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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: Ferreira Gomes Hydro Power Plant CDM Project Activity.
Version: 2
Date: 06/12/2011

A.2. Description of the project activity:

The project activity consists in the construction of the **Hydropower Plant Ferreira Gomes** with final installed capacity of 252.0 MW.

The **HPP Ferreira Gomes** is located on the Araguari River, Atlantic North/Northeast basin, in the municipality of Ferreira Gomes – Amapá State, Brazil. The HPP will create a new a reservoir with 17.72 Km^2. The plant will be managed by the Ferreira Gomes Energia S/A, a special purpose society responsible for the power plant construction and operation.

The project activity main purpose is to provide electric power to the National Interconnected System - *SIN* (from portuguese – *Sistema Interconectado Nacional*), displacing the thermal generation from fossil fuels present in the system with the generation of renewable energy, especially in Amapá state where about 75% of the installed capacity comes from thermoelectric power plants[1] (data from August 2011).

Moreover, it improves the supply of electricity in the country, contributing to its environmental sustainability by increasing the share of renewable energy in relation to total consumption of electricity in Brazil. Thus, the project activity supports the construction of new renewable energy project as environmentally sustainable alternative to generate electric energy.

Considering that the project activity forecasts the construction of a reservoir (17.72 Km^2), it presents low environmental impacts when compared to other hydroelectric facilities installed near to the Amazon domain. This fact is important because the construction of Hydro Power plants with a small reservoirs contributes to the efficient use of natural resources, avoiding the growth of environmental and social liabilities caused by natural resources exploitation through low efficiency approaches, which usually cause significant impacts to the local populations (human, vegetal and animal populations) due to the flood of large areas.

In regard to the contribution of the project in mitigation of Greenhouse Gas emissions (GHG), the project activity reduces emissions of these gases avoiding thermoelectric plants operation that make use of fossil fuels as energy source. In the absence of the project activity, fossil fuels would be burned in thermoelectric plants connected to the grid to supply the electrical demand of the country. The project activity initiative helps Brazil to meet its goals of promoting sustainable development.

[1] http://www.aneel.gov.br/aplicacoes/ResumoEstadual/CapacidadeEstado.asp?cmbEstados=AP:AMAPÁ

The project activity is also aligned with the specific requirements of the CDM (Clean Development Mechanism) of the host country, because:

- It contributes to environmental sustainability as reduce the use of fossil energy (non-renewable sources). Thus the project contributes to the best use of natural resources and makes use of clean and efficient technologies;
- It enlarges the opportunity for employment in areas where the project is located;
- It contributes to better conditions of the local economy, reducing the amount of pollution released into atmosphere and the associated social costs related to it.
- It contributes to the Brazilian biodiversity conservation through the investment on the Conservation Units (protected areas) required by the mechanisms described on the federal law number 9.980/2000 that created the Conservation Units National System - *SNUC* (from Portuguese *Sistema Nacional de Unidades de Conservação*).

Moreover, the project diversifies the sources of generation of electricity and decentralized energy generation from bringing specific benefits such as:

- Increased reliability, with shorter and less extensive interruptions;
- Fewer demands related to reserve margin;
- Energy of better quality for the region;
- Minor losses in transmission and distribution lines;
- Control energy reactive;
- Mitigation of congestion in transmission and distribution.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project Participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
Brazil (Host Country)	**Ferreira Gomes Energia S/A (private entity)**	**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.		

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.:

North Region – State of Amapá (AP)

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

Municipality of Ferreira Gomes.

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

The hydroelectric plant Ferreira Gomes is located on the Araguari river, at the geographical coordinates 00°51'20.126" N and 51°11'41.071" W (or N 94569.409559; E 478332.377099 in the UTM projection), in the city of Ferreira Gomes, State of Amapá, North region, Brazil.

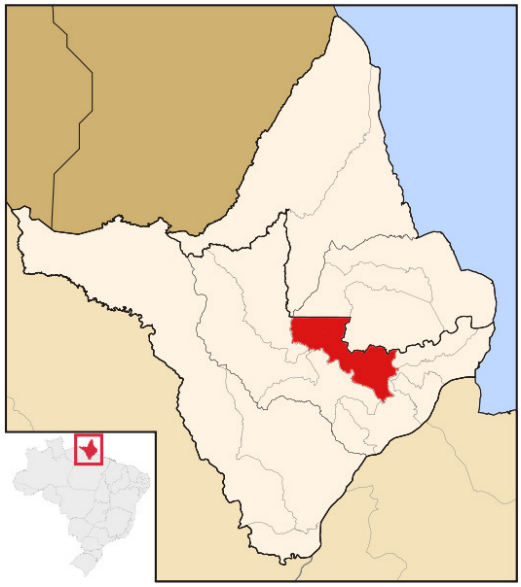

Figure 1: Localization of Ferreira Gomes municipality in Amapá state.

A.4.2. Category of project activity:

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

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

(a) The scenario existing prior to the start of the implementation of the project activity:
Prior to implementation of the proposed project, the electricity was generated by the operational power plant matrix that has a strong participation of fossil fuel power plants. Considering the plants linked to

the national grid, the electrical generation using fossil fuel represents about 17.5%[2] of the national generation and about 74%[3] of Amapá state generation (according data from August 2011). The project activity reduces GHG emissions avoiding the operation entrance of thermoelectric power plants connected to the grid, that use fossil fuel as energy source. In absence of the project activity, those plants would operate in order to supply the electrical demand of the country. Part of this demand, by now supplied by thermoelectric power plants, will start being supplied by the project activity power plant.

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

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

The Hydropower plant Ferreira Gomes will dispatch generated energy to the National Interconnected Grid – SIN (from Portuguese *Sistema Interligado Nacional*) through its lift substation (13.8/138 kV) located close to the machine house of the plant at the coordinates 00º51'06" N and 51º12'00" W.

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

(c) The baseline scenario:

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

The technical characteristics of equipment that will be implemented in the HPP can be seen in table 1:

Table 1: Technical characteristics of main equipment installed at Hydroelectric Plant Ferreira Gomes.

Generator	Characteristics	Source
Type	Synchronous	Supply contract
Quantity	3	Supply contract
Power (kW)	84,000	Supply contract
Nominal Power (kVA)	93,333	Supply contract

[2] http://www.aneel.gov.br/aplicacoes/capacidadebrasil/Combustivel.asp

[3] http://www.aneel.gov.br/aplicacoes/ResumoEstadual/GeracaoTipoFase.asp?tipo=2&fase=3&UF=AP:AMAPÁ

Voltage (kV)	13.8	Supply contract
Frequency (Hz)	60	Supply contract
Turbines	**Characteristics**	**Source**
Type	Kaplan	Supply contract
Quantity	3	Supply contract
Power (kW)	86,000	Supply contract
Nominal Flow (m^3/s)	590.5	Supply contract
Other Information	**Characteristics**	**Source**
Reservoir Area (Km^2)	17.72	ANEEL Dispatch Nº 1.501, dated 27 May 2010.
Power Density (W / m^2)	14.2	Based on ACM0002 – v.12.2.0
Plant Load Factor	0.59	ANEEL data base

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

Table 2 : Estimative ex-ante of emission reductions of CO_2e:

Years	Annual Estimation of Emission Reductions in tonnes of CO_2e
2015	375,706
2016	407,225
2017	407,225
2018	407,225
2019	407,225
2020	407,225
2021	407,225
Total estimated reductions (tonnes of CO_2e)	**2,819,056**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions tonnes of CO_2e)	**402,722**

A.4.5. Public funding of the project activity:

There is no public funding provided by international organizations for the performance of the project works so the carbon credits revenue are the option chosen.

SECTION B. Application of a baseline and monitoring methodology

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

The project uses the methodology: ACM0002 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.2.0).

