at least for 2 years after the end of the last crediting period. 100% of the data above will be monitored. Details of the monitoring are described below. All measurements will be conducted with calibrated measurement equipment according to Brazilian industry standards.

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used	Project Activity Site
Value of data applied for the purpose of calculating expected emission reduction in section B.5	The value used was 290,042 MWh/year This value was obtained by the sum of the assured energies of the plants multiplied by the number of hours in year *y*
Description of measurement methods and procedures to be applied (if any)	Spreadsheets will be used, obtained directly from the electricity meters with information generated hourly. Meters calibration will follow what was described on the document elaborated by ONS – Sub module 12.3 - Maintenance of the measurement system for billing. Meters that will be used are ELO 2180SP, which have an accuracy class of 0.2% both in active energy and reactive energy. The meters must comply with the accuracy classes 0.2 by ABNT (Brazilian Association of Technical Standards). The measurements will be made by a holding Hidrotérmica or by an Outsourced Measurement Agent, to be decided in the operation phase. The data collection and storage of the data produced by the meters located in the Substation Guaporé is, actually made by the holding Hidrotérmica through the software ZFA. This collection is made by the O&M team. This software has a database, which archives all information's. A backup of this file is generated every month. This collection is automatic, and the data´s sent through SDCE to CCEE. Monthly, the information will be confronted with information provided by CCEE, Electric Energy Commercialization Chamber, which supplies records of net electricity supplied to the grid. Continuous measurement and at least monthly recording will be the monitoring frequency.
QA/QC procedures to be applied:	Measurement results will be crosschecked with reports of net electricity generation supplied by CCEE.
Any comment:	CCEE – It is the entity responsible for electricity contracts settlement.

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/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:	*Ex-post* emission factor will be calculated by Enerbio Consultoria through ONS data supplied by Brazilian DNA. The variables $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$. necessary for $EF_{grid,CM,y}$ calculation, will also be monitored and calculated through the Dispatch Data of the National Interconnected System.
Value of data applied for the purpose of calculating expected emission reduction in section B.5	The value of Combined Margin CO_2 Emission Factor (EFgrid,CM,y) which was used for ex-ante estimation of emission reduction of Complexo Carreiro II Project is 0.1635 which was obtained from official data supplied by Brazilian DNA.
Description of measurement methods and procedures to be applied (if any)	As per the "Tool to calculate the emission factor for an electricity system".
QA/QC procedures to be applied:	As per the "Tool to calculate the emission factor for an electricity system". The uncertainty level for these data is low.
Any comment:	

Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	Project Site
Value of data applied for the purpose of calculating expected emission reduction in section B.5	This data was not used to calculate the expected emission reduction. It can be considered the values 24MW, 16MW and 24MW, according to the Installation Licenses 1376/2009-DL, 391/2009-DL and 1381/2009-DL issued by FEPAM, State Foundation for Environmental Protection, for SHPs Boa Fé, São Paulo and Autódromo, respectively.
Description of measurement methods and procedures to be applied (if any)	The installed capacity will be monitored annually by Aneel, environment regulators or by sub-hired companies, according recognized standards. The monitoring frequency is yearly.
QA/QC procedures to be applied:	The uncertainty level for these data is low. The installed capacity is determined on the project's beginning and it will be monitored by the Regulator Agent.
Any comment:	

Data / Parameter:	**A_{PJ}**
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Project Site
Value of data applied for the purpose of calculating expected emission reduction in section B.5	The reservoirs area of the SHPs Boa Fé, São Paulo and Autódromo were not used to calculate emission reductions, because the power density of the three projects is greater than 10 W/m^2. The flooded areas are respectively 580,000 m^2, 370,000 m^2 and 410,000 m^2.
Description of measurement methods and procedures to be applied (if any)	After the Water Level is determined, topographic and top bathymetric surveys are realized to determine with precision the flooded area and the reservoir volume. Initially, superficial landmarks are located near the plants area, using GPS. The planimetry has as origin the DATUM Geodesic WGS84. Starting from the landmark implemented with the GPS, other points of the polygonal are implanted with the Station TOPCOM GTS226. The altimetry have as origin a Reference Level of IBGE (Brazilian Institute of Geography and Statistics), with DATUM in Imbituba – Santa Catarina State. Together with topographic survey, measurement of several top bathymetric sections through the river was performed. The measurements lists of the top bathymetric sections and of the water level points are presented together with the booklet of topographic surveys. Sections are presented in construction plant together with the reservoir topography. With data field, the reservoir area and volume are calculated through the software TopoGRAPH. The flooded area of the reservoir is monitored by the local environmental agency in the licensing process. The value of data can be proved by the licenses of the project. The monitoring frequency is yearly and information regarding reservoir areas can be crosschecked with SHPs licenses.

