



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

**CONTENTS**

- A. General description of project activity
- B. Application of a baseline and monitoring methodology
- C. Duration of the project activity / crediting period
- D. Environmental impacts
- E. Stakeholders' comments

**Annexes**

- Annex 1: Contact information on participants in the project activity.
- Annex 2: Information regarding public funding
- Annex 3: Baseline information
- Annex 4: Monitoring plan

**SECTION A. General description of project activity****A.1 Title of the project activity:**

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Baruíto Hydroelectric Project  
PDD Version Number 01  
07/02/2007

**A.2. Description of the project activity:**

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The Baruíto Hydroelectric Project (hereafter, the “Project”) developed by Global Energia S.A.(hereafter referred to as the “Project Developer”) consists of the installation of a small hydroelectric plant with a capacity of 18MW, located in Sangue River, in the municipality of Campo Novo do Parecis, Mato Grosso State, Brazil.

The plant has the objective to provide renewable electricity to the municipality of Campo Novo dos Parecis in Mato Grosso State, Midwest region of Brazil. The 54.19 km transmission line will be built by the project developer and will be connected to the S-SE-CO interconnected system (hereafter referred to as “the Grid”) through the municipality of Campo Novo dos Parecis.

The plant was built in a remote area, which was isolated from the interconnected grid in the near past. The plant will bring renewable electricity to develop this remote area both socially and economically, which has always been a difficult issue. This project will increase the supply of electricity to the grid, offsetting thermal generation with a renewable source of energy, thus the project will reduce CO<sub>2</sub>e emissions. The power density of the proposed project is 18.75 W/m<sup>2</sup>, therefore project emissions will not be accounted for.

The participants of the project recognize that this Project activity is helping Brazil to fulfil its goals of promoting sustainable development. Specifically, the project is in line with host-country specific CDM requirements due to the following reasons:

- Contributes to local environmental sustainability, since it decreases the dependence on fossil fuels, thus improving air quality.
- Contributes towards better working conditions and increases employment opportunities in the area where the project is located.
- Contributes towards better revenue distribution since it contributes to the regional/local economic development.
- Contributes to development of technological capacity because the technology, hand labour and technical maintenance will be provided inside Brazil, consolidating the technology in the country
- Contributes to regional integration and connection with other sectors. The project facilitates the increase of small hydroelectricity as a generating source in the region and therefore may encourage other similar companies that want to replicate this experience.

**A.3. Project participants:**

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Table 1 - 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)	Global Energia S.A.	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Group PLC	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 requesting registration, the approval by the Party(ies) involved is required.

<b>A.4. Technical description of the <u>project activity</u>:</b>
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<b>A.4.1. Location of the <u>project activity</u>:</b>
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<b>A.4.1.1. <u>Host Party(ies)</u>:</b>
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Brazil. (the “Host Country”)

<b>A.4.1.2. <u>Region/State/Province etc.:</u></b>
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Mato Grosso State.

<b>A.4.1.3. <u>City/Town/Community etc:</u></b>
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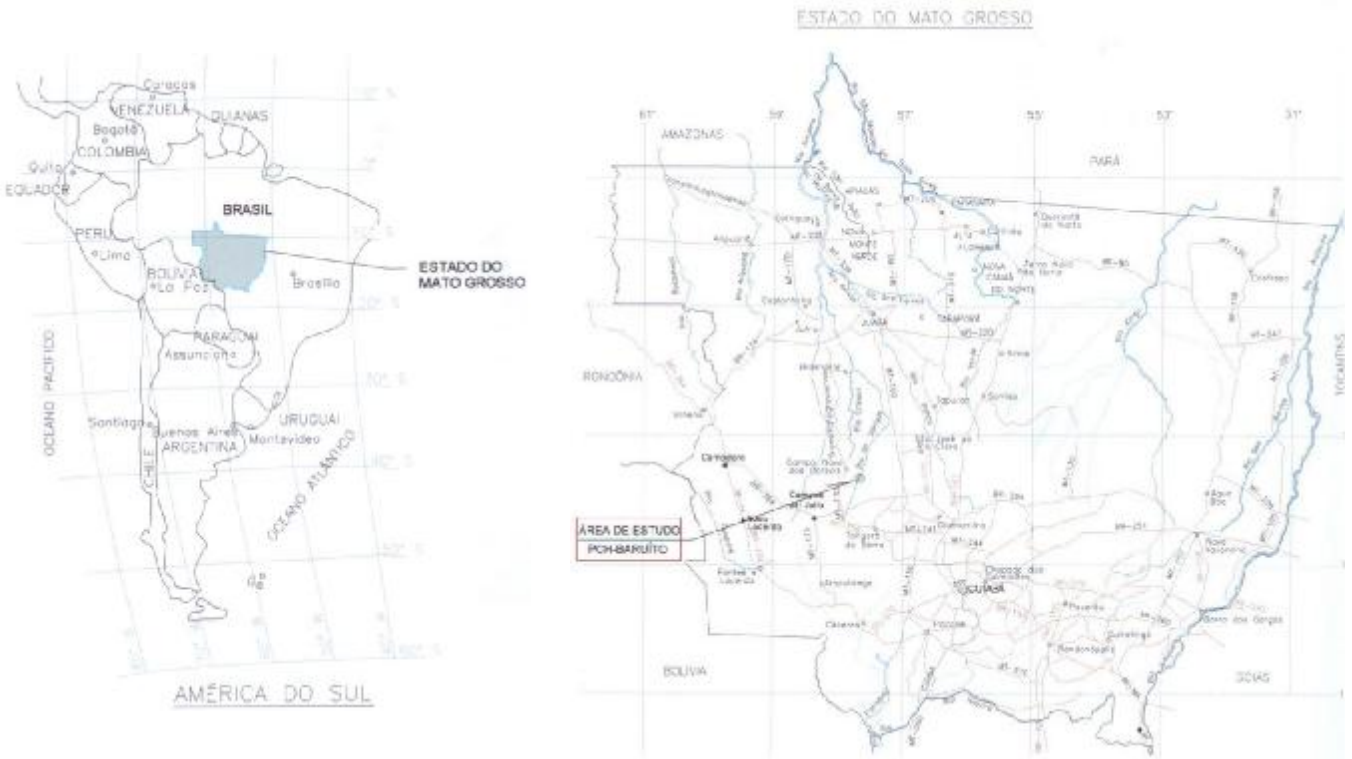
Campo Novo dos Parecís Municipality.

<b>A.4.1.4. <u>Detail of physical location, including information allowing the unique identification of this <u>project activity</u> (maximum one page):</u></b>
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The exact location of the project is defined using GPS coordinates 13°19'05”S, 57°35'49”W.



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

According to Annex A of the Kyoto Protocol, this project fits in UNFCCC Sectoral Category 1: Energy Industries (renewable / non-renewable sources).

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

The project consists of a plant that generates renewable electricity to supply electricity to the grid. The hydro power plant has three sets of equipments. Each consists of one Brazilian horizontal Kaplan S type turbine and Brushless three-phase generators. A Kaplan turbine is a propeller-type water turbine with adjustable blades.

**Table 2 – Turbine technical description**



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Turbine Manufacturer/Type	ALSTOM / Kaplan S
Quantity	3
Nominal Capacity	6.1 MW <sup>1</sup>

Table 3 - Generator technical description

Generators Manufacturer/Type	WEG / S1000
Nominal Power	6630 kVA
Nominal Tension	6.9 kV
Power factor	0,9

By legal definition of the Brazilian Power Regulatory Agency (ANEEL – *Agência Nacional de Energia Elétrica*), resolution number 652, issued on December 9<sup>th</sup>, 2003, small hydro in Brazil must have installed capacity greater than 1MW but not more than 30MW.

A low level diversion dam (height 20m) raises the water level of the river sufficiently to enable an intake structure to be located on the side of the river. The general arrangement of the diversion dam consists of the implementation of slide bar structures, a spillway and an adduction structure, with total extension of about 430 m. A 138 kV transmission line (total distance 54.19 km) will be built from the switchyard to the CEMAT sub-station at Campo Novo dos Parecís to connect the plant to the grid.

The technology used in the project is environmentally safe and sound, for being a hydro power plant requiring for a minimum diversion dam, which stores water to generate clean electricity; the project's reservoir area is 0.96 km<sup>2</sup>. The project power density is 18.75 W/m<sup>2</sup>, greater than the applicability condition of the methodology.

