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

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SECTION A. General description of project activity

A.1. Title of the project activity:

Title: Guanhães Energia CDM Project, Minas Gerais, Brazil (JUN1123)
Version: 3
Date: 03 November 2009

A.2. Description of the project activity:

The present project activity is the generation of electricity by renewable source (hydro-energy source), through construction of four Small Hydro Power (SHP) plants called Dores de Guanhães, Fortuna II, Jacaré and Senhora do Porto, all of them located in Minas Gerais State, Brazil south-west region.

The total power installed capacity of SHPs is 44 MW (Dores de Guanhães, 14 MW; Fortuna II, 9 MW; Jacaré, 9 MW and Senhora do Porto, 12 MW).

The Dores de Guanhães SHP is located in the Guanhães River in the Dores de Guanhães city and has 0.11 Km^2 reservoir area.

The Senhora do Porto SHP is located in the Guanhães River in the Dores de Guanhães city and has 0.42 Km^2 reservoir area.

The Fortuna II SHP is located in the Guanhães River, between Guanhães and Virginópolis cities and has 0.963 Km^2 reservoir area.

The Jacaré SHP is located in the Guanhães River in the Dores de Guanhães city and has 0.77 Km^2 reservoir area.

These enterprises have as main goal the generation of electricity that must be delivered to the National Interconnected System (SIN) compensating the thermal generation from fossil fuels in this system with the generation of renewable electricity. The SHPs construction also helps meet the growing demand for energy in Brazil.

Moreover, help with regard to improvement in the supply of electricity contributing to 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 consists in SHPs with small reservoirs, it is virtually zero environmental impact when compared to large hydroelectric facilities. This fact is important because the construction of Small Hydro Power plants contributes to the efficient use of natural resources and environment, thus avoiding the growth of environmental and social liabilities caused by new large hydroelectric plants.

Even as a factor of relevance to be blamed for this case is the fact that investment in modern technology is one of the justifications for the project makes efficient use of water resources.

In regard to the contribution of the project in mitigation of Greenhouse Gas emissions (GHG), the project activity reduces emissions of these gases prevent the entry into operation of thermoelectric plants that use fossil fuels as energy inputs. In the absence of the project activity, fossil fuels would be burned in thermoelectric plants which are interconnected to the grid. The project activity initiative helps Brazil to meet its goals of promoting sustainable development.

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 contributes to better working conditions and increases the opportunity for employment in areas where the projects are located;
- It contributes to better conditions of the local economy, because the use renewable energy reduces our dependence on fossil fuels, reduce the amount of pollution and the associated social costs related to it.

Moreover, the project diversify 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)	SPE Guanhães Energia S.A. (private entity)	No
	Carbotrader Assessoria e Consultoria em Energia Ltda (private entity)	
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM- PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

The *Guanhães Energia S.A* special purpose company is 51% to the INVESTMINAS PARTICIPAÇÕES S.A and 49% to the CEMIG Geração e Transmissão S.A. (Companhia Energética do Estado de Minas Gerais Generation Area).

The CEMIG Geração e Transmissão S.A CDM project participation is possible through the *Programa Minas PCH*, whose objective is to increase the generation company portfolio through SHP or other renewable energy generation Project.

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.:

South-East Region / Minas Gerais State

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

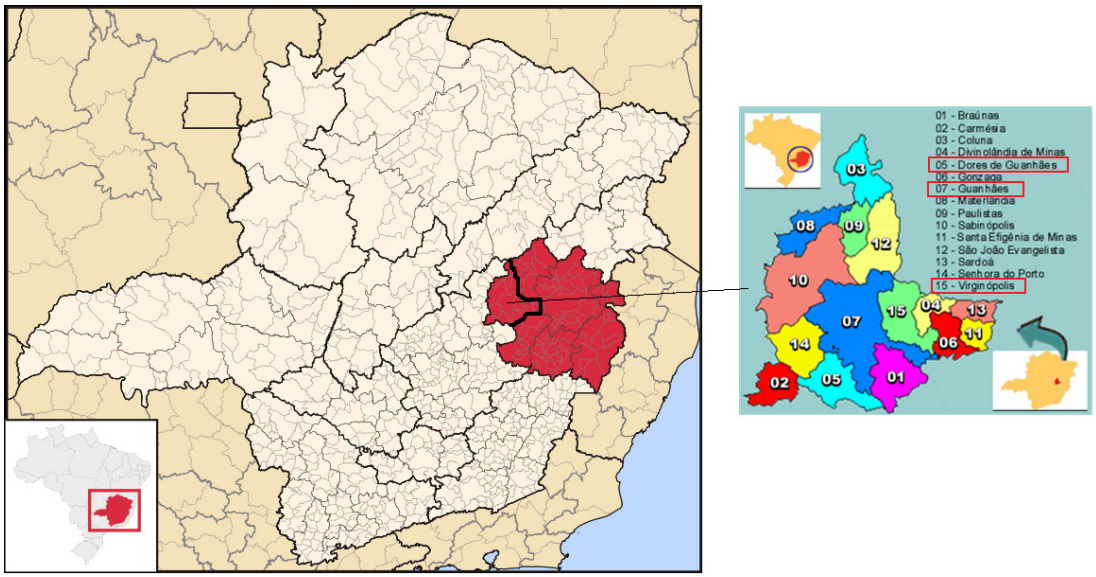
- SHP Dores de Guanhães – Dores de Guanhães city;
- SHP Fortuna II - Guanhães and Virginópolis cities;
- SHP Jacaré - Dores de Guanhães city;
- SHP Senhora do Porto – Dores de Guanhães city.

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

Table 1: SHPs physical location

SHP	City	Coordinates
Dores de Guanhães	Dores de Guanhães	19º 04'S 42º 53'W
Fortuna II	Guanhães and Virginópolis	18º 54' S 42º 41' W
Jacaré	Dores de Guanhães	19º 00' S 42º 57' W
Senhora do Porto	Dores de Guanhães	19º 02' S 42º 55' W

Figure 1: SHPs Localization



Sources: Wikipedia - pt.wikipedia.org and City Brazil - www.citybrazil.com.br

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

Sectoral Scope 1 – Energy Industries (Renewable/Non-Renewable Sources)

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 continues to be generated with the actual power plant mix that have a strong fossil fuel power plants in operation.
The project activity reduces GHG emissions prevent the entry into operation of thermoelectric plants that use fossil fuels as energy inputs. In the absence of the project activity, fossil fuels would be burned in thermoelectric plants which are interconnected to the grid.