QA/QC procedures to be applied:	The uncertainty level for these data is low. The reservoir areas are monitored by environment regulators. Any changes in this area must be approved by regulators.
Any comment:	The Technical Information number 3680/2009 of FEPAM, which is local environmental agency, can prove the value adopted. Operation Licences necessary for the project operation may be used yearly to prove the value adopted in the project.

B.7.2 Description of the monitoring plan:

The Monitoring Plan is elaborated according to the Monitoring Methodology present in the consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 12.1.

The responsibilities described below are common to all three plants.

Responsibilities

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

- Measurement Area, linked to the Operation and Maintenance Board: responsible for collecting information directly in meters.

- Outsourced Agent Measurement: part of the Measurement Area allocation can be outsourced by hiring an measurement agent. In this case, the measurement area is responsible for monitoring the work carried out by Measurement Agent outsourced.

- Electric Power Commercialization Chamber (CCEE): it is responsible for implantation, operation and maintenance of SCDE[29], to enable the collection of electric energy's data for the use of Accounting and Settlement System (SCL), aiming at assuring the accuracy of the amounts measured, as well as the meeting of the required deadlines

- Enerbio Consultoria: responsible for calculating the greenhouse gases emission reductions of the project.

Before describing the monitoring process for each small hydro power plant, it is necessary to present a peculiarity of the Complex. The plants are located in the following sequence: SHP Boa Fé, São Paulo and Autódromo. SHP Boa Fé does not have internal meters. In SHP São Paulo, there are two meters (one main and one rear) that measure the gross electricity generated by SHP Boa Fé. In SHP Autódromo, there are two groups of two meters (main and rear). One group measures the gross electricity generated by SHP Autódromo and another group measures the total electricity generated by SHPs Boa Fé and São Paulo.

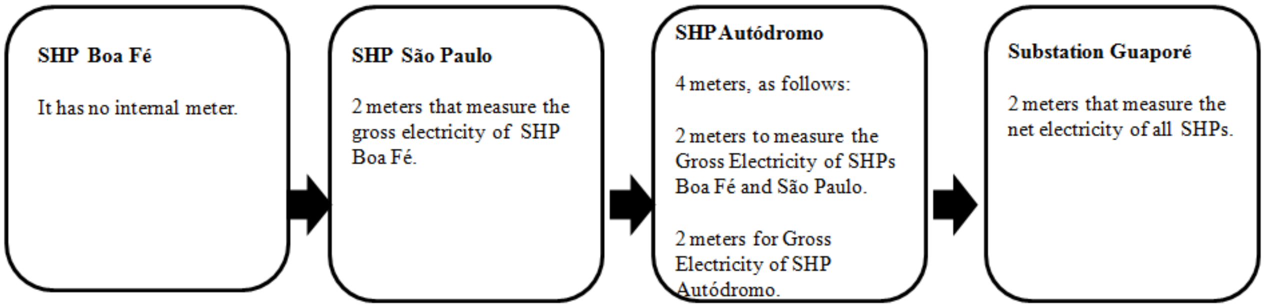
Net electricity measurement occurs through two meters (one main and one rear) located at the substation Guaporé. Net electricity of the 3 SHPs are accounted jointly by the two meters located at this substation.

The data collection and storage of the data produced by the meters located in the Substation Guaporé is, actually made by the holding Hidrotérmica through the software ZFA. This collection is made by the O&M team. This software has a database, which archives all information's. A backup of this file is generated

[29] The SCDE is a system responsible for the daily collection and treatment of measurement. Data acquisition is made automatically, directly from the meters or through the database of the agent.

Source: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=101da5c1de88a010VgnVCM100000aa01a8c0RCRD every month. This collection is automatic, and the data´s sent through SDCE to CCEE. The check of this information is made through files of CCEE, like consolidated measures, accounting report of MRE.

The diagram below shows the number and location of the SHPs meters.