<b>A.4.4 Estimated amount of emission reductions over the chosen crediting period:</b>
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Table 4 - Estimated Emissions Reductions from the Project

Years	Annual estimation of emission reductions in tonnes of CO <sub>2</sub> e
2007 (since October)	8.621
2008	34.483
2009	34.483
2010	34.483
2011	34.483
2012	34.483
2013	34.483
2014 (until September)	25.862

<sup>1</sup> Although the nominal total installed capacity is 18,3 MW, the actual installed capacity to be used is 18 MW, the amount that the project developer is authorised to sell to the grid. The ANEEL dispatch authorization states 18 MW, this value will be used as the installed capacity.



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Total estimated reductions (tonnes of CO <sub>2</sub> e)	241.383
Total number of Crediting years	7
<b>Annual average over the crediting period of estimated reductions</b> (tonnes of CO <sub>2</sub> e)	34.483

**A.4.5. Public funding of the project activity:**

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The project will not receive any public funding from Parties included in Annex I of the UNFCCC.

**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:**

1. The baseline methodology: ACM0002: “Consolidated baseline methodology for grid connected electricity generation from renewable sources” version 06, in effect as of 19 May 2006;
2. The monitoring methodology: the approved consolidated monitoring methodology ACM0002: “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”, Version 06 in effect as of 19 May 2006;
3. The tool for demonstration and assessment of additionality: “the tool for demonstration and assessment of additionality”, Version 02, in effect as of 28 November 2005.

More information about the methodology can be obtained at:

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

**B.2 Justification of the choice of the methodology and why it is applicable to the project activity:****Table 5 - Applicability criteria as set out in the methodology**

Criteria	Are the criteria met?	Justification
Applies to electricity capacity additions from: <ul style="list-style-type: none"> <li>× Run-of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased.</li> <li>× New hydro electric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m<sup>2</sup></li> <li>× Wind sources;</li> <li>× Geothermal sources;</li> <li>× Solar sources;</li> <li>× Wave and tidal sources.</li> </ul>	Yes	As the description in section A.4.3, the Project consists of a hydro power plant with a diversion dam and thus is in accordance with this requirement.
This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	Yes	The project consists of the construction of a new hydroelectric plant, therefore no fuel switch is applicable.
The geographic and system boundaries for the relevant electricity grid can be clearly identified and information	Yes	The plant is connected to the S-SE-CO interconnected system. All data



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on the characteristics of the grid is available		necessary to calculate the grid is available. See Annex 3.
Applies to grid connected electricity generation from landfill gas capture to the extent that it is combined with the approved "Consolidated baseline methodology for landfill gas project activities" (ACM0001).	Not applicable	The project is a hydroelectric project, thus this condition is not applicable.

The project activity meets all the conditions above and is therefore applicable to the methodology.

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

The project boundary includes the S-SE-CO interconnected system, the physical site of the plant as well as the reservoir area. For the baseline determination, only CO<sub>2</sub> emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity were accounted for.

The grid boundary is clearly defined as the spatial extent of the power plants that can be dispatched without significant transmission constraints. Specifically for this project the grid in question is the Rondônia-Acre Isolated System.

**Table 6 - GHG included or excluded in the project boundary**

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid electricity production	CO <sub>2</sub>	Included	According to ACM0002 only CO <sub>2</sub> emissions from electricity generation should be accounted for.
		CH <sub>4</sub>	Excluded	According to ACM0002
		N <sub>2</sub> O	Excluded	According to ACM0002
Project Activity	Hydro electric electricity production	CO <sub>2</sub>	Excluded	As the power density of the project is more than 10 W/m <sup>2</sup> no greenhouse gas emissions from the project have to be considered according to ACM0002.
		CH <sub>4</sub>	Excluded	
		N <sub>2</sub> O	Excluded	

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

The project consists of a new electricity generation facility that will supply electricity to the grid. As stated in the methodology, for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:





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Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in section B.6.1.

The following table provides the key information and data used to determine the baseline scenario:

Table 7 - key information and data used to determine the baseline scenario

Variable	Unit	Data Source
Operating Margin Emissions Factor (EF_OM <sub>y</sub> in tCO <sub>2</sub> /MWh)	tCO <sub>2</sub> /MWh	See Annex 3
Build Margin Emissions Factor (EF_BM <sub>y</sub> in tCO <sub>2</sub> /MWh)	tCO <sub>2</sub> /MWh	
Baseline Emissions factor (EF <sub>y</sub> )	tCO <sub>2</sub> /MWh	

The national grid is divided in two main subsystems. There are transmission constrains the link between these two systems that limit the energy throughput between them so that they must be seen as separate systems. Specifically for this project the baseline is defined as the S-SE-CO interconnected system.

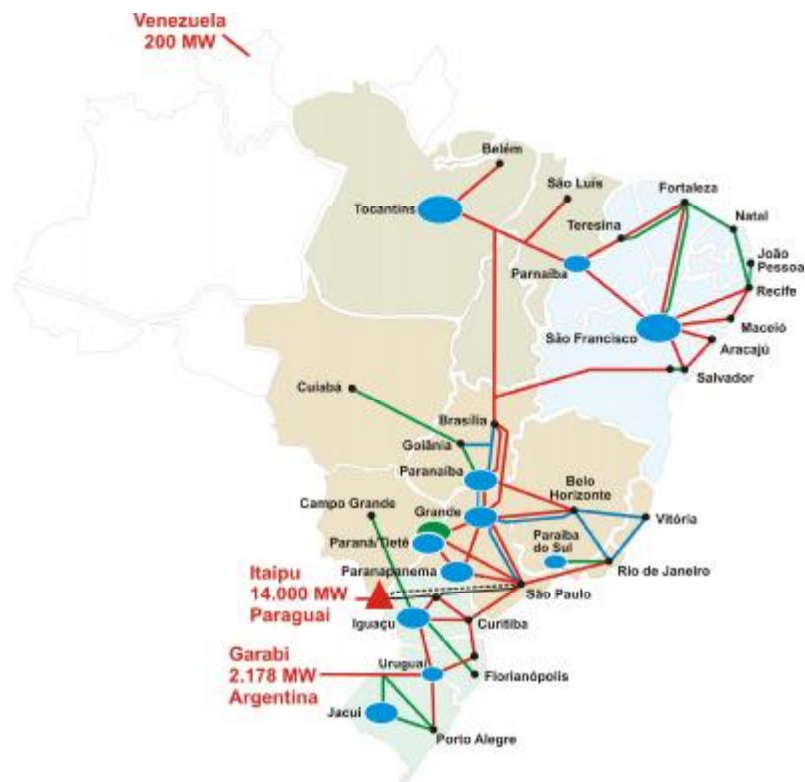


Figure 1 - National Grid Configuration

All realistic and credible baseline alternatives to the project activity were identified and are listed below.

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- Scenario 1** Continuation of current practices, i.e. Electricity will continue to be generated by the existing generation mix operating in the grid;
- Scenario 2** Build a thermoelectric plant, with internal combustion technology, diesel fueled and with a energy output similar to project activity and;
- Scenario 3** The Project Activity not taken as a CDM project.

Scenario 2 can be excluded from further consideration since the project developer is a hydro company, and building thermal power plants is not part of its core business. This is also conservative, since scenario 1 (continuation of generation by the existing grid generation mix) would have lower emissions. According to the full assessment of alternatives (see section B.5) alternative 1 is identified as the baseline scenario.

<b>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):</b>
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**Step 0. Preliminary screening based on the starting date of the project activity**

Project participants wish to have the crediting period starting after to the registration of their project activity. In spite of that, the communication between the project developer and the carbon consultants started before the project started operation and before the start of the crediting period. The president of the Developer Company and also shareholder of the project asked EcoSecurities to take a course related to Carbon Credits in the year 1999, before the project activity began to be constructed. Subsequently, meetings and discussions were held between EcoSecurities and the project developer concerning CDM accreditation for the project.

**Step 1. Identification of alternatives to the project activity consistent with current laws and regulations*****Sub-step 1a. Define alternatives to the project activity:***

All realistic and credible baseline alternatives to the project activity were identified and are listed below.

- Scenario 1 Continuation of current practices, i.e. Electricity will continue to be generated by the existing generation mix operating in the grid, predominantly fossil-fuel-fired thermal plants;
- Scenario 3 The Project Activity not undertaken as a CDM project.