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

The technology used in the enterprise is the river hydro energy use, the gravitational energy of water is used to move the turbines and by doing this, trigger generators that enable the generation of electricity. This is a source of clean energy and renewable that presents minimal impact on the environment.
The SHPs are ventures classified as Small Hydro Power Plant because according to the Brazilian Resolution no. 652, 09/12/2003, from National Electric Energy Agency (ANEEL), to be considered a SHP the reservoir area must be less than 3 Km^2 (300 ha) and the total installed capacity between 1 MW to 30 MW.
The SHPs shall dispatch generated energy to the National Interconnected Grid (SIN - Sistema Interligado Nacional) trhough the Guanhães 2 Substation (located in Guanhães city, Minas Gerais state, Brazil and far 25 Km from the SHP Jacaré dispatch substation) also in the SHP Jacaré will be constructed a Substation with 45 MVA whereas SHPs Senhora do Porto, Dores de Guanhães and Fortuna II should be interconnected (the power transmission line distance should be 7.5 and 36 Km respectively).
The technology and equipment used in the project activity are developed and manufactured in Brazil are

not expected transfer of know-how or technology to the host country.
The technical characteristics of equipment that will be implemented in SHP can be seen in Table 2 below:

Table 2: SHPs technical datas (source: Guanhães Energia S/A)

SHP	Dores de Guanhães	Fortuna II	Jacaré	Senhora do Porto
Installed Power (MW)	14.0	9.0	9.0	12.0
Reservoir Area (Km^2)	0.11	0.77	0.963	0.42
Power Density (W/m^2)	127.3	9.3	11.7	28.6
Turbines Type	Kaplan – vertical shaft	Francis - horizontal	Kaplan – vertical shaft	Kaplan - vertical
Turbines Quantity	1	2	1	1
Unit Nominal Power (kW)	14,500	4,660	9,320	12,440
Flow Rate (m^3/s)	46.90	10.37	42.20	46.02
Synchronous Speed (rpm)	720	400	790	740
Generators				
Generators Quantity	1	2	1	1
Effective Power (kW)	14,000	4,500	9,000	12,000
Power`s Factor	0.9	0.9	0.9	0.9
Frequency (Hz)	60	60	60	60

(c) The baseline scenario:

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

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

Table 3 : Estimation of Emission Reductions

Year	Estimation of annual emission reductions in tonnes of CO_2e
2011 (February)	50,401
2012	64,150
2013	64,150
2014	64,150
2015	64,150
2016	64,150
2017	64,150

2018 (January)	5,345
Total estimated reductions (tonnes of CO_2e)	440,646
Total number of crediting years	7
Annual average of the estimated reductions over the crediting period	62,949

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 choosen.

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 methodology tool used to the baseline calculation is the **"Tool to calculate the emission factor for an electricity system" - version 01.1 (valid from 29 July 2008 onwards).**

The monitoring tool used is the ACM0002: **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" - version 10 (valid from 11 June 2009 onwards).**

The methodology tool used to the additionality assessment is the **"Tool for the demonstration and assessment of additionality" - version 05.2 (valid from de 26 August 2008 onwards).**

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

The ACM0002 methodology is applicable to grid-connected renewable power generation project activities that involve electricity capacity additions under the following conditions:

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

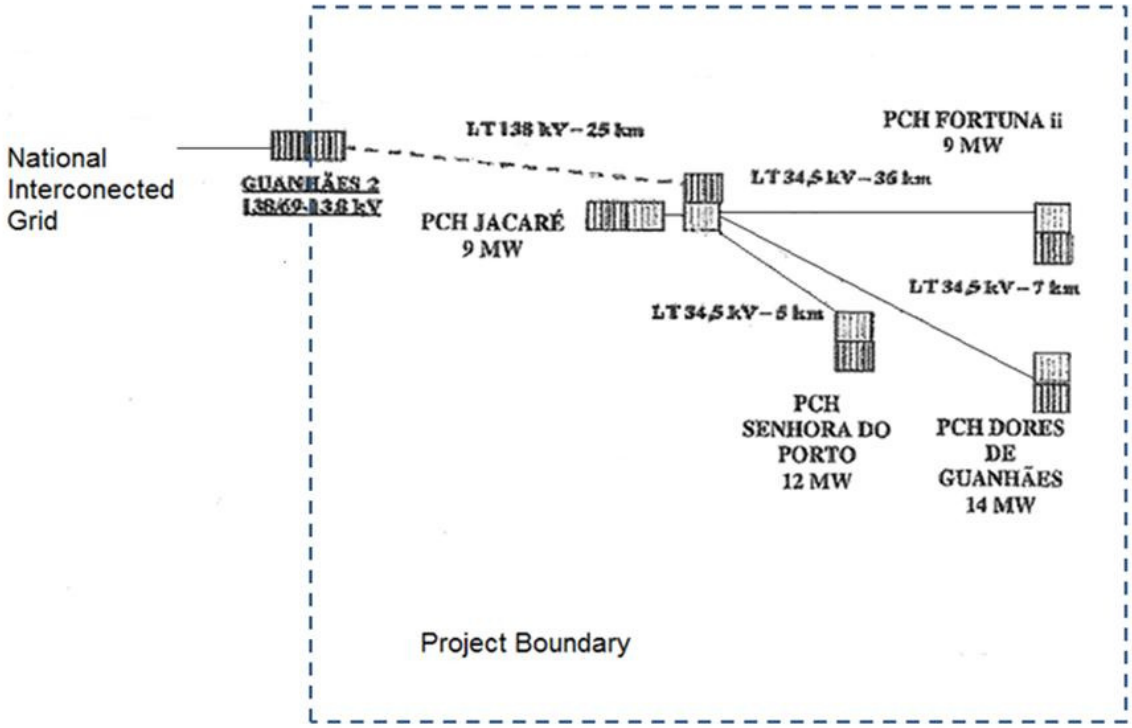
In case of hydro power plants:

- The project activity is implemented in an existing reservoir, with no change in the volume of reservoir.
- The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions 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/m2.

  The SPE Guanhães SHPs grid-connected constructions are considered renewable power generation plant with new reservoirs and Power Densities greater than 4 W/m^2 (third item above mentioned).

Figure 2: SHPs grid connection



So the ACM0002 methodology is applicable.

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

According to ACM0002 the special extension of the project's boundaries includes the project power plant and all power plants physically connected to the electricity system that the CDM project power plant is connected to, SIN (National Interconnected Grid) in this case. The greenhouse gases included in the project boundary are shown in the table below:

Table 4: Sources and Gases included in the Project Limits

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 CH4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	Yes	Main emission source.
		N_2O	No	Minor emission source.

The baseline emissions are related in the B.6.1.2 item with the tool to calculate the grid-connected emission factor.

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

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:
The electricity delivered to the grid by the project would have otherwise been generated by the operation of a grid-connected power plant and by the addition of new generating sources, as reflected in the combined margin (CM) from "Tool to calculate the emission factor for an electricity system", described in the item B.6.1.2.
Also the baseline emissions are the kWh produced by the renewable generating unit multiplied by an emission coefficient, calculated in a conservative and transparent manner.

So in the Project activity absence, the electricity should be provided by the other grid-connected power plants included the fossil fuel based Power plants.

Thus this fact the project activity alternatives scenarios, in accordance with the local agencies requirements, are:

Scenario 1: proposed project activity undertaken without being registered as a CDM project activity.

Scenario 2: The continuation of the current situation, with the electricity being generated to the SIN which has a high participation of fossil fuel plants.

Also, the project activity uses as a data source for the calculation of the Emission Factor of the National Interconnected System (SIN), data of the operating margin and the margin of construction provided by the Designated National Authority (DNA) of the host country.

The Emission Factor of CO_2 resulting from the generation of electric energy in the system checked in the National Interconnected System (SIN) in Brazil is calculated based on generating records from plants centrally operated by the **National Electric System Operator (ONS)**, which includes thermoelectric plants that use fossil fuels as energy.

The method used to make this calculation is the method of dispatch analysis, which is the most appropriate in determining the emission factor of the electrical grid.

This information is needed for renewable energy projects connected to the electric grid and implanted in Brazil under the **Clean Development Mechanism (CDM)** of the Kyoto Protocol.