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

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

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

The monitoring process for each small hydro power plant is described below:

<u>Process Description – SHP Boa Fé</u>

I – Procedure of Generation Data Collection

Measurement Area is responsible for generating, at each month in the first working day, based on consultation from a meters` database, the spreadsheets with the generation data, consolidated hourly, regarding the previous month.

SHP Boa Fé has two meters of gross electricity located at SHP São Paulo and net electricity meters are located in the substation Guaporé.

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

II – Data Storage

The information of generation is electronically stored by the Operation and Maintenance Board.

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

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

III – Confronting of the internal generation data with the third party reports

Monthly, information will be confronted with information provided by CCEE .

Process Description – SHP São Paulo

I – Procedure of Generation Data Collection

Measurement Area is responsible for generating, at each month in the first working day, based on consultation from a meters` database, the spreadsheets with the generation data, consolidated hourly, regarding the previous month.

Gross electricity measurement of SHP São Paulo happens through two meters located in SHP Autódromo and net electricity is accounted through meters located at the substation Guaporé.

This procedure can be outsourced through a Measurement Agent's hiring. In this case, Measurement Area is responsible for supervising the work performed by the Measurement Outsourced Agent

II – Data Storage

The information of generation is electronically stored by the Operation and Maintenance Board.
Periodically, the Information Technology Area accomplishes a insurance backup for all company`s data through a Data Server *backup.*

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

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

Monthly, information will be confronted with information provided by CCEE .

Process Description – SHP Autódromo

I – Procedure of Generation Data Collection

Measurement Area is responsible for generating, at each month in the first working day, based on consultation from a meters` database, the spreadsheets with the generation data, consolidated hourly, regarding the previous month.

Gross electricity measurement occurs through two meters located inside the SHP and net electricity is accounted through meters located in the substation Guaporé.

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

II – Data Storage

The information of generation is electronically stored by the Operation and Maintenance Board.

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

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

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

Monthly, information will be confronted with information provided by CCEE .

Emission Reductions Calculation

Emission reductions calculation for the three SHPs that comprise the Complex will be carried out by Enerbio Consultoria. The emission factors are calculated each year, as explained in item B.6.1. To calculate the emission factors, it will be used data supplied by the Ministry of Science and Technology, MCT, (www.mct.gov.br), an institution that chairs Brazilian DNA.

Emission reductions from the project will be regularly monitored and calculated as described in this PDD.

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

The baseline study and monitoring methodology for the project activity were elaborated by Enerbio Consultoria and they were completed on 05/08/2010. Enerbio Consultoria is also a project participant.

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

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SECTION C. Duration of the project activity / crediting period

C.1 DURATION OF THE PROJECT ACTIVITY:

C.1.1. Starting date of the project activity:

01/11/2009 is the starting date of the project activity. This is the date when the company responsible for SHPs Boa Fé and Autódromo construction was hired (Contracts: CT BF 047/2009 and CT AUT 046/2009 are evidence for these dates).

Company responsible for SHP São Paulo construction was hired in 01/08/2010 (contract SP055/2010).

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

30 years

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

The project activity will use renewable crediting period.

C.2.1. Renewable crediting period

7 years and it can be renewed at most two times.

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

01/06/2011 (Operation beginning expectation of the SHP Autódromo)[30].

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

SECTION D. Environmental impacts

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

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

Brazilian law requires a licensing process for new enterprises that involve polluting or potentially pollutant activity. In the State of Rio Grande do Sul, the State Foundation of Environmental Protection Henrique Luiz Roessler (FEPAM) is the legal responsible of the licensing process, which begins with the environmental impact study conducted by the entrepreneur and follows with the previous analysis (preliminary studies) undertaken by the local environmental agency.

In Taquari-Antas Basin, where SHPs are located, FEPAM developed an integrated study of hydroelectric projects planned in the inventory conducted by the Electric Energy Company of Rio Grande do Sul, CEEE, and it determined which of them were environmentally unviable and which of them were feasible through detailed environmental studies. In this study, it was defined that SHPs of Complexo Carreiro II, among others, should be licensed through the Environmental Impact Assessment (EIA).

[30] SHP Autódromo schedule predicts commercial operation beginning in 23/05/2011. For projection purposes, it was considered commercial operation starting date in 01/06/2011.

Checked their environmental feasibility, the project must go through three phases to obtain all necessary licenses for its operation. In the first stage, federal and state environmental legislation is consulted in order to verify venture feasibility and enforce the legal conditions. If FEPAM has a positive understanding about environmental design concepts, Previous Environmental License (LP) is issued.