***Sub-step 1b. Enforcement of applicable laws and regulations:***

**Scenario 1** – Is consistent with current laws and regulations. There is no regulation in Brazil to prevention of continuation of current practice.



**Scenario 3** – Is consistent with ANEEL laws and regulations. There is no regulation in Brazil to prevent implementation of hydroelectric plants.

## Step 2. Investment Analysis

### *Sub-step 2a: Determine appropriate analysis method*

According to the tool for the demonstration and assessment of additionality, one of three options must be applied for this step: simple cost analysis (where no benefits other than CDM income exist for the project), investment comparison analysis (where comparable alternatives to the project exist) or benchmark analysis.

Option three was chosen (benchmark analysis).

### *Sub-step 2b: Option III - Apply benchmark analysis*

The Net Present Value (NPV) will be used as the most appropriate financial indicator for comparison. The NPV places a valuation, in terms of present value, of the future income associated to a project or investment alternative, i.e. it measures the present value of cash flows generated by the project along its lifetime. The decision to go ahead with the project is made if the NPV is positive. A positive NPV generates value to the company and a negative NPV represents a loss to the company.

In order to perform a benchmark analysis using NPV, a discount rate must be chosen. The basis for the selected discount rate used in the financial analysis is the SELIC rate (Sistema Especial de Liquidação e Custodia, that is, Special System of Clearance and Custody), set by the Banco Central do Brasil (Central Bank of Brazil) which represents the expected return of a low risk investment fund<sup>2</sup>. Results with negative NPV mean that the investment return is lower than the discount rate, thus lower than the return from a low risk investment. Positive NPV represents a return higher than a conservative investment. Scenarios with a negative NPV presents significant financial/economical barrier. In 2000, the year when the decision to go ahead with the project activity was taken, the SELIC rate oscillated between 13.49% and 16.49% (Brazil Central Bank, <http://www.bcb.gov.br/?english>). In order to be conservative, 13% has been taken as a reference value for the financial and sensitivity analysis. This is conservative given that the SELIC rate represents the return on a zero risk government bond, as compared to investment in a hydro electric grid connected power plant, which incurs many risks.

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

Table 8 below shows the financial analysis for the project activity without carbon finance. As shown, the project NPV without carbon is negative, proving that the Project is not attractive for investors, which inhibits the project's implementation.

#### **Table 8– Project Financial Results**

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<sup>2</sup> Central Bank of Brazil <http://www.bcb.gov.br/?SELICEN>



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Parameter	unit	value	source
Investments	R\$	72,017,908.00	Project developer
Installed Capacity	MW	18.00	ANEEL
Electricity generation	MWh	132,092.00	Project developer
Electricity Tariff	R\$/MWh	64.00	PPA
Annual Increase in tariff	%	10.00	IGPM 2001-6
O&M Costs	R\$/month	2,037,096.00	Project developer
Discount Rate	%	13.00%	SELIC
<b>NPV without Carbon Credits</b>	R\$	<b>(14,683,264.49)</b>	Calculated

*Sub-step 2d: Sensitivity analysis*

A sensitivity analysis was conducted by altering the following parameters:

- O&M costs reduction;
- Discount rate reduction;
- Investment reduction and;
- Electricity tariff increase.

Those parameters were selected as being the most likely to fluctuate over time. Financial analyses were performed altering these parameters by 10% in favour of the project, and assessing what the impact on the project NPV would be (see Table 9 below).

**Table 9 - Sensitivity analysis summary**

Parameter	Variation	NPV
O&M costs	-10%	(R\$ 13,705,053.97)
Discount Rate	-10%	(R\$ 11,607,269.96)
Investments	-10%	(R\$ 8,309,998.30)
Electricity Tariff	+10%	(R\$ 8,800,114.23)

The financial analysis shows that even if the critical parameters are varied more than expected, the NPV of the project is still negative and therefore not financially attractive for a rational investor.

#### Step 4. Common Practice Analysis

##### *Sub-step 4a: Analyse other activities similar to the proposed project activity*

Brazilian electricity sector expansion was practiced during the 60's and 70's fundamentally based on state owned large hydro plants. It was only during the 90's, with the privatization of the sector, that the influence of central planning started to diminish. Central planning, as carried out in Brazil, always sought the large plants as a means of keeping control of the system and allocating scarce resources (monetary and workforce) to the best projects. As of now, less than 2% of the country's installed capacity is located in small hydro plants, with less than 30 MW of installed capacity; Figure 2 shows the installed capacity distribution among the different types of power plants. One of the side effects of central planning was the absence of market driven players seeking alternative sources. It is felt that the traditional players (privatized utilities) are still seeking larger plants and that both the new player and the regulatory agencies



## CDM – Executive Board

are still in the learning process of dealing with a more decentralized system. By the end of 2004, only 9 new small-hydro projects were authorized by the regulatory agency.



Figure 2 – Installed capacity distribution per type of generation (Source: ANEEL BIG)<sup>3</sup>

In order to stimulate other alternatives, Brazilian government launched a program called Proinfa (Programa de Incentivo as Fontes Alternativas de Energia Elétrica – Alternative Sources for Electric Energy Incentive Program) that sought to increase the share of small hydro, biomass cogeneration and wind plants. Basically, it offers a better-than-market purchase price and long-term contracts for electricity and lower interest rates in loans from the federal development bank (BNDES). Even with these conditions, the program attracted fewer projects than intended to. Even now, some of the projects that were included in the program are withdrawing from it, basically due to the cumbersome process in obtaining finance from BNDES. As other similar projects, despite its attractiveness, the Project did not apply for participation in Proinfa.

It should also be noted that several of the projects being developed have included CER revenues in their feasibility studies. As of now, there are more than 15 plants with CDM projects in different stages of development showing that CER revenues are an important aspect of these projects.

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

The Figure 3 below shows the trends for installed capacity expansions in the electric sector in Brazil, including projects that are authorized by the electricity agency, ANEEL, but that are not operating yet.

<sup>3</sup> **CGH** – Central Geradora Hidrelétrica, meaning Hydroelectric Power Unit (less than 1MW); **EOL** - Central Geradora Elioelétrica, meaning Wind Power Unit; **PCH** – Pequena Central Hidrelétrica, meaning Small Power Hydro (between 1 and 30MW); **SOL** – Central Geradora Solar Fotovoltaica, meaning Solar Photovoltaic Power Unit; **UHE** – Usina Hidrelétrica de Energia, meaning Hydroelectric Unit (more than 30MW); **UTE** – Usina Termelétrica de Energia, meaning Thermoelectric Unit; **UTN** – Usina Termonuclear, meaning Thermonuclear Unit.

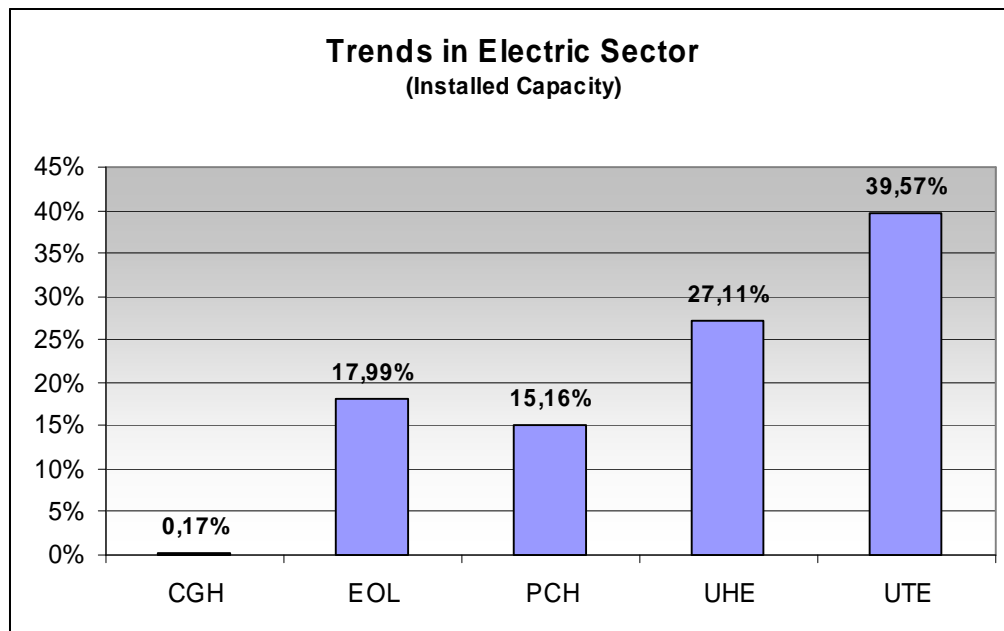


Figure 3 - Trends in the electric sector, based in installed capacity. (Source: adapted from ANEEL BIG)

As shown by the information provided above, generating electricity in small hydroelectric plants is neither the common practice nor the expansion trends in Brazil. Therefore, based on these data, it is clearly demonstrated that the prevailing practice, is not the construction or operation of small hydro plants.