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

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

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

This item is elaborated based on **"Tool for the demonstration and assessment 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:

1 – The proposed project activity undertaken without being registered as a CDM project activity..

2 - The continuation of the current situation, with the electricity being generated to the SIN which has a high participation of fossil fuel plants

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

Both the project and the alternative scenario are in compliance with all regulations according the following entities: National Electric System Operator (ONS - Operador Nacional do Sistema Elétrico), Electricity Regulatory Agency (ANEEL - Agência Nacional de Energia Elétrica), Minas Gerais Environmental Agency (FEAM - Fundação Estadual do Meio Ambiente) and the CDM Executive Board.

Step 2: Investment analysis

Determine whether the proposed project activity is not:
(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of Certified Emission Reductions (CERs).

Sub-step 2a: Determine appropriate analysis method

To the investment analyses there are the options below according to the meth:

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

The III option was chosen.

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

The key benchmark to be compared should be the Project Activity **Internal Rate Return (IRR),** considered adequate to this kind of Project as well decision context.

To the Investment analysis was established as benchmark:

The Basic Discount Rate set up by the brazilian government (SELIC rate), which is the main reference for Public Debt instruments traded in the market (this benchmark is the most common in Brazil in order to check the project viability).

The SELIC Rate

The SELIC rate is set up by the Special System for Settlement and Custody ("Sistema Especial de Liquidação e Custódia"). It is obtained by the calculation of the overnight average weighted rate for financing operations, secured by federal public debt instruments and traded in the said system and in clearing houses as committed operations[1]. The institution responsible for setting this rate is the Monetary Policy Committee (COPOM), whose main objective is to set up monetary policy and the underlying interest rate. The COPOM has been following adequate procedures mirroring the examples of the US Federal Reserve Board´s Federal Open Market Committee and (FOMC) and by Germany´s Central Bank Council.

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

Federal public debt securities main purpose is to collect resources for the financing of the public debts, as well as finance the Federal Government´s activities, such as education, health and infra-structure. These fixed income assets are the main conservative investment options and are mostly indexed by the SELIC.

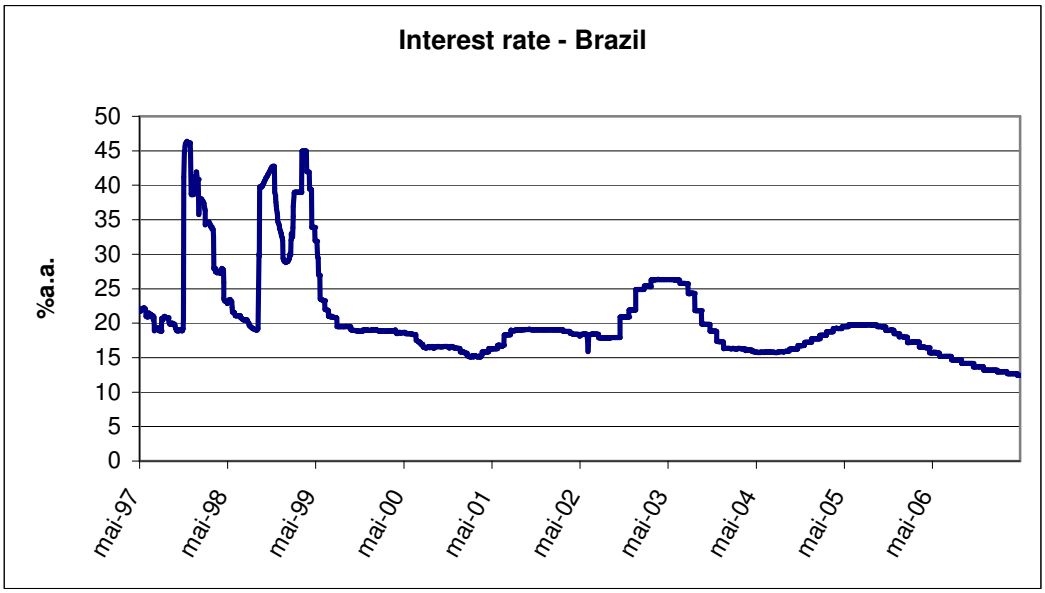
The Brazilian economy has withstood several phases of instability oftentimes caused by the international scenario. International economic uncertainties created severe fluctuations in Brazilian monetary policy, mainly in the setting of the brazilian basic interest rate. The fluctuations at the end of the 1990´s and between 2000 and 2002 were caused by external factors (Asian crisis in 1999 and the presidential election in Brazil in 2002).

As an emerging country, Brazil has always had high interest rates, which from an investment point of view makes public debt securities quite attractive when compared with developed countries. At the present time the brazilian economy has enjoyed economic growth, relative expansion, high level of international reserves, which has facilitated capturing foreign resources, resulting in smoothing SELIC rate fluctuations as shown in Graph 1.

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

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

Graphic 1: Selic rate historic



Source: Central Bank of Brazil - Brasil. 28 March 2008.

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

In this scenario the SELIC rate makes brazilian government public debt securities attractive as a relatively conservative or risk-free investment.

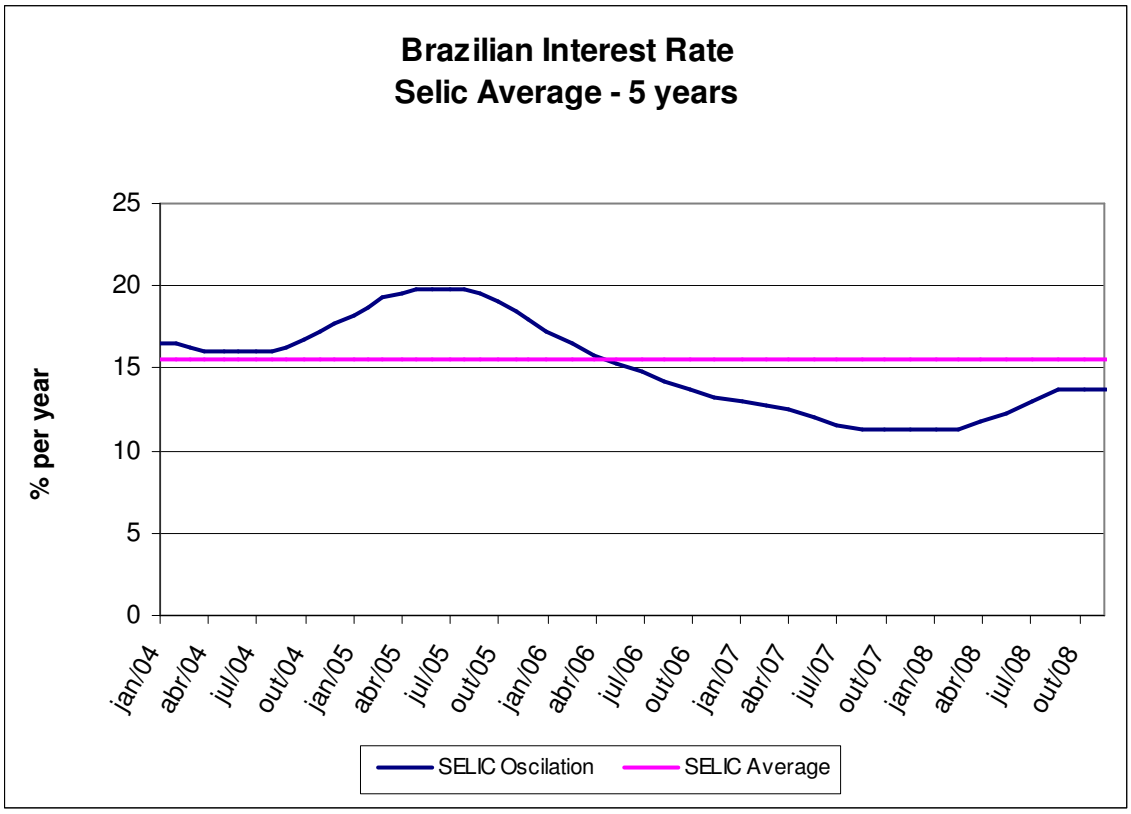
Sub-step 2c: Calculation and comparison of financial indicators

The cash-flow information will be presented integrally in a separated document according to the UNFCCC rules.