The ACM0002 also refers to the following tools:

- Tool to calculate the emission factor for an electricity system (version 02.2.1);
- Tool for the demonstration and assessment of additionality (version 06.0.0);

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

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

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

• The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.

In this project activity, it results in a new single reservoir and its power density, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.

The hydro power plant Ferreira Gomes is considered electric generation by renewable source with new reservoir, which have power density of 14.2 W/m^2.

Also, the installed capacity of the plant is 252 MW, greater than 15 MW (as can be verified in table 1), thus the project activity is included in the large scale project category considering the CDM standards.

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

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

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	Considering that the Power Density of the Hydropower Plant Ferreira Gomes is 14.2 W/m^2, so greater than 10 W/m^2, emissions from the reservoir are considered null.
		N_2O	No	Minor emission source.

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

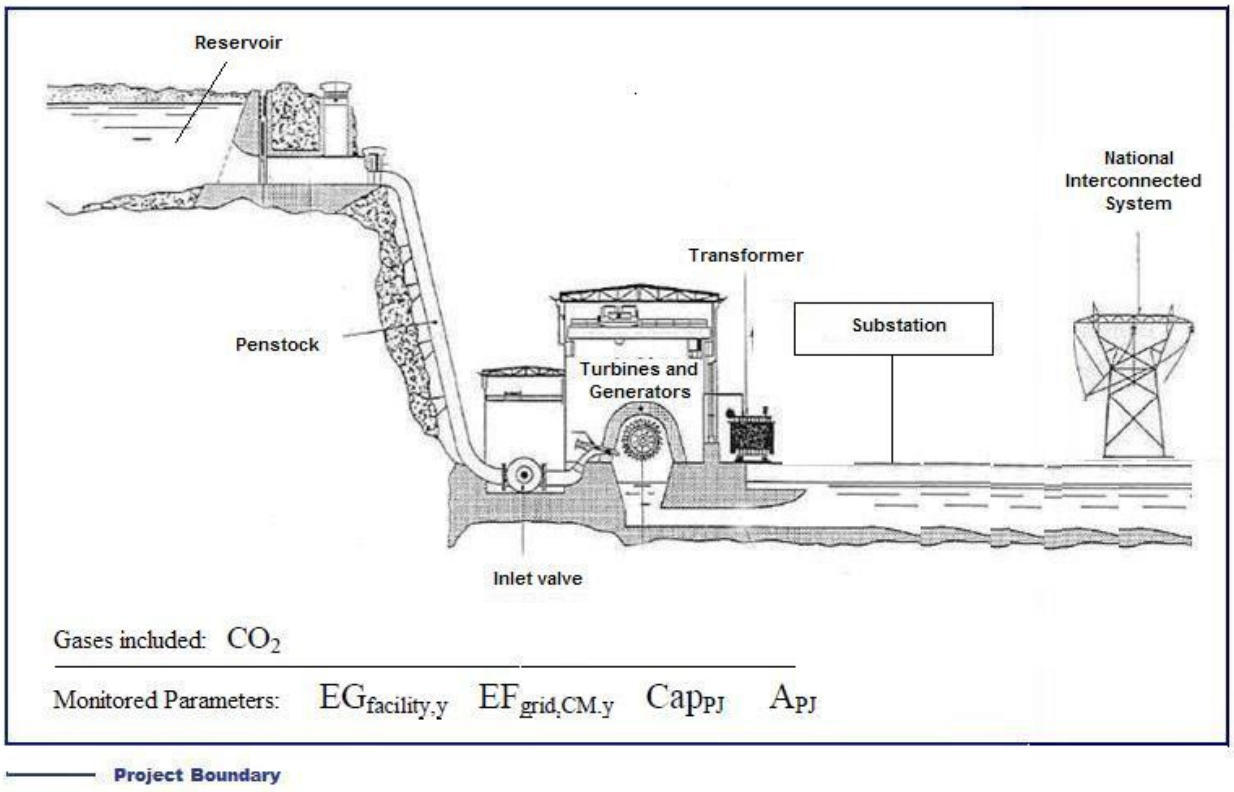

Figure 2: Diagram about project activity boundaries, monitored parameters and included gases.

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

According to the Version 12.2.0 of CDM methodology ACM0002, "*if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*"

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

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

The generation electricity potential of project activity plants shall provide the necessary data to estimate the GHG baseline emissions in kWh.

In the project activity absence (baseline scenario), the electricity would continue to be provided by other grid-connected power plants, included fossil fuel based power plants (more details about the Brazilian National Interconnected Grid in section B.6.1).

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

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

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

Further details of the development of the project baseline can be viewed through the link: http://www.mct.gov.br/index.php/content/view/307492.html

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

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

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

The realistic alternatives to the project activity are:

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

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

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

The implantation of hydroelectric plant Ferreira Gomes is in compliance with all regulations according to the following entities: National Grid System Operator – *ONS*, Electricity Regulatory Agency – *ANEEL* (from Portuguese *Agência Nacional de Energia Elétrica*), Environmental Secretary of Amapá state - *SEMA*, and CDM Executive Board. Their main functions into the national electric system are:
ONS – Operates the national system, regulating the generation activities of each agent according the demand of the country.
ANEEL – Recognizes and controls all agents (generator and consumers) linked to the national electric system policing the compliance of the parameters imposed by Brazilian Government to the energy sector players.
SEMA – Analyses the environmental aspects of enterprises to be installed in Amapá state and issues the licenses (prior, installation and operation licenses) to allow their implementation after all the constraints have been met.

Step 2: Investment Analysis

The investment analysis shall be performed in order to determine whether the proposed project activity is not:

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

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

Sub-step 2a: Determine appropriate analysis method

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

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

According to the Tool, if the CDM project activity and the alternatives identified in Step 1 generate financial or economic benefits other than CDM related income, then the investment comparison analysis (Option II) or the benchmark analysis (Option III) shall be used. The benchmark analysis will be applied,

because it is most appropriated for this type of activity in Brazil. Moreover, the Option II shall be applied when there are credible alternative scenarios to the project activity, as there are no alternative to compare with the project's indicator (Internal Rate of Return) the Option III shall be applied.

Therefore, the III option was chosen.

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

The suitable financial indicator chosen for the proposed CDM project activity is the project's Internal Rate of Return (IRR), where such data is considered adequate for this kind of Project as well decision context. The financial indicator most appropriate for this type of project is the Internal Rate of Return (Project's IRR), because it is the compound rate of return annualized effective that can be obtained on invested capital.

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

The benchmark analysis is performed comparing the project's IRR with a benchmark. The established benchmark for this comparison is the Cost of Equity (K_e), extracted from the Weighted Average Costs of Capital (WACC) calculation, in line with the accountable rules generally accepted. The details are described below:

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

K_e – Cost of Equity

The Weighted Average Costs of Capital considers the costs of equity and the costs of third parties capital that any company or sector have.

The sum of return rates required by the creditors (shareholders or third parties) weighted by the participation of each financial agent over the total debt, results the weighted average cost of capital of the companies (WACC). This cost shall be overcome by the project`s return in order to allow the company to honor their commitments and to invest in its growth.

The cost of equity was calculated as the sum of a tax free of risk (US Bonds) plus a Brazilian risk premium plus a global risk premium to the equity investment. This methodology of calculation follows the recommendations to the calculation of the equity presented in the "Guidelines on the assessment of financial analysis" published in 62 meeting of the CDM Executive Board (Annex 5).

Cost of Equity calculation

The cost of equity was calculated as follows:

$K_e = GB + PE_g$

Where:

K_e = Cost of equity;
GB = Tax Free of Risk (Rf) + Host country risk premium (ERP)
PE_g = Global Equity risk premium

GB = 5.03% + 5.20% = 10.23%

Rf = Average of return rates of American Bond (T-Bond) corresponding to years 2000 to 2009;
ERP (EMBI+ $_{2000\ -\ 2009}$) = Average of Brazilian Risk Premium, based on data from JP Morgan corresponding to years 2000 to 2009;
PE_g = Global Equit Risk Premium provided by Aswath Damodaran[4].