After obtaining LP, it must be presented physical and operational project for the enterprise and construction activities, if necessary, demonstrating how they will be observing the conditions and restrictions imposed by LP. To obtain the installation environmental license (LI) is required (a) additional information about previous environmental assessment, (b) a new simplified assessment (RDPA – Detailed Report of Environmental Programs), or (c) the Environmental Basic Project (PBA), as resolution of the environmental agency informed in the LP.

If the project fully attends the requirements expressed in LP, the enterprise gets approval to begin the project implementation through the issuance of Environmental Installation License (LI).

The third and last stage provides the authorization for starting the enterprise operational with the issuance of Environmental Operating License (LO). The LO issuance is the confirmation that the enterprise construction was carried out accordingly to the submitted project and it is licensed in compliance with conditions and environmental restrictions.

Below, it follows SHPs Boa Fé, São Paulo and Autódromo installation licenses in effect at the time of PDD elaboration, provided to the designated operational entity in the validation phase.

Table 21: SHPs Installation Licenses

	SHP Boa Fé	SHP São Paulo	SHP Autódromo
Installation License (IL)			
Number	1376/2009-DL	391/2009-DL	1381/2009-DL
Date	02/12/2009	08/04/2009	03/12/2009
Valid	01/12/2014	07/04/2013	15/10/2014

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 three SHPs have a restricted flooding area, not significantly altering the environment. Thus, the environmental impact of the activity is considered small and Complexo Carreiro II project meets the various requirements of state environmental laws and the Brazilian electric sector, having the necessary licenses for their development.

In order to identify possible environmental impacts caused by SHPs, it was performed a study, called Environmental Impact Assessment (EIA). In this document, it is described and explained all environmental impacts produced in physical, biotic and anthropic environment. It is also predicted and indicated some environmental and social projects to be developed with the objective of mitigating the impact generated by the venture.

It will be conducted 29 programs and actions to minimize the impact of the entrepreneurship. All programs that comprise the basic environmental project (PBA) were prepared according to the latest natural and social resources management techniques.

Environmental impact study and basic environmental project (PBA) of the enterprises will be supplied to entities involved in the CDM and present a detailed environmental impact assessments and mitigation measures that are being and will be adopted.

It follows a brief description of some programs to be developed in the Complexo Carreiro II Project implementation:

Cleaning of Accumulation Basin Program

The area to be flooded by the enterprises is reduced. However, the existing vegetation flooding and the water contact with possible sources of pollution can deteriorate the reservoir water quality, so there is a necessity to define a deforestation scenario with less environmental impact.

The Cleaning Basin Accumulation Program aims to present guidelines for the implementation of activities of deforestation and cleaning, in-depth way, and ensure protection of aquatic communities, providing maintenance of water quality of future reservoirs and mitigating the environmental impacts caused by removal of existing vegetation in the area to be flooded by the enterprises.

Hydrosediment Monitoring Program

Sediment flow to the river channel is basically dependent of natural processes that are often associated with human actions, and contribute for rocks dissociate, sediments formation and its consequent carry.

For that, this program aims to (i) broad and deep the knowledge of hydrosediment processes in direct and indirect influence area of the enterprise; (ii) know the dynamics of sediments inflow and their deposition; (iii) determine the sediments distribution; (iv) identify and monitor margins erosion; (v) evaluate changes both upstream and downstream; (vi) monitor the sediment volume; (vii) propose corrective and preventive actions.

Climate Monitoring Program

This program aims to monitor the microclimate in direct and indirect influence area of the dams, with the installation of an automatic weather station in direct influence area, integrating information from other meteorological stations in the region. One of his goals is to systematize, facilitate and disseminate weather information for environmental planning and management of the reservoir, forming a database with relevant meteorological parameters and time series to quantify accurately the climatic effect resulting from the venture.

Fauna Rescue and Monitoring Program

The surveys aimed at terrestrial vertebrates populations monitoring are frequently carried out quarterly, with campaigns distributed seasonally. It will be done fauna rescues during the deforestation for construction sites and reservoirs. Rescues with boats will be made just during SHPs reservoirs filling.

According to IBAMA’s recommendations, it is necessary the construction of the Screening and Rehabilitation Temporary Center (CPTR) for rescued animals. The objective of this measure is to ensure the integrity of the animal that may be rescued for later release.