#### Step 5. Impact of CDM registration

This section clearly explains how the approval and registration of the project as a CDM activity, and the attendant benefits and incentives derived from the project activity, will alleviate the investment barrier illustrated above.

The financial benefit from the revenue obtained by selling the GHG emissions reductions has been one of the key issues encouraging project developers to go ahead with the project. The CDM has been considered from an early stage of the project implementation (see Step 0).

As shown in Step 2 above, the project is unlikely to move forward without the additional financial support. The additional revenue generated by carbon sales would be very important to make the project go ahead, since the project NPV with carbon revenues became less negative, see Table 10 below. Although with carbon revenues, the NPV, under current carbon prices, remains negative, CDM participation brings numerous other attendant benefits, including reduced currency risks due to the fact that CDM revenue is gained in US\$, enhanced international participation in the project, international publicity of the project and recognition of its environmental benefits, and the added prestige associated with a pioneering CDM project activity. The use of the CDM will allow the Project developer to overcome the investment barrier previously demonstrated..

Table 10 - Financial analysis considering carbon credits revenues



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Analysis with Carbon Revenues		
NPV with Carbon Credits	R\$	(7,615,169.04)

All steps of the Tool for the demonstration and assessment of additionality were satisfied, thus the project is additional to what would have occurred in absence of the project activity.

## B.6 Emission reductions

### B.6.1. Explanation of methodological choices:

**Step 1 – Calculate the Operating Margin emission factor:** the calculation was based on the simple OM method, option (a) of the methodology. This method was selected because low-cost/must run resources constitute less than 50% of total grid generation in average of the five most recent years. For more information please see Annex 3

The OM was calculated *ex-ante*, using the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission.

The Simple OM emission factor ( $EF_{OM, simple}$ ) is calculated as the generation-weighted average emissions per electricity unit (tCO<sub>2</sub>/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM, simple\_ajusted, y} (tCO_2 / MWh) = (1 - I_y) \frac{\sum_{i,j} F_{i,j,y} * COEF_{i,j}}{\sum_j GEN_{j,y}} + I_y \frac{\sum_{i,k} F_{i,k,y} * COEF_{i,k}}{\sum_k GEN_{k,y}} \quad (1)$$

Where,

- $F_{ij}$  is the amount of fuel  $i$  (in GJ) consumed by power source  $j$  or  $k$  in year  $y$ ;
- $k$  is the set of low-cost or must-run plants and carbon financed plants delivering electricity to the grid;
- $j$  is the other sources delivering electricity to the grid, not included in the set  $k$ .
- $COEF_{ij}$  is the carbon coefficient of fuel  $i$  (tCO<sub>2</sub>/GJ), consumed in plants  $j$  or  $k$ ;
- $GEN_j$  is the electricity (MWh) delivered to the grid by sources  $j$  or  $k$ .

$$I_y = \frac{\text{number of hours per year for wich low - cost / must - run are on margin}}{8760 \text{ hours per year}} \quad (2)$$

**Step 2 – Calculate the Build Margin emission factor:** the calculation was done as the generation-weighted average emission factor (tCO<sub>2</sub>/MWh) of a sample of power plants  $m$ , as follows:

$$EF_{BM} = \frac{\sum_{im} F_{im} \cdot COEF_{ij}}{\sum_m GEN_m} \quad (3)$$

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Where  $F_{i,m,y}$ ,  $COEF_{i,m}$  and  $GEN_{m,y}$  are analogous to the variables described for the simple OM method above, for plants  $m$ . This sample includes either the last five plants built or the most recent plants that combined account for 20% of the total generation, whichever is greater (in MWh). From these two options the sample group that comprises the larger annual generation is the five most recent plants.

The option 1 of the methodology was chose to calculate the Build Margin emission factor *ex-ante* based on the most recent information available on plants already built for sample group  $m$  at the time of PDD submission.

**Step 3 – Calculate the baseline emission factor:** the calculation was done as the weighted average of the Operating Margin emission factor and the Build Margin emission factor:

$$EF = w_{OM} \cdot EF_{OM, simple\_ajusted} + w_{BM} \cdot EF_{BM} \quad (4)$$

where the weights  $w_{OM}$  and  $w_{BM}$ , by default, are 50% (i.e.,  $w_{OM} = w_{BM} = 0.5$ ), and  $EF_{OM,y}$  and  $EF_{BM,y}$  are calculated as described in Steps 1 and 2 above and are expressed in tCO<sub>2</sub>/MWh.

**Project Emissions: (PE)**

According to Annex 5, EB 23, hydroelectric power plants with power densities greater than 4 but less than 10 W/m<sup>2</sup> have to account for project emissions due to the reservoir. Project power density is 18.75 W/m<sup>2</sup>, thus project emissions were not accounted for.

$$PE = 0 \quad (5)$$

**Baseline Emissions: (BE)** resulting from the electricity supplied and/or not consumed from the grid is calculated as follows,

$$BE = EG_y \cdot EF \quad (6)$$

Where,

$EG_y$  is the annual net electricity generated from the Project and delivered to the grid

**Leakage Emissions: (L)** no leakage emissions calculation is needed.

**Emission Reductions: (ER)**

$$ER = BE - PE \quad (7)$$

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





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<b>Data / Parameter:</b>	$EF_{OM, \text{ simple\_ajusted}}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	Grid Operating Margin
Source of data used:	See Annex 3
Value applied:	0.4349
Justification of the choice of data or description of measurement methods and procedures actually applied :	OM is calculated according to option (b) Simple Ajusted OM method of methodology ACM0002. For further information please refer to Annex 3.
Any comment:	

<b>Data / Parameter:</b>	$w_{OM}$
Data unit:	Fraction
Description:	Weighting
Source of data used:	ACM0002
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default weighting value for Operating Margin taken from ACM0002
Any comment:	

<b>Data / Parameter:</b>	$EF_{BM}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	Grid Build Margin
Source of data used:	See Annex 3
Value applied:	0.0872
Justification of the choice of data or description of measurement methods and procedures actually applied :	BM is calculated according to methodology ACM0002. For further information please refer to Annex 3.
Any comment:	

<b>Data / Parameter:</b>	$w_{BM}$
Data unit:	Fraction
Description:	Weighting
Source of data used:	ACM0002
Value applied:	0.5
Justification of the	Default weighting value for Build Margin taken from ACM0002



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choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

<b>Data / Parameter:</b>	<b>EF<sub>v</sub></b>
Data unit:	tCO <sub>2</sub> /MWh
Description:	Grid emission factor. Is the CO <sub>2</sub> emissions intensity of the electricity displaced in the grid
Source of data used:	See Annex 3
Value applied:	0.2611
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Baseline Emission Factor calculation consists of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Detailed information is attached in Annex 3.
Any comment:	

<b>Data / Parameter:</b>	$\lambda_{2003}$
Data unit:	Fraction
Description:	Number of hours per year for which low-cost must-run sources are on margin, for 2003
Source of data used:	See Annex 3
Value applied:	0.5312
Justification of the choice of data or description of measurement methods and procedures actually applied :	$\lambda$ calculation was done according to the Methodology ACM0002.
Any comment:	

<b>Data / Parameter:</b>	$\lambda_{2004}$
Data unit:	Fraction
Description:	Number of hours per year for which low-cost must-run sources are on margin, for 2004
Source of data used:	See Annex 3
Value applied:	0.5055
Justification of the choice of data or description of	$\lambda$ calculation was done according to the Methodology ACM0002.