Therefore:

K_e = 10.23% + 5.775% = 16.00%

Considering the exclusion of the inflation rate 4.03%, the Ferreira Gomes Energia S.A cost of equity is 11.96%[5].

Below, the table 3 summarizes the reference values to the project activity IRR and the equity value used as benchmark.

Table 3: Comparative table between project activity IRR and the project benchmark

Benchmark Cost of Equity (%)	**IRR FerreiraGomes (%)**
11.96	6.27

The cash-flow was elaborated for the concession period of project activity (35 years), getting an Internal Return Rate (IRR) equal 6.27%, without revenues of the Certified Emissions Reductions (CERs).

As the cash flow of project activity is considered confidential information, this will be integrally presented to the validation entities in a separated worksheet. In the worksheet are also identified all the reference sources to the applied values.

The cash flow has as main input values the following:

Table 4: Main Inputs Values of cash flow.

Parameter	**HPP Ferreira Gomes**
Investment - Equity (R$)[6]	390,202,986.00
Net Power (MW)	150.2
Energy Assured (MWh/h) (70%)	69.78
Energy Price (R$/MWh) – Free Market (30%)	132.00
Operation and Maintenance (R$/MWh)	3.44

[4] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

[5] Please, check the worksheet "WACC CHE FGV" provided to more details about the calculation performed

[6] Correspondent to 48.15% of the total investment value of R$810,713,000.00, which is the equity parcel of the investment.

The project's IRRs have stayed below of the project proponent`s equity value. The analysis shows that the project is destroying capital of the investor considering the parameters that compose the calculation of Ferreira Gome's equity, facing therefore investment barriers because there are other more attractive alternatives.

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

To better understand the investment barrier was also performed a **sensitivity analysis** in which were varied the following parameters: (1) Energy Price, (2) Investment, (3) Net Power (Plant Load Factor) and (4) Operation and Maintenance costs, in order to check the financial impact of these on the project.

A **Breakeven Point Analysis** was performed in order to discuss the likelihood of occurrence of these scenarios.

The table 5 presents the main results of the analysis.

Table 5: HPP Ferreira Gomes sensitivity analysis.

Parameter	Original Value	Breakeven point	% of deviation
Investment - Equity (R$)	390,202,986.00	247,115,551.03	- 36.67%
Net Power (MW)	150.2	230.93	53.75%
Energy Price (R$/MWh) – ACR (70%)	69.78	Fixed Parameter	-
Energy Price (R$/MWh) – Free Market (30%)	132.00	256.21	94.10%
Operation and Maintenance (R$/MWh)	3.44	Not sensible enough to reach the benchmark	- 100%

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

Likelihood of occurrence of scenarios of the breakeven point

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

Investment (R$)

Regarding the total investment costs, the input values come from the *Quadro de Usos e Fontes – QUF* (Uses and Sources Table in free translation), that can be cross checked with the Relevant Announcement nº 1 of ANEEL, issued on 07 July 2010, corresponding to the auction 03/2010. Although the value

estimated by ANEEL (R$810,713,000.00), the real value of investment to the venture implementation is higher, reaching the sum of R$898,000,000.00 as can be verified in the protocol of the information memorandum sent to the financial agent on 4 August 2011. Thus, it is not possible to the investment value be lower than the value used in the IRR worksheet.

Also, in this memorandum is possible to verify that 51.87% of the sum to be invested is requested to the financial agent.

Keeping the equity/debt financing proportion (51.87% coming from loan and 48.13% coming from equity)[7] the analysis shows that to reach the benchmark, the investment values should had been 36.67% lower than the previously forecasted. Its breakeven point is R$247,115,551.03. Fluctuations of this amplitude are not possible to occur, even because, as above spoken, the investment value will be about 10.8% higher than the initially forecasted.

Thus, the input values are adequate as well conservative.

Net Power or Plant Load Factor

The Net Power is considered adequate because the data comes from the Information Bank of Generation of ANEEL[8] – the Brazilian regulatory agency for the electric sector.

The ANEEL has a body of technical project reviewers who properly analyses generation projects in different sectors in Brazil. The main technical issues that influence the value of Net Power and consequently the Plant Load Factor are the historical series of hydrological data of a river, climate conditions, topography, flow regularity, among others. The ANEEL's technical body is capable to analyze those conditions and issue the plant load factor for the Brazilian HPP projects.

Is unlikely to occur an increase above the factor showed in the table 1 (0.59), due to be in accordance with historical inflow series including critical periods in hydrological terms.

To led the IRR of project activity to reach the applied benchmark, the net power of HPP Ferreira Gomes should be 230.93 MW (53.75% greater than the established by ANEEL, considering all the studies above mentioned) with its plant load factor assuming the value of 0.91. So, it is unlikely to occur.

Energy Price (R$/MWh)

The values used to determine the energy volumes to be traded by the project activity both in the Regulated Hiring Environment (*ACR* from the portuguese - *Ambiente de Contratação Regulada*) and in the Free Market, come from the ANEEL auction which granted the exploitation rights of hydro potential Ferreira Gomes (auction 03/2010). At this announcement is stated that 70% of the energy must be traded in *ACR*, while other 30% can be traded in Free Market. In the auction results report issued by ANEEL on 09/2010, is possible to verify that the value of the energy to sales in *ACR*, offered by Alupar

[7] This financing proportion assumed by the company is close to the default value suggested by version 5 of the "Guidelines on the assessment of investment analysis" to the cases where there are no debt/equity finance structure available (standard value of debt 50% and 50% equity financing). Therefore, it is ratified by the CDM Guidance.

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

Investimentos S.A., owner of SPE Ferreira Gomes Energia S.A., is R$69.78/MWh. Therefore, this value represents the price of 70% of the energy to be traded by Ferreira Gomes Energia S.A. The other 30% will be traded in the Free Market, through bilateral agreements, for about R$132.00/MWh. This value comes from projections commissioned by project participants for the Brazilian energy market specialized consultancy - PSR[9], and reflects the scenario when the project activity starts generating (December 2014).

Regulated Hiring Environment - *ACR*

In *ACR*, the energy distribution companies buys energy through auctions regulated by ANEEL and operated by CCEE (in order to deliver the energy to their captive consumers).

The energy price is defined by these auctions (as above explained), and is fixed to the operational time life of the plant. The energy price adjustments are made only to absorb the inflation effects, being corrected according the National Index of Prices to Consumer - IPCA[10] (from the Portuguese *Índice Nacional de Preços ao Consumidor Amplo*).

So, it is not possible to occur variations on energy price traded in ACR.

Energy Free Market

In the Free Hiring Environment, the electrical energy is traded between generation utilities, independent producers, self-producers, trading agents, energy import agents and free consumers.

The variations applied to this parameter have found a breakeven point 94.10% greater than the energy price used by the project (R$132.00/MWh) on its financial worksheet. So, the energy should be traded in the free market for R$256.21/MWh to lead the IRR of project activity to reach the benchmark.

As can be checked in the PSR`s projection, there`s no possibility of variation with the amplitude defined by the sensibility analysis. Also a article[11] published on 11 January 2011 by Brazilian Association of Big Industrial Consumers and Free Consumers of Energy – ABRACE (from Portuguese *Associação Brasileira de Grandes Consumidores Industriais de Energia e de Consumidores Livres*), talks about a announcement promoted by Energia Sustentável do Brasil – ESBR (which keeps the rights to exploit the HPP Jirau), to sell part of its future generation, when none proposals were raised due to the high prices proposed, which ranged from R$130.00 to R$140.00/MWh. So, if the market considers R$130.00/MWh too much expensive, the value of R$256.21/MWh is not possible to be practiced.