Flora Rescue Program

Flora rescue program meets the environmental mitigation and compensation requirements, in order to mitigate the impacts resulting from the projects implementation, including the epiphytes rescue, seeds and seedlings collecting, and the transplanting of trees species immune to cut, as well as scientific and commercial interest species. For this, the program efforts should address the selection of a group of species capable of allowing the maintenance of local genetic diversity and the work of rescue, transplantation, collection, relocation and monitoring.

Revegetation of Surrounding Areas of the Reservoir Program

The reforestation of areas devoid of trees along the permanent preservation area (APP) is environmentally friendly for the restoration of pre-existing ecological processes, as well as being required by law as a condition for implementation of hydropower projects.

This program aims to recover and preserve the main areas acquired by the entrepreneur, which will restructure APP surrounding the future reservoir. Through planting native tree species in the region, it will ensure the fulfillment of obligatory forest replacement established by FEPAM, the recovery of local floristic diversity, restoring their interrelationship with wildlife.

Ichthyofauna Rescue and Monitoring Program

The changes arising from the operation of the projects are quite complex, because it involves interactions of the fish fauna with the water quality of reservoirs, the presence of physical barriers for movements and new environments created by dams.

Due to ichthyofauna and enterprises characteristics, Ichthyofauna Monitoring Program includes activities for evaluating the effectiveness of measures to mitigate the impacts of the operation of hydroelectric plants to the elements of this fauna.

Social Communication Program

Landscape transformations, such as the implantation of a SHP and all alterations provoked by it generate impacts, curiosities and doubts in the population of the region, both in direct and indirect entrepreneurship’s areas of influence.

In this context, the social communication performs a key role, once it attempts to minimize these feelings and involve the population with the project through the information exchange, making use of the Social Communication. This program has as target people affected by the construction, the city’s authorities, NGOs, syndicates, associations, communitarian leaderships, the press and others that manifest interest.

Infrastructure and Territory Restructuring Program

The infrastructure and territory restructuring program is justified by the necessity to meet a new reality resulting from the projects implementation. For this, it will be necessary to reorganize the affected territory and restore infrastructure and services affected, protecting the relations between the communities existing before the project, seeking to maintain already established living conditions, reconstructing the current infrastructure dynamics. In addition, the program is also justified by the need to implement improvements in local roads to meet the construction demands, not only in the current road system, but also in new segments.

Historical, Cultural and Landscape Rescue Program

The landscape heritage of a region refers both to the natural land forms, inherited from the landscape and which served as a substrate for fixing the inhabitants, and the landscape created by man constructing their houses, planting for subsistence, in the expression of their religiosity and their culture. The landscape rescue assumes to preserve relevant scenarios and property of historical and cultural value, defining the best way to save them for future generations.

Archaeological Rescue Program

The places where are found traces of material culture, results of human actions, are called archaeological sites. Consulting archaeological sites of the Institute of Historical and Artistic Heritage (IPHAN) database, it is concluded that there is record of archaeological sites in the region. More specifically in the records of the Center for Archaeological Research and Education (CEPA) at the University of Santa Cruz do Sul (UNISC), it is found the registration of two archaeological sites for the town of Serafina Corrêa; one for Nova Bassano and two for the municipality of Vista Alegre do Prata.

For the municipality of Guaporé, there are eight archaeological sites occurrences, according to the records of the Center for Archaeological Research and Education (CEPA) at the Catholic University of Rio Grande do Sul (PUCRS). Even though preliminary studies during the EIA have identified that in the SHPs area there were no indications of archaeological sites, due to the high inclination of the slopes and difficult access, but as it is an area with archaeological potential justifies the development of Archaeological Rescue Program for the area, as determined by IPHAN.

Migrant Population Support Program

During the construction of SHPs Autódromo, Boa Fé e São Paulo, there will be a natural influx of people into the region. The induced population may be grouped as migrants linked to the installation of new enterprises and migrants attracted to the region by the expectation of obtaining jobs, open your own business or to enjoy other opportunities in the municipalities affected.

The assistance to migrant population related to the construction is regulated by applicable employment laws or clauses included in contracts to be signed between the entrepreneur and companies hired. Regarding the population indirectly attracted by construction activities, actions must be guided by negotiations and agreements with local government.