## CDM – Executive Board

measurement methods and procedures actually applied :	
Any comment:	

<b>Data / Parameter:</b>	$\lambda_{2005}$
<b>Data unit:</b>	Fraction
<b>Description:</b>	Number of hours per year for which low-cost must-run sources are on margin, for 2005
<b>Source of data used:</b>	See Annex 3
<b>Value applied:</b>	0.5130
<b>Justification of the choice of data or description of measurement methods and procedures actually applied :</b>	$\lambda$ calculation was done according to the Methodology ACM0002.
<b>Any comment:</b>	

<b>Data / Parameter:</b>	Area submerged
<b>Data unit:</b>	km <sup>2</sup>
<b>Description:</b>	Surface area of the reservoir
<b>Source of data used:</b>	Project developer data, report named “Principais Características do Projeto”.
<b>Value applied:</b>	0,96
<b>Justification of the choice of data or description of measurement methods and procedures actually applied :</b>	Area submerged
<b>Any comment:</b>	

<b>B.6.3 Ex-ante calculation of emission reductions:</b>
--

All equations used to estimate the emission reductions were provided in section B.6.1. The grid emission factor was calculated using equations 1, 2, 3 and 4, according to the description provided in the methodology. Project emissions, equation 5, Baseline emissions, equation 6 and emissions reduction calculations, equation 7, were done also according to the methodology.

Detailed information of how the equations were used, and values applied are provided in Table 11

**Table 11 - The ex-ante emission reductions values and calculations**



## CDM – Executive Board

Parameter	Formula	Value	Unit
BM	provided in section B.6.1	0.0872	tCO <sub>2</sub> /MWh
wBM	-	0.5	-
OM	provided in section B.6.1	0.4349	tCO <sub>2</sub> /MWh
wOM	-	0.5	-
EF	provided in section B.6.1	0.2611	tCO <sub>2</sub> /MWh
Installed_capacity	-	18.00	MW
EG	provided by project developer	132,092.00	MWh
Reservoir_area	-	0.96	km <sup>2</sup>
Power density	= Installed_capacity/Reservoir_area	18.75	MW/km <sup>2</sup>
BE	= EG * EF	34,483	tCO <sub>2</sub> e
PE	-	0	tCO <sub>2</sub> e
ER	= BE - PE	34,483	tCO <sub>2</sub> e

<b>B.6.4 Summary of the ex-ante estimation of emission reductions:</b>
--

Table 12 - Ex-ante estimation

Years	Estimation of project activity emissions (tonnes of CO <sub>2</sub> e)	Estimation of baseline emissions (tonnes of CO <sub>2</sub> e)	Estimation of leakage (tonnes of CO <sub>2</sub> e)	Estimation of emission reductions (tonnes of CO <sub>2</sub> e)
2007 (since October)	0	8,621	0	8,621
2008	0	34,483	0	34,483
2009	0	34,483	0	34,483
2010	0	34,483	0	34,483
2011	0	34,483	0	34,483
2012	0	34,483	0	34,483
2013	0	34,483	0	34,483
2014 (until September)	0	25,862	0	25,862
Total (tonnes of CO <sub>2</sub> e)	0	241,383	0	241,381
Average	0	24,138	0	34,483

<b>B.7 Application of the monitoring methodology and description of the monitoring plan:</b>
--

<b>B.7.1. Data and parameters monitored:</b>
--



## CDM – Executive Board

<b>Data / Parameter:</b>	EG <sub>y</sub>
<b>Data unit:</b>	MWh
<b>Description:</b>	Net electricity delivered to the grid
<b>Source of data to be used:</b>	Project developer and CEMAT
<b>Value of data applied for the purpose of calculating expected emission reductions in section B.5</b>	132,092.00 MWh
<b>Description of measurement methods and procedures to be applied:</b>	Data collected will be the continuous reading from the plant meters and the monthly reading from the utility meter (SAGA1000 - model 1317, the accuracy is $\pm 0.5\%$ . The utility monthly reading is used for issuing the electricity sale invoices (this document will show the amount of energy supplied to the grid).
<b>QA/QC procedures to be applied:</b>	According to national standards, equipment will be subject to a regular maintenance, calibration and testing regime to ensure accuracy. Collected data has low uncertainty levels and to guarantee its accuracy it will be cross checked with the electricity sales receipts obtained from the grid operator.
<b>Any comment:</b>	Data will be archived at least for two years after crediting period.

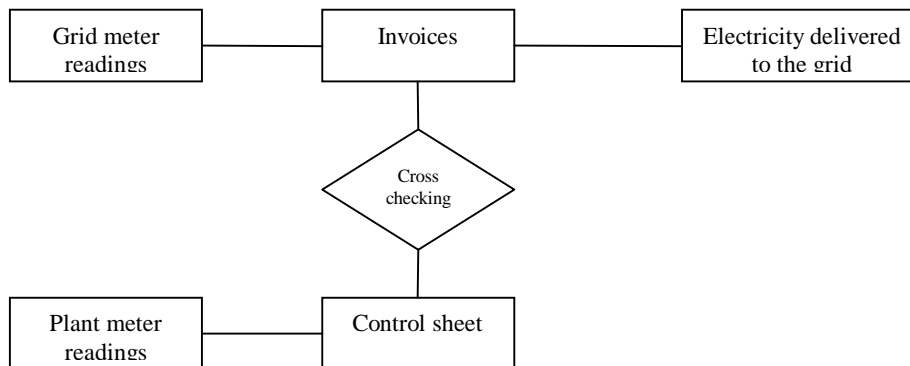
**B.7.2 Description of the monitoring plan:**

The monitoring of this type of project consists of metering the electricity generated by the renewable technology. Below you find the description of monitoring procedures for data measurement, quality assurance and quality control.

## 1. Monitoring organisation

The grid operator reads the meter in a monthly basis and this data will be used by the project developer to issue electricity sale invoices. Those invoices contain the amount of electricity delivered to the grid and will be used to calculate the amount of CERs generated from the project activity.

Power plant operators read, in an hourly basis, the electricity generated and delivered to the grid, in order to oversight the plant operation. The plant operation control is automatically done by ALSTOM equipment. Internal readings are also used to check the consistency of the amount of electricity stated in the invoices read by the grid operator.

**CDM – Executive Board**Metering of Electricity Supplied to the Grid

The main electricity meter for establishing the electricity delivered to the grid is owned by the grid operator. This electricity meter will be the revenue meter and measures the quantity of electricity that the project will be paid for. As this meter provides the main data for CER measurement, it will be the key part of the verification process.

Data will also be measured continuously by the plant operator and at the end of each month the monitoring data will be filed electronically and a back-up will be made regularly. The project developer will keep the electricity sale invoices. Data will be archived electronically and on paper and will be kept for at least two years after the crediting period.

The electricity meter should meet relevant local standards at the time of installation. The meter will be installed by either the project developer or the grid company in accordance with Brazilian standards, established by INMETRO (*“Instituto Nacional de Metrologia, Normalização e Qualidade Industrial”*- entity responsible for calibration standards) and by ANEEL (*Agencia Nacional de Energia Elétrica* – The Electricity National Agency).

Quality Control and Quality Assurance

Quality control and quality assurance procedures will guarantee the quality of data collected. The electricity meter(s) will undergo maintenance subject to industry standards. Moreover, meter(s) are calibrated by the distribution concessionaire CEMAT - which signs a long term PPA with the plants - in accordance with national standards established by INMETRO (*“Instituto Nacional de Metrologia, Normalização e Qualidade Industrial”*- entity responsible for calibration standards) and recalibrated according to manufacturer specifications, but at least once every 3 years.

Internal meters will undergo to maintenance on a yearly basis. The calibration is done by a private entity, which is accredited by INMETRO, contracted at the time that the calibration is necessary.

To guarantee the consistency and accuracy of the data collected from the meter(s), data will be cross-checked with the sale invoices which will show the amount of electricity supplied to the grid.

**CDM – Executive Board**

Before the crediting period starts, the organisation of the monitoring team will be established and clear roles and responsibilities will be assigned to all staff involved in the CDM project.

Data will be read off the meter and energy sale invoices will be collected from the small hydro by the plant operation personnel. This information will be transferred to EcoSecurities on a monthly basis in order to monitor emission reductions.

The energy generating equipment will not be transferred from another activity; therefore, leakage effects do not need to be accounted.

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

>>

The baseline study and the monitoring methodology were concluded on 08/02/2007. The entity determining the baseline study and the monitoring methodology and participating in the project as the Carbon Advisor is EcoSecurities Group PLC, listed in Annex 1 of this document.

Leandro Noel  
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**SECTION C. Duration of the project activity / crediting period****C.1 Duration of the project activity:****C.1.1. Starting date of the project activity:**

01/11/2000 (start of construction)

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

More than 30 years.