Considering the information above provided, the energy price used is suitable and conservative.

Operational Costs - O&M

[9] http://www.psr-inc.com.br/portal/psr/

[10] http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/032010-ANEXO%202%20-%20Minuta_CCEAR_Leilao_A-5_2010_Hidro_posAP.pdf

[11] http://www.abrace.org.br/port/noticias/ler.asp?id=19198

As demonstrated in the table 5, this parameter (which comprehends the sum of employees` salaries and maintenance costs) is not sensible to the analysis. Even reducing the parameter to zero, the IRR of project activity (6.91%) would not reach the benchmark.

Facing the variations above described, it is possible to verify that for all analyzed parameters the breakeven point overcome the variation margin of 10% determined by CDM as sensitivity indicator. Therefore, fluctuations of this amplitude would not lead the IRR of project activity to reach or overcome the considered benchmark.

The project activity has taken in consideration the revenues of CERs sales for the implantation. These financial benefits generated in strong currency (euro or dollar) bring to the project a better security against monetary depreciations.

Facing the explanations, information and evidences provided by the PP, the IRR of the project activity is below than the established benchmark, evidencing that project activity is destroying capital, not being therefore the most financially attractive investment option without the CERs revenues. The CDM benefits were the key point to go ahead and to implement the project activity, improving its financial attractiveness.

Therefore, the project activity is financially additional.

Step 3: Barrier analysis

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

Step 4: Common practice analysis

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

This analysis is based in the version 01.0 of "Guidelines on Common Practice", and has the purpose of complement the investment analysis, discussing the existing common practice of the sector and region relevant to project activity. The following stepwise approach clearly demonstrates the project activity do not represent common practice.

The list of hydropower plants operating in the country is made available by ANEEL[12].

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

The projects to be considered in the analyses must be into the range of installed power which goes from 126 MW (50% below the HPP Ferreira Gomes) to 378 MW (50% above of HPP Ferreira Gomes installed capacity which is 252 MW).

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

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

In a conservative approach was considered the entire host country as the applicable geographical area.

The plants identified in Step 1 are presented below[13]:

Table 6: Operational plants that are within of the applicable capacity range of project activity.

Candonga (currently called Risoleta Neves)
Ponte de Pedra
Aimorés
Capim Branco I (Amador Aguiar I)
Corumbá IV
Capim Branco II (Amador Aguiar II)
São Salvador
Salto Pilão
Serra do Facão

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

In Brazil all hydropower plants implanted in the installed capacity range above, must pass by a grant process which finishes with the concession issuance to the companies responsible for their implementation (auction winner). In this analyses, the issuance of these concessions was took as reference date to define the investment decisions regarding to those the plants, since this decisions were compulsorily took at or before their concessions issuance.

Defined the concession issuance is the reference date to investment decision, the investment climate installed into the country during the investment decision of the plants will be discussed.

Below is presented a summary of Brazilian Electric Sector history where is possible to identify clear differences between the former energy market models and the current model. The information presented came from Electric Power Commercialization Chamber – CCEE (created by law Nº 10,848 of 15 March 2004 to operate in the new market model), which is the organ responsible to carry out the wholesale

[13] Were considered the HPP which became operational from July 2004 to November 2010. The approach will be explained on step 3.

transactions and commercialization of electric power within the National Interconnected System, for both Regulated and Free Contracting Environments and for the spot market. In addition, CCEE is in charge of financial settlement for the spot market transactions[14].

History of the Brazilian Electric Sector

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

During the years 2003 and 2004 the Federal Government has issued the foundations for a new model of Brazilian Electric Sector, supported by Laws Nº 10,847[15] (which creates the Energetic Research Company - EPE that is responsible for the long term planning of the electrical sector), and Nº 10,848[16] of 15 March 2004 (which establishes the ways of energy commercialization in free or regulated ambiences, among other issues), and the Decree Nº 5,163, of 30 July 2004[17] (that rules the energy commercialization and concession procedures to the electricity generation).

The table 7 shows the summary of the main changes between the pre-existing models and the current model, which changed the activities of some agents of the sector.

Table 7: Summary of the several changes in the Brazilian Electric Sector.

Former Model (until 1995)	Free Market Model (1995 to 2003)	New Model (2004)
Financing using public funds	Financing using public and private funds	Financing using private and public funds
Verticalized Companies	Companies classified by activity: generation, transmission, distribution and commercialization	Companies classified by activity: generation, transmission, distribution, commercialization, imports and exports.
Predominantly State-controlled companies	Opening up of the market and emphasis on the privatization of the Companies.	Coexistence between State-controlled and Private Companies.
Monopolies – No competition	Competition in generation and commercialization.	Competition in generation and commercialization.
Captive Consumers	Both Free and Captive Consumers	Both Free and Captive Consumers
Tariffs regulated throughout	Prices are freely negotiated for the	In a free environment: Prices are

[14] http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=92f6a5c1de88a010VgnVCM100000aa01a8c0RCRD

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

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

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

Former Model (until 1995)	Free Market Model (1995 to 2003)	New Model (2004)
all sectors	generation and commercialization.	freely negotiated for the generation and commercialization. In a regulated environment: auctions and bids for the least tariffs.
Regulated Market	Free Market	Coexistence between Free and Regulated Markets.
Determinative Planning – Coordinator Group for the Planning of Eclectic Systems (GCPS)	Indicative Planning accomplished by the National Council for Energy Policy (CNPE)	Planning accomplished by the Energy Research Company (EPE)

Source: Electric Power Commercialization Chamber - CCEE[18]

As can be seen in the table 6, the current energy sector´s model was implemented in 2004, having as legal milestone the Decree number 5,163 issued on 30 July 2004. Before the issuance of this Decree, the investment environment was different from the current, so no similar to the existing on the date when the investment decision on project activity was took.

The analyses of common practice here performed considers different from project activity all hydropower plants that became operational between July 2004 (when the currently established model of energy market became operational in Brazil) and November 2010 (starting date of project activity), but had their exploit concession issued before the new model of energy market implementation.

All 8 the plants listed in table 6 had their concessions issued before July 2004[19].

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

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

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

$$F=1-28/28$$

$$F=0$$

[18] Electrical Power Commercialization Chamber - *CCEE* (form Portuguese *Câmara de Comercialização de Energia Elétrica*), changes occurred in Brazilian electric system: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=3df6a5c1de88a010VgnVCM100000aa01a8c0RCRD

[19] For details see the worksheet provided "Common Practice_v.2".

$$N_{all} - N_{diff} = 28 - 28 = 0$$

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

Table 8: Timeline of HPP Ferreira Gomes implantation events.

Data	Event	Evidence
09/4/2010	Prior License Issuance	LP 0040/2010
30/07/2010	ANEEL auction 03/2010	Process nº. 48500.000883/2010-23
28/09/2010	Issuance of installation license to site building and borrowed areas	LI 0267/2010
09/11/2010	Signature of Concession Contract for the power plant construction and operation – starting date.	48500.005179/2010-67
15/12/2010	Issuance of installation license to land cofferdam	LI 0278/2010
18/4/2011	CDM Prior Consideration	http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html?s=20
05/05/2011	Signature of equipment supply contract	Contract with Voith Hydro da Amazônia
10/06/2011	Issuance of installation license for the power plant construction	LI 056/2011
30/12/2014	Forecasted Start of commercial operations of generating unit 01.	Concession Contract MME Nº 02/2010
28/02/2015	Forecasted Start of commercial operations of generating unit 02.	Concession Contract MME Nº 02/2010
30/04/2015	Forecasted Start of commercial operations of generating unit 03.	Concession Contract MME Nº 02/2010

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

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

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

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

According to the methodology ACM0002 version 12.2.0, for hydro power project activities that result in new reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, estimated as follows:

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

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

Where;
$PE_{HP,y}$ Emission from water reservoir as tCO_2e/year;
EF_{Res} is the default emission factor for emissions from reservoirs.
TEG_y Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

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

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

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

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

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

To the project activity power plant, $PD = \frac{252{,}000{,}000 - 0}{17{,}720{,}000 - 0} = 14.22$ W/m^2

The power density of the HPP Ferreira Gomes are greater than 10 W/m^2, then its GHG emissions are considered null.