The cash-flow was elaborated for the operational life of the project activity (30 years), getting an Internal Return Rate (IRR) equal 9.73% per year, without prescriptions of the Certified Emissions Reduction (RCEs – Reduções Certificadas de Emissões) sales, and 10.80% per year with the sales of the CERs.

In order to have a non-point benchmark, was calculated the average values of benchmarks covering the range from January 2004 until December 2008, thus totalizing 5 whole years of observations before the PDD publication for the global stakeholders year. The average value calculated can be found in graphic 2.

Graphic 2: SELIC Average Rate.



Source: Banco Central do Brasil.

Below the table 5 summarizing the calculated values

Table 5: Comparative analyse between public and Project benchmark

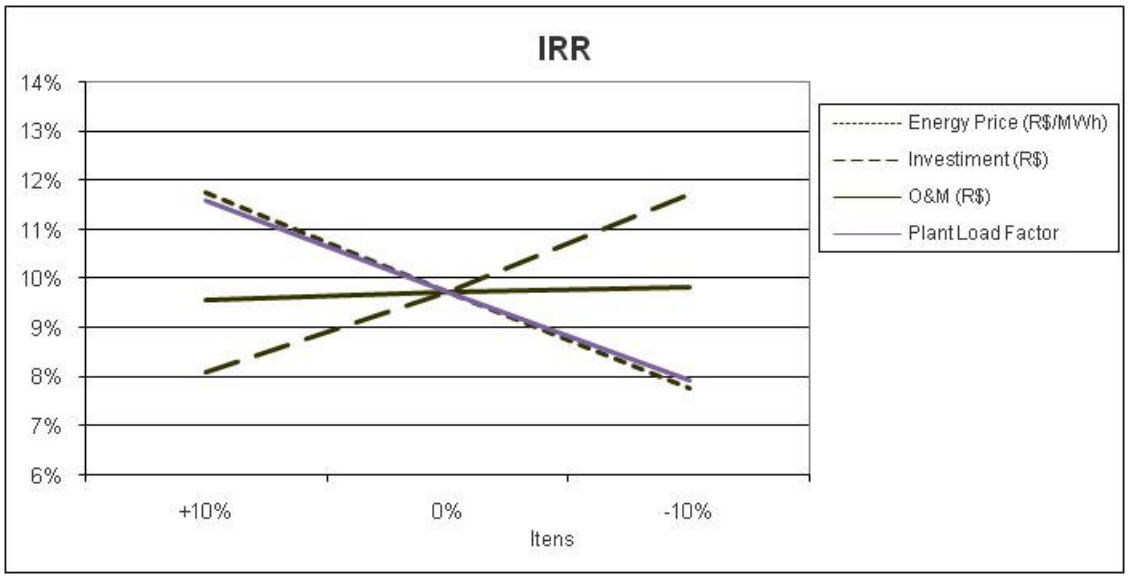
SHPs	Benchmark (% year.)	IRR (% year)	IRR (with CERs) (% year)
	15.48	9.73	10.80

The project's IRR has stayed below the average SELIC rate. The analysis shows that the project faces investment barriers because there are other more attractive alternatives.

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

Sub-step 2d: Sensitivity analysis

For the sensitivity analysis varied (1) Energy Price, (2) The Investment, (3) Annual operation cost, in order to analyze the financial impact of these at the project and (4) Plant Load Factor.



Even with the positive variation the Project couldn´t reach the benchmark.

Breakeven point analyses were done in order to discuss the likelihood of occurrence of these scenarios. The table below presents the main results:

	Original Value	Breakeven Point	Original IRR	% of deviation	Benchmark
Energy Price (R$/MWh)	140,00	**177,94**	9,73%	**27%**	15,48%
Investiment (R$)	251.175.000,00	**192.519.156,27**	9,73%	**-23%**	15,48%
O&M (R$/MWh)	7,56	**-26,17**	9,73%	**-446%**	15,48%
Plant Load Factor	25,03	**32,30**	9,73%	**29%**	15,48%

Likelihood of scenarios occurrence

The scenarios presented above, considered for the financial calculations, whether from the point of view of 10% parameters variation of even under the conditions of overcoming the benchmark (breakeven point between Benchmark and IRR), are not considered feasible, due to several factors.

Those factors will be explained by parameter variated in the sensitivity analysis, which can be viewed below:

Energy Price (R$/MWh)

The energy price used in the financial calculations is considered adequate for this type of project and reflects the energy market in Brazil. From the analysis provided above, the scenario which would make

the project's IRR overcome the benchmark was estimated as being R$177.94/MWh, i.e. 27% higher than the original energy price.

Also, the input value reflects the market - previously the world financial crisis, which such occurrence has influenced the electricity market in Brazil, lowering the prices practices in the market. The current prices practiced in the spot market of energy clearly reflects the market instability, where such data has ranged from R$74.28/MWh (data from October 2008) to R$16.31/MWh (current prices – September 2009), released by CCEE (Electric Power Commercialization Chamber). Moreover, the low increase on demand for electricity has been probably influencing the energy prices.

Other important information that corroborates along the argumentation is that the validated energy price is above the average prices practiced in the first Auction of Alternative Sources of energy, which has occurred in 18/06/2007. The auction promoted by entities from the Brazilian government aims to estimulate the development of generation projects based on renewable energy in Brazil.
The results of the auction can be viewed in the following link:
http://www.ccee.org.br/StaticFile/Arquivo/biblioteca_virtual/Leiloes/1_leilao_fontes_alternativas/Resultados/resumo_vendedor.pdf
On which prices for the energy commercialized ranged from 134.97 to 135.00 (R$/MWh) for Small Hydro Power Plants. The energy prices in the same auction for other renewable sources (such as biomass) ranged from 138.50 to 139.12 (R$/MWh).

Also, in the last Auction of New Energy the sale price for the electricity practiced under the CCEE conditions, for one SHP in Brazil was R$144/MWh (source: http://www.ccee.org.br/StaticFile/Arquivo/biblioteca_virtual/Leiloes/8_energia%20nova/Resultado%20por%20vendedor.pdf).

The ANEEL´s Annual Energy Reference Value (VR) for the 2008 year is R$ 139.44/MWh, according to the ANEEL Oficio number 031/2008 fowarded to the CCEE agency. http://www.ccee.org.br/StaticFile/Oficio%200312008%20SEM%20Aneel.pdf . The Annual Energy Reference Value has three basic uses in the electricity sector. The first is to provide a date for the consumers transfer fares in the energy price purchased by distributors in so-called auction setting, small auctions in which dealers buy up to 1% of their burden when they must balance their market. The second use of VR is also used as a limit to the value that the distributor may pay to purchase power agreement from the small generators that operate within their concession areas (known as "distributed generation").
The third use is to serve as a reference to the penalties (fines) imposed by Aneel to the companies.