**C.2 Choice of the crediting period and related information:****C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

01/10/2007

**C.2.1.2. Length of the first crediting period:**

7 years – 0 months

**C.2.2. Fixed crediting period:****C.2.2.1. Starting date:**

Not applicable

**C.2.2.2. Length:**

Not applicable

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



**CDM – Executive Board**

The Project generates no emissions of greenhouse gases and produces no toxic waste, and has limited, controlled and reversible effects on the environment because the project is a small hydro, using water from the river with a small storage area designed only to allow the water intake to operate. The project has easy integration in the landscape and has compatibility with the protection of water, fauna and flora.

As for the regulatory permit, the project developer has authorization to operate issued by ANEEL (ANEEL Dispatch n° 203, issued on 11/05/2000).

As for the environmental permits, the project has the necessary environmental licenses. The license of operation was issued by the state environmental agency, SEMA/MT, LO number 1907/2007 issued on 19/01/2007.

A PRDA (Program for Recovering of Degraded Areas) was developed with the purpose to analyse, address and establish the recovering plan for the eventual negative impacts derived from the project activity. According to the PRDA all impacted areas were isolated and recovered. The impacts due to the project are not significant and recovery actions have been done.

All documents related to operational and environmental licensing are public and can be obtained at the state environmental agency.

**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 project is already in operation under the approval of the environmental agency, SEMA/MT, and the environmental impacts are not significant.

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

According to Resolution #1 dated December 2<sup>nd</sup>, 2003 from the Brazilian Inter-Ministerial Commission of Climate Change (Comissão Interministerial de Mudança Global do Clima -CIMGC), any CDM project must send a letter with a description of the project and an invitation for comments by local stakeholders. In this case, letters were sent to the following local stakeholders:

- City Hall of Campo Novo dos Parecís;
- District Attorney (known in Portuguese as Ministério Público, i.e. the permanent institution essential for legal functions responsible for defending the legal order, democracy and social/individual interests);
- Chamber of Deputy of Campo Novo dos Parecís;
- SEMA;
- Brazilian Fórum of NGOs;
- Environmental Agency of Campo Novo dos Parecís;
- Local community associations



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Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation.

**E.2. Summary of the comments received:**

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To date no formal comments have been received from stakeholders.

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

>>

Not applicable, given that no comments were received.



## CDM – Executive Board

Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	GLOBAL ENERGIA ELÉTRICA S.A.
Street/P.O.Box:	Rua Bosque da Saúde, 129
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Country:	Brazil
Telephone:	+55 65 3051 5050
FAX:	+55 65 3051 5052
E-Mail:	
URL:	
Represented by:	
Title:	President
Salutation:	Mr.
Last Name:	Garcia
Middle Name:	Antonio
First Name:	Carlos
Department:	Direction
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	<a href="mailto:carlosantonio@globalgardenhotel.com.br">carlosantonio@globalgardenhotel.com.br</a>

**Project Annex 1 participant:**

Organization:	EcoSecurities Group Plc.
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Telephone:	+353 1613 9814
FAX:	+353 1672 4716
E-Mail:	<a href="mailto:cdm@ecosecurities.com">cdm@ecosecurities.com</a>
URL:	<a href="http://www.ecosecurities.com">www.ecosecurities.com</a>
Represented by:	
Title:	COO & President
Salutation:	Dr.
Last Name:	Moura Costa
Middle Name:	



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Annex 2

**INFORMATION REGARDING PUBLIC FUNDING**

This project will not receive any public funding from Annex 1 parties.



CDM – Executive Board

Annex 3

**BASELINE INFORMATION**

**Financial Analysis Information**

PRIMAVERA SHP			0	1	2	3	4	5	6	7	8	9	10
P R I M A V E R A S H P	<b>INVESTMENTS</b>												
	Total Investments	R\$	72,017,908.00	72,017,908.00									
	<b>REVENUES</b>												
	Installed Capacity	MW	18										
	Electricity Generation	MWh	132,092										
	Electricity Tariff	R\$/MWh	64.00										
	<b>Income</b>	R\$	8,453,888.00	8,453,888.00	9,299,276.80	10,229,204.48	11,252,124.93	12,377,337.42	13,615,071.16	14,976,578.28	16,474,236.11	18,121,659.72	19,933,825.69
	Total Revenues	R\$	8,453,888.00	8,453,888.00	9,299,276.80	10,229,204.48	11,252,124.93	12,377,337.42	13,615,071.16	14,976,578.28	16,474,236.11	18,121,659.72	19,933,825.69
	<b>O&amp;M COSTS</b>												
	Unitary Costs	R\$	2,037,096.00										
Total Costs	R\$	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	2,037,096.00	
Net Cash Flow			(72,017,908.00)	6,416,792.00	7,262,180.80	8,192,108.48	9,215,028.93	10,340,241.42	11,577,975.16	12,939,482.28	14,437,140.11	16,084,563.72	17,896,729.69
Discount Rate	%												
NPV	R\$												(R\$ 14,683,264.49)
IRR	%												8%

CARBON CREDITS			0	1	2	3	4	5	6	7	8	9	10
C A R B O N C R E D I T S	<b>CARBON CREDITS</b>												
	Validation Costs	R\$	15,000.00	15,000.00									
	Verification Costs	R\$	15,000.00										
	Emission Reduction	tCO2e	34,483	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00
	CER Price	R\$/tCO2e	43										
	<b>Income</b>	R\$	1,489,675	1,489,675.42	1,489,675.42	1,489,675.42	1,489,675.42	1,489,675.42	1,489,675.42	1,489,675.42	1,489,675.42	1,489,675.42	1,489,675.42
	Carbon Credits Cash Flow		(15,000.00)	1,474,675.42	1,474,675.42	1,474,675.42	1,474,675.42	1,474,675.42	1,474,675.42	1,474,675.42	1,474,675.42	1,474,675.42	1,474,675.42
	Project Cash Flow		(72,032,908.00)	7,891,467.42	8,736,856.22	9,666,783.90	10,689,704.35	11,814,916.84	13,052,650.58	14,414,157.70	15,911,815.53	17,559,239.14	19,371,405.11
	Discount Rate	%											
	NPV	R\$											
IRR	%												10%

CER price US\$	20
Exchange R\$ x US\$	2.16



CDM – Executive Board

Grid Emission Factor Information

Generation data used to calculate the Grid Emission Factor (Combined Margin) is from ONS – The National System Operator and ANEEL – The Electricity National Agency. Figures below shows the data used to calculate the Grid EF:

	2003			2004			2005	
	Generation (MWh)	Fuel Consumption (TJ)		Generation (MWh)	Fuel Consumption (TJ)		Generation (MWh)	Fuel Consumption (TJ)
JAUURU	78.921	0	TermoRio	120.326	1,444	Quebra Queixo	16.197	0
GUAPORÉ	86.201	0	Gandonga	129.327	0	Ourinhos	25.167	0
TRÉS LAGOAS	233.793	2,806	Queimado	360.952	0	Barra Grande	249.690	0
FUNIL (MG)	370.111	0	Norte Fluminense	1.507.181	18,086	Mimoso	48.329	0
ITUIQUIRA I	408.728	0	JAUURU	487.636	0	Ponte de Pedra	439.462	0
ARAUCÁRIA	22	0	GUAPORÉ	335.127	0	Aimorés	122.877	0
CANOAS	182.256	2,187	TRÉS LAGOAS	1.419.067	17,029	Santa Clara PR	321.818	0
PIRAJU	417.894	0	FUNIL (MG)	667.597	0	Monte Claro	243.331	0
N. PIRATININGA	47.847	574	ITUIQUIRA I	856.539	0	TermoRio	1.150.380	8,283
PCT CGTEE	0	0	ARAUCÁRIA	22	0	PCH CESP	0	0
ROSAL	316.262	0	CANOAS	527.587	6,331	Gandonga	565.935	0
IBIRITE	530.761	6,369	PIRAJU	466.775	0	Queimado	588.657	0
CANA BRAVA	2.200.434	0	N. PIRATININGA	13.820	166	Norte Fluminense	3.635.646	26,177
STA CLARA	169.471	0	PCT CGTEE	0	0	JAUURU	514.779	0
MACHADINHO	3.436.304	0	ROSAL	384.555	0	GUAPORÉ	389.619	0
JUIZ DE FORA	5.845	75	IBIRITE	1.245.228	14,943	TRÉS LAGOAS	690.051	7,763
Macaé Merchant	2.389.507	35,843	CANA BRAVA	2.214.839	0	FUNIL (MG)	800.466	0
LAJEADO (ANEEL res. 402/2001)	4.457.790	0	STA CLARA	345.880	0	ITUIQUIRA I	1.104.190	0
ELETROBOLT	242.364	3,635	MACHADINHO	4.337.016	0	ARAUCÁRIA	0	0
D. FRANCISCA	895.131	0	JUIZ DE FORA	66.002	849	CANOAS	927.637	10,435
Porto Estrela	410.136	0	Macaé Merchant	740.098	11,101	PIRAJU	446.366	0
Cuiaba (Mario Covas)	2.228.109	26,737	LAJEADO (ANEEL res. 402/2001)	4.331.991	0	N. PIRATININGA	231.010	2,599
W. ARJONA	549.729	7,916	ELETROBOLT	1.324.501	19,868	PCT CGTEE	0	0
URUGUAIANA	1.751.486	24,251	D. FRANCISCA	683.674	0	ROSAL	421.691	0
S. CAXIAS	5.556.125	0	Porto Estrela	554.865	0	IBIRITE	490.201	5,515
CANOAS I	594.298	0	Cuiaba (Mario Covas)	1.659.230	19,911	CANA BRAVA	2.316.663	0
CANOAS II	507.843	0	W. ARJONA	538.087	7,748	STA CLARA MG	332.249	0
IGARAPAVA	1.140.260	0	URUGUAIANA	2.270.176	31,433	MACHADINHO	4.480.027	0
P.PRIMAVERA	9.059.670	0	S. CAXIAS	6.015.459	0	JUIZ DE FORA	232.477	2,615
Cuiaba (Mario Covas)	0	0	CANOAS I	578.928	0	Macaé Merchant	119.568	1,345
SOBRAGI	341.073	0	CANOAS II	486.299	0	LAJEADO (ANEEL res. 402/2001)	4.539.333	0
PCH EMAE	103.188	0	IGARAPAVA	1.090.945	0	ELETROBOLT	190.904	2,148
PCH CEEE	240.724	0	P.PRIMAVERA	9.472.700	0	D. FRANCISCA	761.279	0
PCH ENERSUL	119.405	0	SOBRAGI	395.652	0	Porto Estrela	593.357	0
PCH CEB	76.857	0	PCH EMAE	137.132	0	Cuiaba (Mario Covas)	1.229.232	13,829
PCH ESCELSA	260.910	0	PCH CEEE	215.617	0	W. ARJONA	728.835	8,199
PCH CELESC	442.080	0	PCH ENERSUL	174.892	0	URUGUAIANA	1.733.424	12,481
PCH CEMAT	966.348	0	PCH CEB	109.606	0	S. CAXIAS	5.920.260	0
PCH CELG	80.656	0	PCH ESCELSA	353.471	0	CANOAS I	555.667	0
PCH CERJ	256.284	0	PCH CELESC	468.240	0	CANOAS II	441.828	0
PCH COPEL	421.439	0	PCH CEMAT	1.353.714	0	IGARAPAVA	1.297.196	0
PCH CEMIG	564.461	0	PCH CELG	73.309	0	P.PRIMAVERA	9.686.480	0
PCH CPFL	328.332	0	PCH CERJ	297.264	0	SOBRAGI	385.988	0
S. MESA	4.490.258	0	PCH COPEL	707.277	0	PCH EMAE	149.526	0
PCH EPAULO	0	0	PCH CEMIG	672.546	0	PCH CEEE	173.917	0
Guilam Amorim	511.414	0	PCH CPFL	458.822	0	PCH ENERSUL	162.165	0
CORUMBA	1.604.930	0	S. MESA	4.397.135	0	PCH CEB	114.097	0
MIRANDA	1.778.457	0	Guilam Amorim	661.366	0	PCH ESCELSA	500.563	0
NOVA PONTE	2.208.901	0	CORUMBA	2.163.267	0	PCH CELESC	481.799	0
SEGREDO (Gov. Ney Braga)	5.253.636	0	MIRANDA	1.069.831	0	PCH CEMAT	1.515.897	0
TAQUARUÇU	2.251.810	0	NOVA PONTE	1.302.583	0	PCH CELG	72.592	0
MANSO	841.600	0	SEGREDO (Gov. Ney Braga)	5.897.593	0	PCH CERJ	311.762	0
ITA	5.222.285	0	TAQUARUÇU	2.022.042	0	PCH COPEL	578.787	0
ROSANA	2.029.045	0	MANSO	732.036	0	PCH CEMIG	619.029	0
ANGRA	13.355.432	0	ITA	6.054.272	0	PCH CPFL	461.440	0
T. IRMAOS	2.493.761	0	ROSANA	1.864.543	0	S. MESA	4.731.322	0
ITAIPU 60 Hz	46.309.279	0	ANGRA	11.581.987	0	PCH EPAULO	0	0
ITAIPU 50 Hz	36.692.448	0	T. IRMAOS	2.058.733	0	Guilam Amorim	632.333	0
EMBORCAÇÃO	3.928.062	0	ITAIPU 60 Hz	46.853.256	0	CORUMBA	1.923.111	0
Nova Avanhandava	1.377.657	0	ITAIPU 50 Hz	36.935.778	0	MIRANDA	1.480.071	0
Gov. Bento Munhoz - GBM	4.178.204	0	EMBORCAÇÃO	4.312.481	0	NOVA PONTE	2.015.019	0