Baseline Emissions *(BE_y)*

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

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

Where:
BE_y Baseline emissions in year y (tCO_2e/year);
$EG_{PJ,y}$ 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/year);
$EF_{grid,CM,y}$ 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).

Calculation of $EG_{PJ,y}$

The project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant were operated prior to the implementation of the project activity, thus classified as a Greenfield renewable energy power plants, then:

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

Where:

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

$$EG_{PJ,y} = EG_{Ferreira\ Gomes}$$

$$EG_{PJ,y} = 1{,}315{,}752 \text{ MWh/year}$$

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

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero.
Source of data used:	Project site.
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determine the installed capacity based on recognized standards.
Any comment:	-

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

Fixed parameter:

Data / Parameter:	EF_{res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emission from reservoirs.
Source of data to be used:	Decision by EB 23.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	90
Description of measurement methods and procedures to be applied:	Standard value.
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	-
Any comment:	Applicable to calculate project emissions if the power density of project activity become greater than 4 W/m^2 and less than or equal to 10 W/m^2. Therefore, it is not applicable to HPP Ferreira Gomes while its PD is kept 14.2 W/m^2 and only will start being monitored if the PD becomes smaller than 10 W/m^2.

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

The baseline methodology considers the determination of emission factor of the grid which the project activity is connected to as the core data to be determined in the baseline scenario. In Brazil, the grid is interconnected by the National Interconnected System (SIN) in a single system[20].

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

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

STEP 1. Identify the relevant electricity system.

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

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

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

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

The method adopted to calculate the operating margin is "Dispatch data analysis OM". The calculation of $EF_{EL,DD,h}$ is performed by the Brazilian DNA and made publicly available.

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

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

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

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

For effect of a good ex-ante estimation of operating margin emission factor ($EF_{grid,OM-DD,y}$) value, was calculated the arithmetic average of the emission factors of operating margin correspondent to 2010 year, published by the DNA (latest data available to a whole year)[21].

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

Table 9: Emission Factor of Operating Margin for year 2010.

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

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

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

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

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

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

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

For the build margin emission factor $EF_{grid,BM,y}$ also will be adopted the 2010 year values published by the DNA (latest data available)[22].

Table 10: Emission Factor of Build Margin for year 2010.

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

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

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

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

To the calculation of combined margin emission factor (combination of operation and build margins) is used a weighted-average formula, considering both w_{OM} and w_{BM} = 0.5. As a conservative approach, is

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

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

presented below the emission factor calculated using four decimal places, rounded down. Thus, the result is:

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

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

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

$$BE_y = 0.3095 * 1{,}315{,}752 = 407{,}225 \text{ tCO}_2\text{/year}$$

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

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

Where:
ER_y = Emission reduction in year y (tCO_2e/year);
BE_y = Baseline emissions in year y (tCO_2e /year);
PE_y = Project emission in year y (tCO_2e/year)

Considering the value for the emissions of the reservoir from HPP Ferreira Gomes is zero, the project activity emission reductions are calculated as following:

$$ER = 407{,}225 - 0 = 407{,}225 \text{ (tCO}_2\text{e/year)}$$

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

Table 11: Ex-ante estimative on emission reduction.

Year	EGy (MWh)	PEy (tCO_2)	BE (tCO_2)	CERs
2015	1,213,917	0	375,706	375,706
2016	1,315,752	0	407,225	407,225
2017	1,315,752	0	407,225	407,225
2018	1,315,752	0	407,225	407,225
2019	1,315,752	0	407,225	407,225
2020	1,315,752	0	407,225	407,225
2021	1,315,752	0	407,225	407,225
Total	**9,108,429**	**0**	**2,819,056**	**2,819,056**
Annual Average	**1,292,997**	**0**	**402,722**	**402,722**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{Ferreira\ Gomes,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project activity to the grid, in year y, recorded by five meters.
Source of data to be used:	Project proponents – Eletricity meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,315,752
Description of measurement methods and procedures to be applied:	The net electricity delivered to the grid will be checked through the electricity unidirectional meters. The meters must comply with national standards stated by ONS module 12.2 (which can be viewed through the link http://www.ons.org.br/procedimentos/modulo_12.aspx), and industry regulation to ensure the accuracy (class 0.2). For safety, the meter will be sealed after calibration.
Monitoring frequency:	Continuously measurement and monthly recording.
QA/QC procedures to be applied:	These data will be used to calculate the emission reductions. The data will be archived monthly (electronic) and kept archived during the credit period and two years after. The data from the energy meters will be cross checked with the CCEE databank in order to verify the coherency of the data.
Any comment:	$EG_{facilities,y} = EG_{PJ,y}$

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2e/MWh
Description:	Combined Margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data to be used:	Based on data provided by DNA (Designated National Authority).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.3095
Description of measurement methods and procedures to be applied:	The Combined Margin is calculated through a weighted-average formula, considering the $EF_{grid,OM-DD,y}$ and the $EF_{grid,BM,y}$ and the weights w_{OM} and w_{BM} default 0.5.
Monitoring frequency:	Annual.

QA/QC procedures to be applied:	Continuous measurement and annual update to recalculate ex-post project emission reductions.
Any comment:	To ex-ante estimative of emission reductions, was used the value of 2010 year, the latest data available. Source: http://www.mct.gov.br/index.php/content/view/74689.html

Data / Parameter:	$EF_{grid,OM-DD,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Operating Margin emission factor of the grid, in a year y
Source of data to be used:	Data provided by DNA (Designated National Authority) to the year y.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.4787
Description of measurement methods and procedures to be applied:	According procedures established by "Tool to calculate the emission factor for an electricity system".
Monitoring frequency:	Monthly.
QA/QC procedures to be applied:	Monthly monitoring and annual update to recalculate ex-post project emission reductions.
Any comment:	To ex-ante estimative of emission reductions, was used the value of 2010 year, the latest data available. Source: http://www.mct.gov.br/index.php/content/view/74689.html

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Build Margin emission factor of the grid, in a year *y*
Source of data to be used:	Data provided by DNA (Designated National Authority) to the year *y*.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.1404
Description of measurement methods and procedures to be applied:	According procedures established by "Tool to calculate the emission factor for an electricity system".
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	Continuous measurement and annual update to recalculate ex-post project emission reductions.
Any comment:	To ex-ante estimative of emission reductions, was used the value of 2010 year, the latest data available.

	Source: http://www.mct.gov.br/index.php/content/view/74689.html

Data / Parameter:	$Cap_{PJ\ –\ Ferreira\ Gomes}$
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	ANEEL Dispatch 1,501 issued on 27 May 2010.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	252,000,000
Description of measurement methods and procedures to be applied:	Technical specifications on the installed equipments.
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	Determined based on recognized standards. This data will be applied for the Power Density calculation
Any comment:	-

Data / Parameter:	$A_{PJ\ –\ Ferreira\ Gomes}$
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the water surface, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	ANEEL Dispatch 1,501 issued on 27 May 2010.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	17,720,000
Description of measurement methods and procedures to be applied:	Measured from topographical surveys or satellite pictures.
Monitoring frequency:	Annual.
QA/QC procedures to be applied:	The preventive erosion environmental measures and the permanent preservation area (APP) recovering program will allow to monitor the slopes` and the reservoirs` margins stability, providing additional data about the reservoir area.
Any comment:	This data is applied for the Power Density calculation.