Environmental Education Program

It will be performed activities along the school communities in the entrepreneurship's influence area, with focus on (i) capacitating teachers of municipal state education which act in the municipalities covered by the entrepreneurship, besides (ii) capacitating activities with the workers of hired companies and (iii) educational activities with residents surrounding the reservoir. This program must have intense integration with the programs of Social Communication, Prevention of Accidents and Public Health and Conservation and Use of the Reservoir Waters and its Surroundings.

Municipalities Support Program

The main objective of this program is to support the socioeconomic development of municipalities in the area of influence of the venture, aiming to assist the development and implantation of sustainable farming technologies and its tourism potential.

SECTION E. Stakeholders' comments

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

According to the resolution nº 7, from March 5th, 2008[31] published by Brazilian Designated National Authority and consolidated in the Handbook for Project Activities Submission under the CDM, developed by the Brazilian Designated National Authority, local stakeholders should be invited to perform comments about CDM project activities.

Thus, the following local stakeholders were invited, through letters:

City of Guaporé:

- Guaporé City Hall
- Guaporé Municipal Assembly
- Municipal Secretariat of Planning and Coordination, Department of Environment
- Rural Workers Union of Guaporé

City of Nova Bassano:

- Nova Bassano City Hall
- Nova Bassano Municipal Assembly
- Municipal Secretariat of Agriculture and Environment
- Rural Workers Union of Nova Bassano

City of Serafina Corrêa:

- Serafina Corrêa City Hall
- Serafina Corrêa Municipal Assembly
- Municipal Secretariat of Agriculture and Environment
- Rural Workers Union of Serafina Corrêa

City of Vista Alegre do Prata:

- Vista Alegre do Prata City Hall
- Vista Alegre do Prata Municipal Assembly
- Municipal Secretariat of Agriculture and Environment
- Vista Alegre do Prata Rural Workers Union

Other Stakeholders:

- State Environmental Agency (FEPAM)
- Brazilian NGO Forum (FBOMS)
- State Department of Environment (SEMA)
- State Federal Attorney of Public Interest
- Federal Attorney of Public Interest

[31] http://www.mct.gov.br/upd_blob/0023/23744.pdf

E.2. Summary of the comments received:

So far, it has not been received any comment about the project.

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

So far, it has not been received any comment about the project.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

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

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

The calculation of emission factor of CO_2, published by CIMGC, follows the latest methodological tool "Tool to calculate the emission factor for an electricity system".

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

Table 22 – Monthly Medium Operating Margin Emission Factor of the year 2009 Brazilian Interconnected System

Average Emission Factor (tCO_2/MWh) - Monthly												
2009	Month											
	January	February	March	April	May	June	July	August	September	October	November	December
	0.2813	0.2531	0.2639	0.2451	0.4051	0.3664	0.2407	0.1988	0.1622	0.1792	0.1810	0.1940