Therefore, considering the informations provided above the energy price (input value) validated by the DOE is considered adequate as well conservative.

Investiment (R$)

The Investment costs to implement the four SHPs from the SPE Guanhães was approved by the Committee of Budget Priority (from Portuguese "Comitê de Priorização de Orçamento"). This committee

is a deliberative board that analysis and approve the types of investments that will be on the pipe to receive financial resources for project implementation. In this way it was a condition to implement the SHPs.

The input value for this parameter used in the IRR's calculation is unlikely to reduce for more than 23%. Evidence that justify the input value and which make it adequate is that the value was make public by the Project Participants in a newspaper of the State where the project is located – on which the value published was R$250,000,000.00. (Such evidence was provided to the DOE). Suggesting that the official prices for the project implementation were totalized accordingly to the forecasted.

After observe the data presented above, the input value for investment costs used in the financial analysis is considered adequate/suitable as well as conservative.

Operational Costs - O&M

As demonstrated in the table above, this parameter cannot affect the project viabilization.

Plant Load Factor (MW)

The Plant Load Factor is considered adequate because the data comes from the Decrees issued on 07/01/2008 by the ANEEL – 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 Plant Load Factor are the series of hydrological data and flow that historic occurred, climate conditions, topography, regular flow of the river, among others, that the ANELL's technical body is capable to analyse those conditions and issue the plant load factor for the brazilian SHP projects.

Is unlikely to occur an increase above the factor showed in the Table 3 (25.03 MW), due to it's determination to be in accordance with historical inflow series including critical periods in hydrological terms.

Therefore, considering the explanations, informations and evidences provided by the PP, the IRR of the project activity without being registered as a CDM project is below the established benchmark, evidencing that project activity is not financially attractive to investor. The CDM benefits were the key point to go ahead and to implement the project activity.

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

Step 3: Barrier analysis

As it concluded in the sensitivity analysis that the activity proposal of the CDM project is little probable to be more financially/economically attractive, the analysis of Barriers is not necessary.

Step 4: Common practice analysis

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

Were provided an analysis of any other activities that are operational implemented previously or currently underway and that are similar to the proposed project activity (in the same country, similar technology, similar scale – installed power above 5 MW and below 15 MW[2]).

Due this we have that there are two incentive mechanisms presented (this information is based on the public information available), the Clean Development Mechanism (CDM) and the 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 SHPs projects are one of the types eligible to participate in the PROINFA.

Among the SHPs that become operational from the 2005 (just after the formal CDM market beginning) until 2009 (May) years, 41 SHPs in the total, we have that 11 were implemented with the PROINFA incentive and 28 were implemented with the CDM incentive (this number represents almost 95% of the total SHPs implemented).

Thus all this facts it can be established that the SHP construction without incentives is not a common practice.

Table 6: SHPs between 5 to 15 MW that became operational from the 2005 until 2009 (May) years

[2] These proposed project activity is a bundle between SHPs with installed Power in 9, 14, 12 and 9 MW. SHPs with installed power bigger than 15 MW, isolated, become Large Scale projects according to the UNFCCC rules.

	SHP	State	Incentive
2005			
1	Faxinal II	MT	CDM
2	Furnas do Segredo	RS	CDM
3	Ombreiras	MT	CDM
4	Salto Corgão	MT	CDM
2006			
1	Canoa Quebrada	MT	CDM
2	Carlos Gonzatto	RS	Proinfa
3	Garganta da Jararaca	MT	CDM
4	Sacre 2	MT	CDM
5	Santa Edwiges I	GO	CDM
6	Santa Edwiges II	GO	CDM
7	São Bernardo	RS	Proinfa
8	Senador Jonas Pinheiro	MT	Proinfa
2007			
1	Braço Norte IV	MT	CDM
2	Contestado	SC	
3	Coronel Araújo	SC	CDM
4	Ponte Alta	MS	Proinfa
5	Primavera	RO	CDM
6	Salto	MT	CDM
7	Santa Laura	SC	Proinfa
8	São João (Castelo)	ES	CDM
2008			
1	Alto Benedito Novo I	SC	CDM
2	Cachoeira da Lixa	BA	Proinfa
3	Cachoeirão	MG	CDM
4	Capão Preto	SP	CDM
5	Carangola	MG	Proinfa
6	Chibarro	SP	CDM
7	Colino I	BA	Proinfa
8	Graça Bernnand (Terra Santa)	MT	CDM
9	Jararaca	RS	CDM
10	Mambaí II	GO	Proinfa
11	Paranatinga II	MT	CDM
12	Pequi	MT	
13	Porto das Pedras	MS	CDM
14	Riacho Preto	TO	Proinfa
15	Salto Buriti	PA	CDM
16	Salto Curuá	PA	CDM
17	Sucupira	MT	CDM
2009			
1	Santa Edwiges III	GO	CDM
2	Cachoeirão	MG	CDM
3	Cocais Grande	MG	Proinfa
4	São Domingos II	GO	CDM

Sub-step 4b: Discuss any similar Options that are occurring:

According to the National Agency for Electrical Energy (ANEEL), only 2.12% of the installed capacity of the overall operational Brazilian plants are represented by SHPs, while Large Hydro Power Plants are 73.92% and 21.62% are Thermal power plants[3].
This project activity is not the business-as-usual scenario in the country where large hydro with large reservoirs and natural gas fired thermal power projects represent the majority of new installed capacity.

Currently the CDM is proving to be an important incentive mechanism for the renewable energy projects implementation in Brazil, enabling increased participation of such sources in the Brazilian energy matrix

In the light of all explanations provided we can conclude, as outcome of the sub-step 4a and 4 b, that the proposed project activity is not the common practice.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the methodology ACM0002, new hydro electric power projects with reservoirs shall account for project emissions, estimated as follows:

a) If the power density of project (PD) is greater than 4W/m^2 and less 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, and the default value as per EB23 is 90 Kg CO_2e /MWh;

TEG_y Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

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

$PE_{HP,y} = 0$.

The power density of the project activity is 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.

[3] ANEEL Databank from the Brazilian Generation - 20/08/2008 - http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2

Cap_{PJ} Installed capacity of the hydro power plant after the implementation of the project activity (W).

Cap_{BL} Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

A_{PJ} Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2).

A_{BL} Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

Below we have the summaryze Table 8.

Table 8: Parameters used for the Power Density Calculation

SHP	Cap_{PJ} (W)	Cap_{BL} (W)	A_{PJ} (m^2)	A_{BJ} (m^2)	*PD*
Dores de Guanhães	14,000,000	0	110,000	0	127.3
Fortuna II	9,000,000	0	963,000	0	9.3
Jacaré	9,000,000	0	770,000	0	11.7
Senhora do Porto	12,000,000	0	420,000	0	28.6

The reservoir emissions should be considered only for Fortuna II[4] SHP, because it was the only one with Power Density between 4 and 10. Following the calculation:

$$PE_y = \frac{90 \cdot 45376}{1000} = 4084 \text{ (tCO}_2\text{/year)}$$

The baseline is the kWh produced by renewable generation unit multiplied by an emission coefficient (measured in tCO_2e/MWh) calculated in a transparent and conservative manner, called combined margin (CM), which consists of a combination between the operation margin (OM) and the build margin (BM) according to procedures prescribed in the methodological tool "Tool to calculate the emission factor for an electricity system".
For the calculation of the baseline, the six steps below should be followed:

STEP 1. Identify the relevant electric power system.
STEP 2. Select an operating margin (OM) method.
STEP 3. Calculate the operating margin emission factor according to the selected method.
STEP 4. Identify the cohort of power units to be included in the build margin (BM).
STEP 5. Calculate the build margin emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

As mentioned in the section B.4, the operating margin and the build margin are publicly available by the brazilian DNA.