B.7.2. Description of the monitoring plan:

The monitoring plan for the project activity is based on the CDM methodology ACM0002 - "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*", version 12.2.0, and consists of the monitoring of the electricity generation from the proposed project activity, the surface area of the reservoirs at their full levels, their CO_2 emissions, the installed capacities of the plants and CO_2 emission factors of Brazilian grid.

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

General characteristics of the measurement system:

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

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

As stated by the sub-module 12.1 of Grid Procedures[23], the *SMF* is a system composed of main and back-up meters, instrument transformers, communication channels between the agents and CCEE and data collecting systems to billing measures.

"The data stored in the meters are collected by the Energy Data Collecting System – *SCDE* (from Portuguese *Sistema de Coleta de Dados de Energia Elétrica*) of the *CCEE*, remotely and automatically, through direct access to the agent meters or intermediated for the agent through its Meter Collecting Unit – UCM." After collected by *SCDE* of *CCEE*, the generating data are forward to *ONS* as stated by sub-module 12.4 of *ONS* Grid Procedures [24].

The measurement system records the energy generation. In this project activity there are five meters to register the generation data, all of them monitored by CCEE and ONS (figure 3). Three meters are responsible for register the gross generation (one meter for each generation unit), other two (a main and a back up meter) will measure the net generation. The three meters to gross energy measurement will be installed in panels located in power house of the plant. The meters to liquid generation measurement will be installed at the connection point of project activity to the grid, located on Macapá Substation (230 kV), 85 Km far from de plant (this connection belongs to the project activity scope). These two meters will allow PPs, CCEE and ONS to check the energy generated and effectively inputted into the grid by the project activity, considering the transmission loses. Therefore, the two meters installed in the Macapá substation will record the information to be used to calculate the emission reductions of project activity. For this data measurement and record system is guaranteed inviolability. After the calibration, it is sealed for safety. The figure 4 illustrates the localization of Macapá substation which will be connected to the

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

[24] http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.4_Rev_1.1.pdf

Tucuruí – Manaus transmission line (500 kV) through a transmission line (230 kV) with length of 339 Km, which passes by the substations of Laranjal and Jurupari (this connection doesn´t belong to the project activity scope and has been done by other companies with forecasted schedule to be ready in 2013).

Besides electricity measurements performed by PPs, all energy generated by the project activity will be monitored online by CCEE. The measurement system contains a remote communication system to send the dispatched electricity data to the CCEE.

CCEE is responsible for monthly readings and keeping the records of the energy dispatched. If any problem happens at the local meter level, the reading lecture corresponding to the amount of energy generated during the time of the problem will not be lost because of the online readings performed by CCEE.

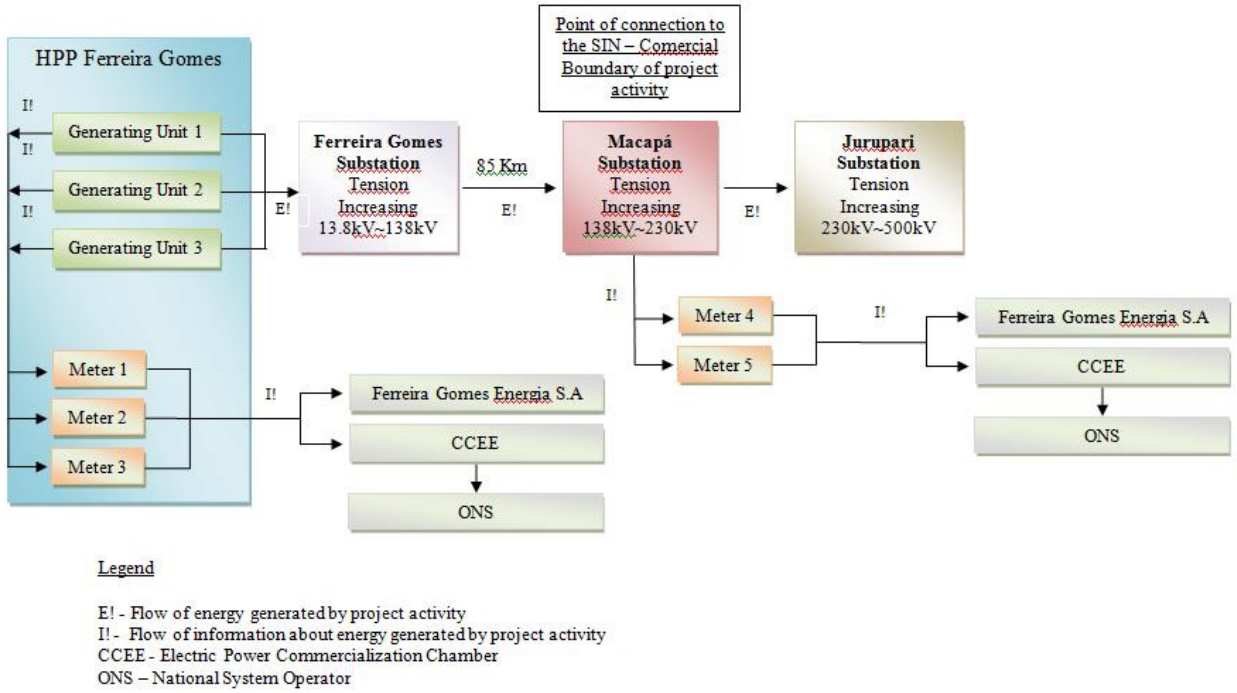

Figure 3: Energy and information (about generation) flows of project activity.

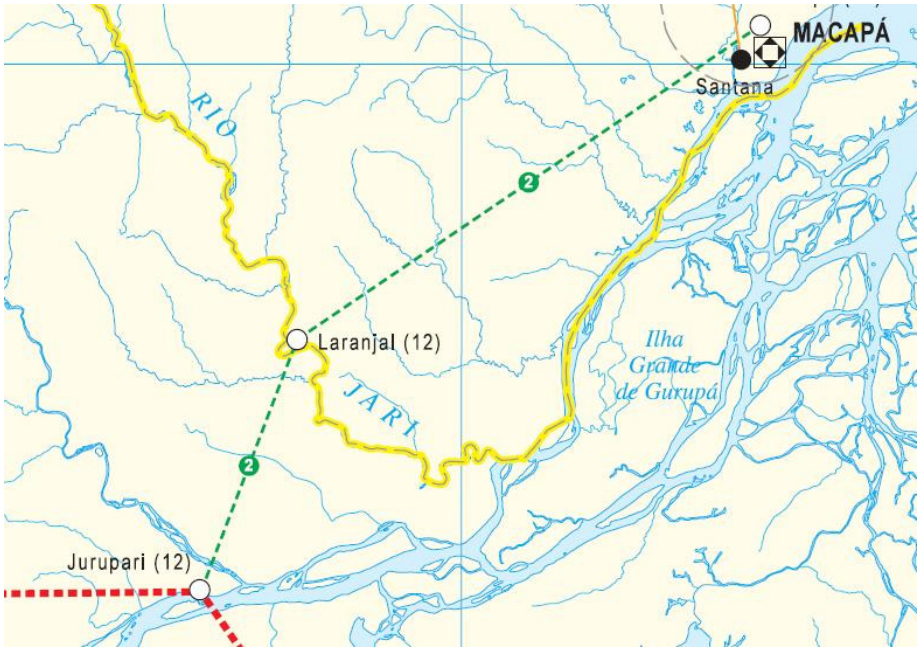

Figure 4: Transmission line Macapá – Jurupari which connects the Macapá substation to the line Tucuruí – Manaus (the Red line).