Table 23 –Medium Daily Operating Margin Emission Factor of the year 2009

Medium Emission Factor (tCO_2/MWh) – Daily												
2009	**Month**											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dez
1	0.2746	0.3036	0.2409	0.2665	0.2744	0.3277	0.3077	0.2361	0.1627	0.2058	0.2333	0.1720
2	0.2262	0.2531	0.1960	0.2705	0.4220	0.3511	0.2790	0.2619	0.1612	0.2137	0.2118	0.1784
3	0.1969	0.2507	0.1868	0.2726	0.4894	0.3029	0.2729	0.2563	0.1580	0.2157	0.1821	0.1843
4	0.2367	0.2346	0.2073	0.2003	0.4338	0.2941	0.2915	0.2373	0.1549	0.2484	0.1800	0.1815
5	0.2669	0.2401	0.2237	0.2272	0.4887	0.2856	0.3846	0.2042	0.1306	0.2017	0.1856	0.1955
6	0.2006	0.2511	0.2222	0.2023	0.4813	0.2401	0.3354	0.1960	0.1527	0.1728	0.1832	0.2208
7	0.1749	0.2596	0.2348	0.1846	0.4570	0.3098	0.3460	0.1875	0.1540	0.1240	0.2069	0.1924
8	0.1549	0.2158	0.3071	0.1639	0.4898	0.2960	0.3155	0.2124	0.1220	0.0970	0.2370	0.2014
9	0.1606	0.1996	0.2627	0.1548	0.4128	0.2975	0.3087	0.2418	0.1660	0.1123	0.1604	0.2054
10	0.1672	0.2033	0.2584	0.1586	0.4305	0.2562	0.2837	0.1859	0.1727	0.2240	0.1602	0.2023
11	0.2368	0.1980	0.2523	0.1581	0.4487	0.2466	0.2780	0.1958	0.1477	0.2503	0.1896	0.1923
12	0.2476	0.1953	0.2621	0.2023	0.4252	0.2330	0.3245	0.1498	0.1473	0.2410	0.1686	0.1844
13	0.2513	0.2106	0.2772	0.2005	0.4280	0.3392	0.2858	0.1970	0.1424	0.1735	0.1658	0.2219
14	0.2503	0.2102	0.2913	0.2015	0.4306	0.3783	0.2736	0.2195	0.1287	0.1574	0.1668	0.1875
15	0.2656	0.2072	0.3130	0.1696	0.4332	0.3602	0.2858	0.1728	0.1235	0.1673	0.1883	0.1763
16	0.2223	0.1787	0.2952	0.2275	0.3552	0.3851	0.2545	0.2075	0.1334	0.1534	0.1705	0.1760
17	0.3490	0.2139	0.3247	0.2888	0.3945	0.4041	0.2124	0.1885	0.1444	0.1821	0.2010	0.1723
18	0.4460	0.2027	0.2945	0.2905	0.4455	0.4334	0.1672	0.1743	0.1661	0.2021	0.1536	0.2045
19	0.4214	0.2093	0.2823	0.3188	0.4198	0.4287	0.1596	0.1803	0.1949	0.1700	0.1668	0.2061
20	0.4369	0.2509	0.2761	0.2648	0.4093	0.5456	0.1063	0.1631	0.2236	0.1291	0.1676	0.2289
21	0.4243	0.3033	0.3020	0.2823	0.3492	0.5636	0.1264	0.1605	0.1590	0.1796	0.1859	0.1708
22	0.4353	0.4380	0.3371	0.3089	0.3650	0.5236	0.1494	0.1708	0.1607	0.1504	0.1989	0.1644
23	0.3837	0.4572	0.2944	0.2978	0.3284	0.5156	0.1474	0.2085	0.1454	0.1545	0.1709	0.1687
24	0.3246	0.4502	0.2592	0.2873	0.3320	0.4446	0.1645	0.1775	0.1609	0.1812	0.1795	0.2097
25	0.3960	0.3402	0.2467	0.2848	0.3577	0.4312	0.2018	0.1839	0.1602	0.2004	0.1642	0.2536
26	0.3145	0.2683	0.2478	0.3208	0.3576	0.4155	0.1933	0.2100	0.1897	0.1923	0.1612	0.2324
27	0.2582	0.2149	0.2405	0.2846	0.3934	0.3240	0.1581	0.2105	0.2546	0.1975	0.1709	0.2281
28	0.2380	0.2288	0.2644	0.2944	0.3722	0.3945	0.1672	0.2083	0.2003	0.1913	0.1862	0.1847
29	0.2367		0.3023	0.2845	0.3951	0.3469	0.2174	0.1928	0.1896	0.1752	0.2056	0.1699
30	0.2622		0.2453	0.2904	0.3431	0.3294	0.2462	0.2239	0.1776	0.1671	0.1675	0.1928
31	0.2588		0.2820		0.3566		0.2463	0.1771		0.1795		0.2004

The hourly average emission factors are also available at the following link: http://www.mct.gov.br/index.php/content/view/74689.html (accessed on July 2010), the Emissions Factor Operating Margin is calculated for the Brazilian National Interconnected System every hour from the value of energy exported from each plant, the cost of generation of each plant (scheduling priority), schedules of exchanges with the neighboring subsystems and emission factors of thermal power plants.

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

The tables below present data concerning the emission factor for the build margin ($EF_{grid,\ BM,\ y}$) for 2009 used for the ex-ante estimation of emission reductions from the project.

Table 24 – Build Margin Emission Factor of the year 2009 – National Interconnected System

	Average Emission Factor (tCO_2/MWh) - Year
2009	0.0794

Source: Designated National Authority
(http://www.mct.gov.br/index.php/content/view/74689.html) (accessed on July 2010).

The emission factor for the build margin emission factor is the average number of new plants over the subsystem. This set must contain at least five plants and their capacity must be greater than 20% of installed capacity of the subsystem.

Others information about the baseline scenario and baseline emissions is presented on item B of the PDD.

Annex 4

MONITORING PLAN

Information about the monitoring plan are described in section B.7.2 of this PDD.