The weights w_{OM} and w_{BM} should be 0.5.

[4] SHP Fortuna II has as ANEEL plant load factor (5.11 MW) also was considered 0.07 MW as internal loads consume (PP benchmark). Thus this TEGy = 5.11 . 8,760 h/year + 0.07 . 8,760 h/year = 45376 MWh/year

Baseline Emissions

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 was operated prior to the implementation of the project activity, thus classified as a Greenfield renewable energy power plant, then:

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

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);

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

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

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2/tCH_4
Description:	Global warming potential of methane valid for the relevant commitment period
Source of data used:	IPCC
Value applied:	
Measurements procedures (if any) :	The default value for the first commitment period = 21 tCO_2e/tCH_4
Any comment:	-

Data / Parameter:	EF_{Res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs
Source of data used:	
Value applied:	90
Measurements procedures (if any) :	The default value as per EB23 is 90 kgCO2e/MWh
Any comment:	

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data used:	Project site.
Value applied:	0
Measurements procedures (if any) :	Determine the installed capacity based on recognized standards
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
Measurements procedures (if any) :	Measured from topographical surveys, maps, satellite pictures, etc.
Any comment:	-

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

The baseline methodology considers the determination of the emissions factor to the grid which the project activity is connected 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.

"Operating Margin *OM* Emission Factor" calculation ($EF_{grid,OM-DD,y}$)

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

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

For effect of *ex-ante* operation margin emission factor calculation will be used, like a good estimation to $EF_{grid,OM\text{-}DD,y}$ value, the arithmetic average of the 12 last monthly emission factors published by the DNA (ultimate datas available).
(http://www.mct.gov.br/index.php/content/view/72901.html)

Average Monthly Factor (tCO_2/MWh)												
year	2008											
month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EF	0.5727	0.6253	0.5794	0.4529	0.4579	0.5180	0.4369	0.4258	0.4102	0.4369	0.3343	0.4686

So the Operationg Margin Emission Factor is:

$EF_{grid,OM\text{-}DD,y} = 0.4766$

"Build Margin Emission Factor BM" calculation ($EF_{grid,BM,y}$)

According to the used methodology, the build margin emission factor (BM) also needs to be calculated:

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

For the build margin emission factor $EF_{grid,BM,y}$ will be adopted the 2008 year value published by the DNA (ultimate data available).
(http://www.mct.gov.br/index.php/content/view/72901.html)

$EF_{grid,BM,y} = 0.1458$

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

Finally the baseline emission factor (EFy) is calculated through a weighted-average formula, considering both the EF_{OMy} and the EF_{BMy} that gives:

$$EF_{grid,CM,y} = 0.4766 \cdot 0.5 + 0.1458 \cdot 0.5 = 0.3112 \quad (tCO_2/MWh)$$

The emissions reduction (**ER**) of this project activity is:

$$ER_y = BE_y - PE_y$$

Where:
ER_y = Emission reduction in year y (tCO_{2e}/year);
BE_y = Baseline emissions in year y (tCO_2/year);
PE_y = Project emission in year y (tCO_2e/year)

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 ($EF_{grid,CM,y}$) with the electricity generation of the project activity.

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

Thus this, the power generated through the Project Activity will be the sum of the four enterprises in the year *y*.

$EG_{DoresdeGuanhães,y}$ = 70,080 MWh
$EG_{FortunaII,y}$ = 44,764 MWh
$EG_{Jacaré,y}$ = 45,114 MWh
$EG_{SenhoradoPorto,y}$ = 59,305 MWh
$EG_{PJ,y}$ = **219,263 MWh**

$BE_y = EF_{grid,CM,y}. EG_{PJ,y} = 0.3112 . 219,263 = 68,235\ tCO2$

$$ER_y = BE_y - PE_y = 68,235 - 4,084\ ^{5} = 64,150\ tCO2$$

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

Table 9: Ex-ante emission reduction

Year	Estimation of project activity emissions (tCO_2e)	Estimation of Baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of Overall emission reductions (tCO_2e)
2011 (Febr)	3,744	54,145	0	50,401
2012	4,084	68,235	0	64,150
2013	4,084	68,235	0	64,150
2014	4,084	68,235	0	64,150
2015	4,084	68,235	0	64,150
2016	4,084	68,235	0	64,150
2017	4,084	68,235	0	64,150
2018 (Jan)	340	5,686	0	5,345
Total (tonnes CO_2e)	28,587	469,239	0	440,646

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

B.7.1 Data and parameters monitored:

[5] See B.6.1 Section

Data / Parameter:	$EG_{DoresdeGuanhães,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data:	Energy Meter
Value of data:	70,080
Measurement procedures (if any):	The net electricity delivered to the grid will be checked through the energy metering. The meter must comply with national standards and industry regulation to ensure the accuracy. The meter will be sealed for safety after calibration.
Monitoring frequency:	Hourly measurement and monthly recording
QA/QC procedures to be applied:	These data will be used for calculate the emission reductions. The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The data from the energy meters will be cross checked with the invoice of energy sales or with the CCEE databank in order to verify the coherency of the data.
Any comment:	

Data / Parameter:	$EG_{Fortuna\ II,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data:	Energy Meter
Value of data:	44,764
Measurement procedures (if any):	The net electricity delivered to the grid will be checked through the energy metering. The meter must comply with national standards and industry regulation to ensure the accuracy. The meter will be sealed for safety after calibration.
Monitoring frequency:	Hourly measurement and monthly recording
QA/QC procedures to be applied:	These data will be used for calculate the emission reductions. The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The data from the energy meters will be cross checked with the invoice of energy sales or with the CCEE databank in order to verify the coherency of the data.
Any comment:	

Data / Parameter:	$EG_{Jacaré,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data:	Energy Meter
Value of data:	45,114

Measurement procedures (if any):	The net electricity delivered to the grid will be checked through the energy metering. The meter must comply with national standards and industry regulation to ensure the accuracy. The meter will be sealed for safety after calibration.
Monitoring frequency:	Hourly measurement and monthly recording
QA/QC procedures to be applied:	These data will be used for calculate the emission reductions. The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The data from the energy meters will be cross checked with the invoice of energy sales or with the CCEE databank in order to verify the coherency of the data.
Any comment:	

Data / Parameter:	$EG_{SenhoradoPorto,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data:	Energy Meter
Value of data:	59,305
Measurement procedures (if any):	The net electricity delivered to the grid will be checked through the energy metering. The meter must comply with national standards and industry regulation to ensure the accuracy. The meter will be sealed for safety after calibration.
Monitoring frequency:	Hourly measurement and monthly recording
QA/QC procedures to be applied:	These data will be used for calculate the emission reductions. The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The data from the energy meters will be cross checked with the invoice of energy sales or with the CCEE databank in order to verify the coherency of the data.
Any comment:	

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Brazilian grid emission factor.
Source of data:	Based on data provided by DNA (Designated National Authority).
Value of data:	0.3112
Measurement procedures (if any):	The Combined Margin is calculated through a weighted-average formula, considering the $EF_{grid,OM\text{-}DD,y}$ 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:	This data will be applied in the project emission reductions calculation. The data will be annually filed (electronic archive) and it will be kept for two years after the end of project activity.