Data monitoring:

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

(1) The data will be measured continuously and recorded monthly;
(2) Spreadsheets containing the electricity dispatched to the grid and consumed by the plant will be generated; CCEE data measured (from CCEE databank – SINERCOM[25]) will be used to cross check the monitored data;
(3) The project owner will provide the generation and consume measurement data and the SINERCOM (restricted access website) generation spreadsheets to the DOE, so it can check the authenticity of declared information.
(4) The emission reductions calculation (and any project emissions if applicable later), should be managed by a company hired to these purposes.

Quality control:

[25] The *SCL* (Accounting and Settlement System), also called SINERCOM is the system that performs all calculations required in the Trading Rules, allowing the CCEE account the differences between the monthly amount of energy produced or consumed and the amounts contracted.
More information in:
http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=d12ba5c1de88a010VgnVCM100000aa01a8c0RCRD

(1) Calibration of meters:

The calibration of meters shall be conducted at least every two years by a qualified organization that must comply with national standards and industrial regulations to ensure the system accuracy. After calibration, the meters are sealed for safety and the calibration certificates are archived with other monitoring records. The class of accuracy of the equipment that will be used in the project activity is under the national standards (class 0.2) stated in "*Grid Procedures*" from the National Grid Operator: Module 12, submodule12.2[26].

(2) Emergency treatment

In case of unavailability of measures from any point of measurement, due to maintenance, commissioning or for any other reason, will be used the methodology to estimate data as the item 14.3 of the Procedure of Energy Commercialization PdC ME.01[27].

Data Management:

All the project activity issues regarding the HPP Ferreira Gomes construction will be treated by the responsible Managers / Directors from Ferreira Gomes Energia S.A.

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

All data gathered in the monitoring range will be electronically filled and kept for the period above mentioned.

The emission reductions to be generated will be calculated regularly by the project proponents and kept for the verification phase.

Training Procedures:

All the training necessary to the plant equipment maintenance team will be provided by their manufacturers/suppliers. The training to plant operating activities will be provided for professionals with senior experience to be hired.

The emergency procedures related to the project activity operation (for instance: workers' safety and health, dam safety related emergency drills/exercises, etc, according to the Brazilian legislation), are included in the training courses that a third party engaged or Ferreira Gomes S.A will apply.

Furthermore, operation, maintenance and calibration procedures will follow the national guidelines set by the National Grid Operator.

---

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

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

2) **Total electricity produced by the project activity** – ***TEG:***

Total electricity produced by the project activity, considering the electricity supplied to the grid and the electricity supplied to internal loads, in year y. It is applicable to hydro power project activities with power density (PD) greater than 4 W/m^2 and smaller than or equal to 10 W/m^2. Therefore, it is not applicable to HPP Ferreira Gomes while it PD is kept 14.2 W/m^2 and only will start being monitored if the PD becomes smaller than 10 W/m^2.

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

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

4) Installed capacity – Cap_{PJ}**:**

The installed capacity of the hydro power plant is a recognized standard to assure the project technical characteristics. After the implementation of project activity, it will be monitored yearly through one of the following options:
- Technical specifications on the installed equipments;
- Factsheets.

In Brazil, the installed capacity of hydropower plants is determined and authorized by the competent regulatory agency. Furthermore, any modification must also be authorized and made available to the public. Thus, any new authorization to increase the installed capacity of the plants will be monitored.

It is also important to highlight that according the ANEEL resolution number 420[28], issued on 30 November 2010, any change in the installed capacity or in the net generation must be communicated to ANEEL to regularization.

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

After the implementation of the project activity, the area of the reservoir will be measured yearly in the surface of the water, when the reservoir is full. For this purpose, will be used measures from topographical surveys or satellite pictures.

Authority and Responsibility:

The Ferreira Gomes Energia S.A is the responsible company for the maintenance and calibration of the monitoring equipments, compliance to the operational requirements and corrective actions related to the functionality of HPP Ferreira Gomes. Moreover, the company has authority and responsibility for

[28] http://www.aneel.gov.br/cedoc/ren2010420.pdf

registration, monitoring and measurements as well as managing all the issues related to the project activity and to organize staff training to use appropriated techniques in those procedures.
Below is provided an organizational chart that illustrates the basic operational structure of the plant.

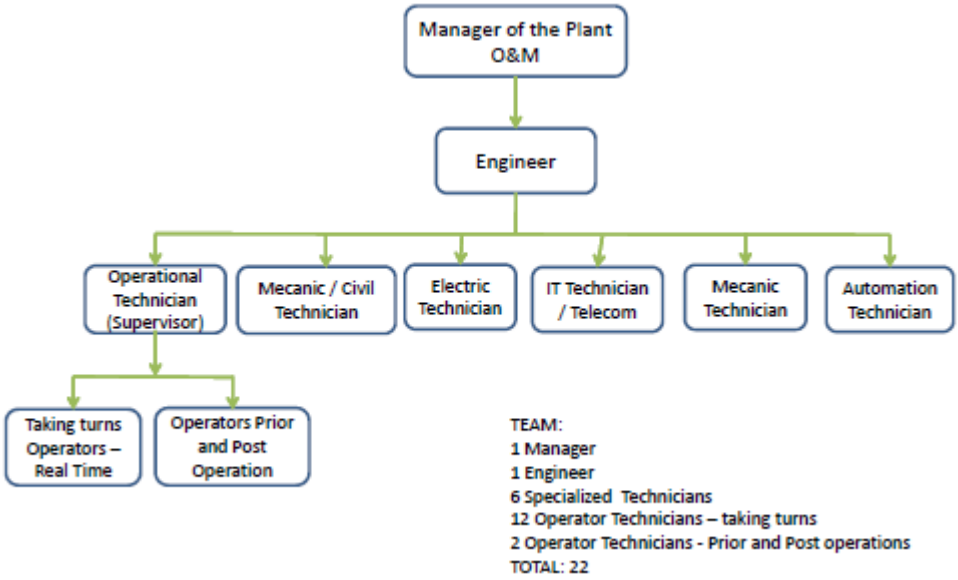

Figure 5: Chart of operational staff of HPP Ferreira Gomes.

The generation data to be used to calculate emissions reductions will be provided by the responsible engineer for an experienced company to be hired to this purpose.

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

Date of completing the final draft of this baseline section: 15/09/2011.

The entity responsible for its development is:

Company:	CARBOTRADER Ltda.
Address:	Rua 23 de Maio, Nº 790, sala 22A
City :	Jundiaí
State:	São Paulo
Zip code :	13.207-070
Country:	Brazil
Phone:	(55) 11 4522 – 7180
Fax:	(55) 11 4522 – 7180
E-mail:	carbotrader@carbotrader.com
URL:	www.carbotrader.com
Represented by:	Mr
First Name:	Arthur
Last Name:	Moraes

Job title:	Managing Director

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:

09/11/2010 – Date of concession contract to Ferreira Gomes hydroelectric exploitation on Araguari River.

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

31 years – 0 months.

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

C.2.1. Renewable crediting period:

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

Forecasted to 01/01/2015 with the commercial operations start of the first generating unit of the plant (on 30/12/2014) or with the registration of project activity on CDM, whichever occur later.

C.2.1.2. Length of the first crediting period:

7 years – 0 months (renewable for more two periods).

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The following state and federal laws and resolutions regulate the project activities of electricity generation by hydropower plants to be implemented on Amapá state:

- Federal Law Nº 6,938 issued on 31st august 1981 - "States about the National Environmental Policy, its goals, formulating mechanisms and applications";

- CONAMA Resolution Nº 01 issued on 23th January 1986 – "Establishes definitions, responsibilities, basic criterion and general guidelines to the implementation of the environmental impact assessment as one of the National Environmental Policy tools."

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

- COMPLEMENTARY LAW Nº. 0005 issued on 18 August 1994 – "To institute the code of environmental protection of Amapá state";

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

- COEMA Resolution Nº. 0001issued on 10th June 1999 – "Establishes guidelines to characterize ventures with environmental degradation potential";

- Federal law Nº 9,980 issued on 2000 - Creates the Conservation Units National System – *SNUC;*

- Federal Decree Nº. 6,848 issued on 14th May 2009 – "Alters and adds dispositives to the Decree Nº 4,340/2002 to rule the environmental compensation".