CDM – Executive Board

S.SANTIAGO	6,124.508	0	Nova Avanhandava	1,406.957	0	SEGREDO (Gov. Ney Braga)	5,587.794	0
ITUMBIARA	7,342.183	0	Gov. Bento Munhoz - GBM	5,352.443	0	TAQUARUÇU	2,032.597	0
IGARAPE	33.791	405	S.SANTIAGO	6,886.744	0	MANSO	616.312	0
ITAUBA	1,895.033	0	ITUMBIARA	7,854.963	0	ITA	5,940.371	0
A. Vermelha (Jose E. Moraes)	7,280.135	0	IGARAPE	19.989	240	ROSANA	1,880.873	0
S.SIMÃO	10,850.060	0	ITAUBA	1,233.332	0	ANGRA	9,854.879	0
CAPIVARA	3,527.028	0	A. Vermelha (Jose E. Moraes)	6,520.363	0	T IRMÃOS	2,030.080	0
S.OSÓRIO	4,305.490	0	S.SIMÃO	12,205.751	0	ITAIPIU 60 Hz	43,263.219	0
MARIMBONDO	6,614.912	0	CAPIVARA	3,302.087	0	ITAIPIU 50 Hz	38,437.460	0
PROMISSÃO	998.520	0	S.OSÓRIO	484.648	0	EMBORCAÇÃO	5,428.696	0
Pres. Medici	1,306.186	18,086	MARIMBONDO	6,349.261	0	Nova Avanhandava	1,424.680	0
Volta Grande	1,892.826	0	PROMISSÃO	1,048.625	0	Gov. Bento Munhoz - GBM	5,264.925	0
Porto Colombia	1,849.042	0	Pres. Medici	1,492.153	20,661	S.SANTIAGO	6,337.245	0
Passo Fundo	1,176.518	0	Volta Grande	1,793.617	0	ITUMBIARA	8,818.284	0
PASSO REAL	771.223	0	Porto Colombia	1,715.325	0	IGARAPE	13.604	148
Ilha Solteira	16,060.345	0	Passo Fundo	705.586	0	ITAUBA	1,725.629	0
MASCARENHAS	777.134	0	PASSO REAL	549.702	0	A. Vermelha (Jose E. Moraes)	7,426.577	0
Gov. Pariqot de Souza - GPS	1,001.495	0	Ilha Solteira	15,868.207	0	S.SIMÃO	11,878.356	0
CHAVANTES	2,026.711	0	MASCARENHAS	786.812	0	CAPIVARA	3,445.003	0
JAGUARA	2,649.364	0	Gov. Pariqot de Souza - GPS	1,204.667	0	S.OSÓRIO	4,404.318	0
SÁ CARVALHO	302.343	0	CHAVANTES	1,935.377	0	MARIMBONDO	6,694.731	0
Estreito (Luiz Carlos Barreto)	3,084.368	0	JAGUARA	2,506.033	0	PROMISSÃO	1,022.782	0
IBITINGA	600.891	0	SÁ CARVALHO	464.819	0	Pres. Medici	1,699.573	18,541
JUPIA	8,944.402	0	Estreito (Luiz Carlos Barreto)	2,948.054	0	Volta Grande	2,181.749	0
ALEGRETE	0	0	IBITINGA	712.124	0	Porto Colombia	1,955.931	0
CAMPOS (Roberto Silveira)	0	0	JUPIA	8,790.288	0	Passo Fundo	994.464	0
Santa Cruz (RJ)	540.073	6,272	ALEGRETE	0	0	PASSO REAL	671.226	0
PARAIBUNA	265.808	0	CAMPOS (Roberto Silveira)	0	0	Ilha Solteira	16,814.478	0
LIMOEIRO (Armando Salles de Oliveira)	128.521	0	Santa Cruz (RJ)	199.124	2,312	MASCARENHAS	795.700	0
CACONDE	340.046	0	PARAIBUNA	199.289	0	Gov. Pariqot de Souza - GPS	1,240.817	0
J.LACERDA C	1,985.975	28,598	LIMOEIRO (Armando Salles de Oliveira)	165.483	0	CHAVANTES	1,785.328	0
J.LACERDA B	1,126.809	19,317	CACONDE	280.607	0	JAGUARA	2,694.735	0
J.LACERDA A	583.250	11,665	J.LACERDA C	2,330.323	33,557	SÁ CARVALHO	478.444	0
BARIRI (Alvaro de Souza Lima)	541.316	0	J.LACERDA B	1,304.788	22,368	Estreito (Luiz Carlos Barreto)	4,208.999	0
FUNIL (RJ)	619.432	0	J.LACERDA A	873.490	17,470	IBITINGA	688.094	0
FIGUEIRA	54.554	655	BARIRI (Alvaro de Souza Lima)	638.646	0	JUPIA	9,114.514	0
FURNAS	4,499.554	0	FUNIL (RJ)	685.740	0	ALEGRETE	0	0
Barra Bonita	477.594	0	FIGUEIRA	73.448	881	CAMPOS (Roberto Silveira)	0	0
CHARQUEADAS	136.595	2,138	FURNAS	4,288.104	0	Santa Cruz (RJ)	176.628	1,987
Jurumirim (Armando A. Lavdner)	439.132	0	Barra Bonita	567.300	0	PARAIBUNA	272.422	0
JACUI	1,419.402	0	CHARQUEADAS	239.467	3,748	LIMOEIRO (Armando Salles de Oliveira)	157.213	0
Pereira Passos	326.708	0	Jurumirim (Armando A. Lavdner)	445.781	0	CACONDE	400.542	0
Tres Marias	1,818.886	0	JACUI	1,178.249	0	J.LACERDA C	2,012.313	21,953
Euclides da Cunha	419.565	0	Pereira Passos	384.696	0	J.LACERDA B	1,188.746	12,968
CAMARGOS	157.100	0	Tres Marias	1,892.922	0	J.LACERDA A	877.032	9,568
Santa Branca	134.029	0	Euclides da Cunha	561.413	0	BARIRI (Alvaro de Souza Lima)	603.788	0
Cachoeira Dourada	2,959.147	0	CAMARGOS	188.520	0	FUNIL (RJ)	857.914	0
Salto Grande (Lucas N. Garcez)	427.192	0	Santa Branca	99.619	0	FIGUEIRA	81.238	886
Salto Grande (MG)	513.869	0	Cachoeira Dourada	3,315.489	0	FURNAS	5,687.817	0
Mascarenhas de Moraes (Peixoto)	2,207.257	0	Salto Grande, SP (Lucas N. Garcez)	484.648	0	Barra Bonita	547.013	0
ITUTINGA	210.152	0	Salto Grande (MG)	579.580	0	CHARQUEADAS	213.418	2,328
S. JERÓNIMO	43.993	609	Mascarenhas de Moraes (Peixoto)	2,337.376	0	Jurumirim (Armando A. Lavdner)	454.698	0
CARIOBA	0	0	ITUTINGA	239.530	0	JACUI	1,174.695	0
PIRATININGA	289.700	3,725	S. JERÓNIMO	30.845	427	Pereira Passos	397.305	0
CANASTRA	237.695	0	CARIOBA	0	0	Tres Marias	2,543.413	0
Nilo PECANHA	2,386.456	0	PIRATININGA	162.952	2,095	Euclides da Cunha	534.411	0
FONTES NOVA	719.497	0	CANASTRA	148.084	0	CAMARGOS	200.117	0
H.BORDEN Sub.	63.638	0	Nilo PECANHA	2,689.893	0	Santa Branca	148.713	0
H.BORDEN Ext	448.281	0	FONTES NOVA	803.368	0	Cachoeira Dourada	3,604.388	0
I. POMBOS	680.168	0	H.BORDEN Sub.	5.393	0	Salto Grande (Lucas N. Garcez)	486.456	0
JAGUARI	54.835	0	H.BORDEN Ext	417.167	0	Salto Grande (MG)	632.393	0
Import international	360.234	0	I. POMBOS	881.028	0	Mascarenhas de Moraes (Peixoto)	2,781.338	0
Export international	0	0	JAGUARI	35.455	0	ITUTINGA	251.290	0
Import NNE	99.352	0	Import international	189.847	0	S. JERÓNIMO	33.587	366
Export NNE	7,632.626	0	Export international	1,180.696	0	CARIOBA	0	0
			Import NNE	1,278.428	0	PIRATININGA	187.501	2,045
			Export NNE	3,830.322	0	CANASTRA	213.576	0
						Nilo PECANHA	2,818.325	0
						FONTES NOVA	748.752	0
						H.BORDEN Sub.	199.758	0
						H.BORDEN Ext	551.061	0
						I. POMBOS	874.876	0
						JAGUARI	99.160	0
						Import international	490.209	0
						Export international	620.561	0
						Import NNE	3,045.043	0
						Export NNE	4,789.574	0

A summary of the calculation is provided below, as well as all sources of information used to calculate the Grid EF.





Emission factors for the Brazilian South-Southeast-Midwest interconnected grid				
Baseline (including imports)	$EF_{OM}$ [tCO <sub>2</sub> /MWh]	Load [MWh]	LCMR [MWh]	Imports [MWh]
2003	0.9823	288,933,290	274,670,644	459,586
2004	0.9163	302,906,198	284,748,295	1,468,275
2005	0.8086	314,533,592	296,690,687	3,535,252
	<b>Total (2003-2005) =</b>	<b>906,373,081</b>	<b>856,109,626</b>	<b>5,463,113</b>
	$EF_{OM, simple-adjusted}$ [tCO <sub>2</sub> /MWh]	$EF_{BM, 2005}$	Lambda	
	0.4349	0.0872	$I_{2003}$	
	Alternative weights	Default weights	0.5312	
	$w_{OM} = 0.75$	$w_{OM} = 0.5$	$I_{2004}$	
	$w_{BM} = 0.25$	$w_{BM} = 0.5$	0.5055	
	Alternative $EF_y$ [tCO <sub>2</sub> /MWh]	Default $EF_y$ [tCO <sub>2</sub> /MWh]	$I_{2005}$	
	0.3480	0.2611	0.5130	

## Sources:

Fossil Fuel Conversion Efficiency	Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba. Road testing baselines for greenhouse gas mitigation projects in the electric power sector. OECD and IEA information paper, October 2002. / Planilha R. Shaeffer: COPPE-2002-IEA termo 1
Carbon emission factor (tC/TJ)	Intergovernmental Panel on Climate Change. Revised 1996 Guidelines for National Greenhouse Gas Inventories.
Fraction carbon oxidized	Intergovernmental Panel on Climate Change. Revised 1996 Guidelines for National Greenhouse Gas Inventories.
Fossil fuel conversion efficiency for Operation Margin calculation (%)	Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba. Road testing baselines for greenhouse gas mitigation projects in the electric power sector. OECD and IEA information paper, October 2002. / Planilha R. Shaeffer: COPPE-2002-IEA termo 1

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**Annex 4**

**MONITORING INFORMATION**

All background information used in the application of the monitoring methodology has been provided in section B.7 above.





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IPCC, 2006 Guidelines for national greenhouse gas inventories

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Bosi, M. 2001, An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study - OECD and IEA Information Paper COM/ENV/EPOC/IEA/SLT (2001)4

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