Any comment:	

Data / Parameter:	$EF_{grid,OM-DD,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 Operating Margin emission factor of the grid, in a year *y*
Source of data:	Data provided by DNA (Designated National Authority) to the year *y*.
Value of data:	0.4766
Measurement procedures (if any):	The Operating Margin Emission Factor will be collected in the DNA website, which is responsible for this calculation.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data, updated, will be applied in *ex-post* calculation of the Emission Factor. The data will be annually filed (electronic archive) and it will be kept for two years after the end of project activity.
Any comment:	

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 Build Margin emission factor of the grid, in a year *y*
Source of data:	Data provided by DNA (Designated National Authority) to the year *y*.
Value of data:	0.1458
Measurement procedures (if any):	The Build Margin Emission Factor will be collect in the DNA website, which is responsible for this calculation.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data, updated, will be applied in *ex-post* for the calculation of the Emission Factor. The data will be annually filed (electronic archive) and it will be kept for two years after the end of project activity.
Any comment:	

Data / Parameter:	TEG_y
Data unit:	MWh/year
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*.
Source of data:	Project activity site
Value of data:	45,376
Measurement procedures (if any):	The total electricity will be checked through the Electricity Meters as required in the ACM0002.
Monitoring frequency:	Hourly measurement and monthly recording
QA/QC procedures to be applied:	
Any comment:	Necessary only for the SHP Fortuna II which have the power density greater than 4 W/m² and less than 10 W/m².

Data / Parameter:	$Cap_{JP\_DoresdeGuanhães}$
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data:	Project site.
Value of data:	14,000,000
Measurement procedures (if any):	Technical specifications on the installed equipments. Yearly monitoring frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data will be applied for the Power Density calculation.
Any comment:	-

Data / Parameter:	$Cap_{JP\_Fortuna\ II}$
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data:	Project site.
Value of data:	9,000,000
Measurement procedures (if any):	Technical specifications on the installed equipments. Yearly monitoring frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data will be applied for the Power Density calculation.
Any comment:	-

Data / Parameter:	$Cap_{JP\_Jacaré}$
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data:	Project site.
Value of data:	9,000,000
Measurement procedures (if any):	Technical specifications on the installed equipments. Yearly monitoring frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data will be applied for the Power Density calculation.
Any comment:	-

Data / Parameter:	$Cap_{JP\_Senhora\ do\ Porto}$
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data:	Project site.
Value of data:	12,000,000
Measurement procedures	Technical specifications on the installed equipments. Yearly monitoring

(if any):	frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	This data will be applied for the Power Density calculation.
Any comment:	-

Data / Parameter:	*APJ_ DoresdeGuanhães*
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:	Reservoir in the Project site.
Value of data:	110,000
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures, etc. Yearly monitoring frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	Data will be monitored and recorded by project developer.
Any comment:	The monitoring will be performed for each SHP mentioned above.

Data / Parameter:	*APJ_ Fortuna II*
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:	Reservoir in the Project site.
Value of data:	963,000
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures, etc. Yearly monitoring frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	Data will be monitored and recorded by project developer.
Any comment:	The monitoring will be performed for each SHP mentioned above.

Data / Parameter:	*APJ_ Jacaré*
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:	Reservoir in the Project site.
Value of data:	770,000
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures, etc. Yearly monitoring frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	Data will be monitored and recorded by project developer.
Any comment:	The monitoring will be performed for each SHP mentioned above.

Data / Parameter:	*APJ_ Senhora do Porto*
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:	Reservoir in the Project site.
Value of data:	420,000
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures, etc. Yearly monitoring frequency.
Monitoring frequency:	Annual
QA/QC procedures to be applied:	Data will be monitored and recorded by project developer.
Any comment:	The monitoring will be performed for each SHP mentioned above.

B.7.2. Description of the monitoring plan:

The monitoring plan for the project activity is based on the methodology ACM0002.

1) Power generation and measurement system:

General characteristics of the measurement system:

The procedures design 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) are the organs responsible for specification of the technical requirements of energy measurement system for billing, that is, those bodies monitor and approve projects for accurate accounting of energy.

The agent responsible for the measurement system for billing (SMF) develop 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.

The measurement system makes the measure and records the energy. This is installed in the panels of measurement, which are located in the control room or cabins of measurement. For this system is guaranteed the inviolability of data, which must be sealed for safety after calibration or sealed with electronic passwords.

The measurement system contains also a communication system that has the function of sending the data from dispatched electricity for the grid to the CCEE.

Data monitoring:

The readings of meters are used for calculating the emission reductions when the Meter is in normal operation state. The monitoring steps are as follows:

(1) The data will be measured hourly and recorded monthly;
(2) The power output settlement sheet, sales receipts will be used to cross check the monitored data and/or with the CCEE data measured (from CCEE databank – SINERCON).
(3) The project owner provides DOE with readings record of meters, acess to the CCEE data measured and sales invoices.

(4) The operational structure should be managed by the Guanhães Energia management responsible;
(5) The emission reductions and any project emissions should be managed/calculated by the Carbotrader project manager responsible;

The Total electricity produced by the project activity (TEG_y), including the electricity supplied to the grid and the electricity supplied to internal loads in year y, will be monitored in order to account any project emissions that would occur.

Details regarding the parameter to be monitored can be founded in the sections B.7.1, B.7.2 and Annex 4.

Quality control:

(1) Calibration of meters
The calibration of meters conducted by qualified organization must comply with national standards and industrial regulations to ensure the accuracy. The meters must be sealed for safety after calibration. The calibration records must be archived together with other monitoring records. The class of accuracy in the equipment that will be used in the project activity is under the national standards (NBR 14519 from Associação Brasileira de Normas Técnicas – Brazilian Association of Technical Standards). It can be viewed in the Grid Procedures from the National Grid Operator: Module 12, Sub-module12.2 Installation of the Measurement System for Billing in the link:
http://www.ons.org.br/download/procedimentos/Submodulo%2012.2_v10.0.pdf.

(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[6]

Data Management:

All the project activity issues regarding the SHP's construction will be treated by the SPE Guanhães Energia Directors Board responsible (to be defined during the plant construction). By now all the SHPs construction issue has been conducted by the SPE Guanhães Energia.

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

All data gathered in the monitoring range will be electronically filed and kept for at least 2 years after the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

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

Training Procedures:

All the training necessary for the plant operational team (eventually remote and local operators) will be provided or will be required from the third party service provider during the plant construction and during the plant commercial operation.

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

2) Emission Factors:

The Emission Factor related to this project activity ($EF_{grid,CM,y}$, $EF_{grid,OM-DD,y}$ e $EF_{grid,BM,y}$) as mentioned previously, are available by the brazilian DNA and it can be viewed at its website (www.mct.gov.br/clima). Thus, the monitoring of such data will be ex-post through periodic access to data provided by DNA.