The project activity is in compliance with all the laws and regulations required. Thus, the permissions and licenses were issued by the regulatory agencies. The environmental protection agency of the state of Amapá, on the basis of the environmental legislation and other pertinent norms, forwarded the following environmental licenses to the Hydro power plant of project activity:

- LP 0040/2010 – Previous Licence issued on 09 April 2010;
- LI 0267/2010 – Installation License to the construction site and borrow areas issued on 28 September 2010;
- LI 0278/2010 – Land dryer installation license issued on 15 December 2010.
- LI 056/2011 – Installation license issued on 10 June 2011.

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:

Studies related to the promoted impacts were carried out as part of the process of environmental licenses issuance. Its results are comprised in the Environmental Impact Report – RIMA (from portuguese *Relatório de Impacto Ambiental*) of the plant. This report recommends a group of activities and programs which have as main goal to minimize the negative effects and to monitor the influences of the plant installation on local water resources.

The EIA/RIMA elaboration is performed previously the issuance of the Previous License – LP, and only if the enterprise are in accordance to all legal and environmental requirements, the process of licensing carries on, proceeding the necessary steps to acquiring further licenses (Installation License – LI and Operation License – LO).

As the plant of project activity already have the Installation License (LI), it is understood that by now, all the constraints necessary were met, and all the impacts caused by project activities were satisfactorily raised and treated, in order to minimize negative effects.

The Environmental Impact Study of HPP Ferreira Gomes presented the socioenvironmental impacts of the venture, in which were identified 58 impacts as follows: 18 of physic environment (15 negatives and 3 positives), 18 in the biotic environment (17 negatives and 1 positive) and 22 in the socioeconimic environment (14 negatives and 5 positives).
Based on the recommendations of EIA and the constraints imposed by prior license, the Basic Environmental Plan – *PBA* (from Portuguese *Plano Básico Ambiental*) was formulated. This is composed by 26 mitigation measures, 5 potentiation measures and 4 compensation measures. The PBA describes 35 programs that will allow the project participants to prevent, to mitigate, to compensate and to monitor the impacts caused by the venture building. The description of all programs and their implementation schedule are in the *PBA* and this document is available to the CDM validation team assessment. The implementation of each one are constraints to the issuance and renewal of installation and operation licenses, so quarterly reports relating the results of the adopted measures and programs must be provided to the regulatory agencies in order to evaluate if the constraints have been met or not.

The programs are:

- P1 – Program of environmental control of buildings;
- P2 – Program of recuperation of degraded sites - PRAD;
- P3 – Program of environmental actions to cleaning the reservoir;
- P4 – Animal rescue plan;
- P5 – Ichthyofauna rescue plan;
- P6 – Aquatic Invertebrate rescue plan;
- P7 – Monitoring program of water quality;
- P8 – Hydrosedimentologic monitoring plan;
- P9 – Meteorological monitoring plan;
- P10 – Seismological monitoring plan;
- P11 – Fauna monitoring plan;
- P12 - Ichthyofauna monitoring and conservation plan;
- P13 – Aquatic invertebrates monitoring program;
- P14 – Terrestrial invertebrates monitoring program;
- P15 – Malaria vectors control action plan and monitoring program;
- P16 – Terrestrial vegetation monitoring program;
- P17 – Aquatic macrophytes monitoring program;
- P18 – Integrated monitoring program to terrestrial fauna and vegetation;
- P19 – Environmental program of conservation and use of reservoir surroundings - PACUERA;
- P20 - Program for compensation of land and buildings;
- P21 - Program of prospection and rescue of archaeological heritage;

- P22 – Program of eligibility of workers and training for young;
- P23 - Program of sustainable tourism in Ferreira Gomes;
- P24 – Local suppliers strengthening;
- P25 – Program of support to local family farmers and riparian communities;
- P26 – Support to Sporting and culture projects;
- P27 – Program of characterization and support to fishing activities;
- P28 - Program of integrated socioenvironmental management;
- P29 – Program of support to the descentralization of environmental management in the municipalities of Ferreira Gomes and Porto Grande;
- P30 – Program of support to the Araguari River Basin committee implementation and of the hydro resources grant system of Amapá state;
- P31 – Research incentive program;
- P32 – Support to the strategic assessment Program for the Araguari River Basin;
- P33 – Support to the elaboration of directive plans Program for Ferreira Gomes and Porto Grande cities;
- P34 – Technology transfer program on sanitation for Ferreira Gomes and Porto Grande cities;
- P35 - Social communication Program.

All the environmental control and impact mitigation measures highlighted are constraints to renewal of installation license and issuance and maintenance of operation license. The impacts raised during the studies phase must be monitored and reported periodically to the environmental agency of the state where the venture is installed on, which is responsible for the regulation of the activities that involve natural resources exploitation. The requirements attendance of these regulation agencies are documented at the licenses issued and its compliment are revised before the renewal of the licenses (installation or operation licenses).

SECTION E. Stakeholders' comments

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

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

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

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

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

- Brazilian Forum of NGOs and Environmental and Development Social Movements – FBOMS.
- Environmental and Territory Ordainment Institute – IMAP;
- Environmental Secretary of Amapá state;
- State Prosecutors Office of Amapá state;
- National Prosecutors Office in Amapá state.
- City Hall of Ferreira Gomes;
- Environmental Secretary of Ferreira Gomes municipality;
- City Council of Ferreira Gomes;
- Prosecutors Office of Ferreira Gomes municipality;
- City Hall of Porto Grande;
- Environmental Secretary of Porto Grande municipality;
- City Council of Porto Grande;
- Prosecutors Office of Porto Grande municipality;
- Fishing Community Z-7;
- Quilombola Association of Igarapé do Palha – AQUIPA.

The interested parties above were invited on 22 August 2011 to present their comments on the project activity during a period of 15 days after receipt of the invitation letter in accordance with the Host Country Rules.

E.2. Summary of the comments received:

Only the Environmental Secretary of Ferreira Gomes Municipality answered the consultation. In a letter dated from 22 September 2011, Mr. Wanderlei Mira Rabelo, the environmental secretary of Ferreira Gomes Municipality manifested his support regarding the project activity and required from the project participants investment in a conservation of nature unit to be created in the municipality.

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

On 17 November, the Ferreira Gomes Energia S.A representative reply the SEMMA´s letter accepting the required, suggesting the schedule of a meeting to deal about the issue. Project participants also said the implementation of a conservation area in Ferreira Gomes municipality was already foreseen in the Environmental Basic Plan – *PBA* of the enterprise.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Ferreira Gomes Energia S.A
Street/P.O.Box:	Av. Doutor Cardoso de Melo,n° 1855 Bloco 1 - 9° andar, sala G
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	04.584 - 005
Country:	Brazil
Telephone:	+55 11 2184-9615 ramal 9798
FAX:	+55 11 2184-9615
E-Mail:	ahenriques@fgenergia.com.br
Represented by:	Alexandre Camargo Henriques
Title:	Administrative and Financing Director
Salutation:	Mr.
Last Name:	Henriques
Middle Name:	Camargo
First Name:	Alexandre
Department:	Administrative Department
Mobile:	
Direct FAX:	+55 11 2184-9615
Direct tel:	+55 11 2184-9615 ramal 9798
Personal E-Mail:	ahenriques@fgenergia.com.br

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

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

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

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

Annex 4

MONITORING INFORMATION

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

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

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

This monitoring plan is based on the Large Scale Methodology ACM0002 – **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"** version 12.2.0, as well as on the "**Tool to calculate the emission factor for an electricity system"** version 02.2.1.

- - - - -