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: 04/09/2009.

The entity responsible for its development is:

Company:	CARBOTRADER Assessoria e Consultoria em Energia Ltda.
Address:	Rua 23 de Maio, Nº 790, sala 22A
City :	Jundiaí
State:	São Paulo
Zip code :	13.207-070
Country:	Brazil
Telefon:	(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:	Director

Carbotrader is also a Project Participant listed in Annex 1.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

15/12/2009 (the EPC contract signature)

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

30 years.

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

C.2.1. Renewable crediting period:

21 years

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

01/02/2011 or the date in which occurs the UNFCCC registration, the one that occurs later.

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:

With respect to regulatory permits:

The **Dores de Guanhães** SHP has autorizations issued by ANEEL:

- Authorization Resolution nº 931, issued on 29 May 2007 owner exchange
- Dispatch from ANEEL nº 2.001, issued on 20 June 2007, base Project approval.

The **Fortuna II** SHP has autorizations issued by ANEEL:

- Authorization Resolution nº 932, issued on 29 May 2007, owner exchange.
- Dispatch from ANEEL nº 1.865, issued on 13 June 2007, base Project approval.

The **Jacaré** SHP has autorizations issued by ANEEL:

- Authorization Resolution nº 934, issued on 29 May 2007, owner exchange.
- Dispatch from ANEEL nº 2.002, issued on 20 June 2007, base Project approval.

The **Senhora do Porto** SHP has autorizations issued by ANEEL:

- Authorization Resolution nº 933, issued on 29 May 2007, owner exchange.
- Dispatch from ANEEL nº 2.003, issued on 20 June 2007, base Project approval.

With respect to environmental permits legislation requires issuing of following licenses:

- **Preliminary License (LP):** preliminary phase of planning activity in which concept and location of enterprise are evaluated. In this phase Environmental Impact Study (EIA) and Environmental Impact Report (RIMA) are analysed, or, depending on the case, the Environmental Control Report (RCA).

- **Installation License (LI):** authorizes implementation of enterprise. In this phase, the Environmental Control Plan (PCA) is analysed, it contains projects for systems of treatment and/or disposing of liquid and atmospheric effluents and solid residue etc.
- **Operation License (LO):** authorizes operation of enterprise after verification of compliance with measures determined in phases of LP and LI.

The **Dores de Guanhães** SHP has the following Environmental Licenses:

- LI – Installation License nº 029/2007 - FEAM in 22.08.2007 validate until 10.04.2013.
- APEF – Autorização para Exploração Florestal do Canteiro de Obras – nº 28074 IEF in 14.11.07.

The **Fortuna II** SHP has the following Environmental Licenses:

- LI – Installation License nº 031/2007 - FEAM in 23.07.2007 validate until 10.04.2013.
- APEF – Autorização para Exploração Florestal do Canteiro de Obras – nº 68994 IEF in 14.11.07.

The **Jacaré** SHP has the following Environmental Licenses::

- LI – Installation License nº 027/2007 - FEAM in 22.08.2007 validate until 30.03.2013.
- APEF – Autorização para Exploração Florestal do Canteiro de Obras – nº 68995 IEF in 14.11.07.

The **Senhora do Porto** SHP has the following Environmental Licenses:

- LI – Installation License nº 030/2007 - FEAM in 23.07.2007 validate until 10.04.2013.
- APEF – Autorização para Exploração Florestal do Canteiro de Obras – nº 68993 IEF in 14.11.07.

With respect to the transboundary environmental impacts, the programs and projects involved in the Environmental Control Plan (PCA – Plano de Controle Ambiental) of the four SPE Guanhães SHPs take in account the impacts that are beyond project limits and it proposes the correct procedures in case the impact is caused by the project activity.

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

The environmental impacts from SHPs activities are not considered significant by the participants of the project. But several environmental improvement actions were made.

All SHP from the Project activity has a Environmental Management Guidelines (Plano de Controle

Ambiental – PCA). The studies have a project influence area environmental diagnostic, and, more than this has a variety of programs and activities that foresee to minimize the negative effects and assesses the changes resultants from the hydric system installations.

The SHPs **Dores de Guanhães**, **Fortuna II**, **Jacaré** e **Senhora do Porto** activities also have the environmental and social objetives forecasted:

- Environmental Management
- Tourism, Environmental Communication and Healthy Incentive and Support Programs
- Degraded Area recover program, deforestation monitoring and fauna and flora recovery
- Primata monitoring project, birds fauna, Herptofauna, Ictiofauna, Limnological and Vegetation
- Climate monitoring project
- APA (Environmental Protection Area) Bom Retiro implementation proposal
- APA Pedra da Gaforina and APA Virginópolis/MG Utilization, Management and Restructuring proposal

SECTION E. Stakeholders' comments

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

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

The project activity applies to only one state of the federation, thus, 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:

- City Hall of Municipality Dores de Guanhães;
- City Council of Municipality Dores de Guanhães;

- City Hall of Municipality Guanhães;
- City Council of Municipality Guanhães;
- Environment Secretary of Municipality Guanhães;
- Municípios da Micro Região da Bacia do Suaçui Association - AMBAS of Guanhães;
- Sindicato dos Produtores Rurais of Guanhães;
- Associação Comercial e Industrial of Guanhães;
- Sindicato dos Trabalhadores na Indústria de Extração de Madeira e Lenha of Guanhães;
- City Hall of Municipality Virginópolis;
- City Council of Municipality Virginópolis;
- State Environment Foundation – FEAM;
- Brazilian Forum of NGOs and Environmental and Development Social Movements – FBOMS ;
- State Prosecutors Office of Minas Gerais State;
- National Prosecutors Office.

The interested parties above were invited to present their concerns and provide comments on project activity during a period of 30 days after receipt of the invitation letter.

E.2. Summary of the comments received:

Until the present moment no stakeholder comments were done.

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

Not necessary since there are no comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	SPE Guanhães Energia S.A.
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Represented by:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

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

The baseline emissions are calculated according to the "Tool to calculate the emission factor for an electricity system" version 01 approved in meeting number 35 of the UNFCCC's Executive Board. With this methodology the National Grid Operator (ONS) is tasked with explaining the SIN´s (National Interconnected System) operational practices regulated by the ANEEL (Brazilian Electricity Regulatory Agency) 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 CO2 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

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Propotion of data to be monitored	How will the data be archived? (eletronic/paper)	Comments
$EG_{facility,y}$	Project Activity	MWh	m	montlhy	100%	electronic	The electricity delivered to the grid will be checked trough the energy metering, data acquisition software and cross checked through CCEE databank.
TEG_y	Project Activity	MWh	m	monthly	100%	electronic	The Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*, will be monitored in order to account the project emission. Necessary only for the SHP Fortuna II as described in the B.7.1 item.
$EF_{grid,CM,y}$	DNA	tCO_2/MWh	c	annually	100%	electronic	These data will be monitored through *ex-post* calculation. The datas will be available by the DNA (Designated National Authority) werbsite.
$EF_{grid,OM-DD,y}$	DNA	tCO_2/MWh	m	Annually or montly	100%	electronic	The Operating Margin Emission Factor, will be monitored in the DNA website, which is responsible for this calculation.
$EF_{grid,BM,y}$	DNA	tCO_2/MWh	m	annually	100%	electronic	The Build Margin Emission Factor, will be annually monitored in the DNA website, which is responsible for this calculation.