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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

Ibirama Small Hydropower Plant – a Brennand CDM Project Activity.

PDD version number: 01

Date (DD/MM/YYYY): 13/08/2009.

A.2. Description of the project activity:

The primary objective of Ibirama Small Hydropower Plant Project Activity (Ibirama SHPP Project) is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to environmental, social and economic sustainability by increasing the share of renewable energy in total electricity consumption for Brazil (and for the region of Latin America and the Caribbean).

Countries in the Latin America and the Caribbean region have expressed their commitment towards achieving a target of 10% renewable energy of total energy use in the region. Through an initiative from the Ministers of the Environment in 2002 (UNEP-LAC, 2002), a preliminary meeting of the World Summit for Sustainable Development (WSSD) was held in Johannesburg in 2002. In the WSSD final Plan of Implementation no specific targets or timeframes were stated, however, their importance was recognized for achieving sustainability in accordance with the Millennium Development Goals[1].

The privatization process initiated in 1995 commenced with the expectation of adequate tariffs (fewer subsidies) and better prices for generators. It drew the attention of investors to possible alternatives not available in the centrally planned electricity market. Unfortunately, the Brazilian energy market lacked a consistent expansion plan; the current expansion plan contains major problems such as political and regulatory uncertainties. In the late 1990's a strong increase in demand contrasted with a less-than-average increase in installed capacity caused the outbreak of the supply crisis/rationing in 2001/2002. One of the solutions the government provided was flexible legislation, which favored smaller independent energy producers. Furthermore the possible eligibility under the Clean Development Mechanism of the Kyoto Protocol drew the attention of investors to small hydropower projects.

This indigenous and cleaner source of electricity also provides an important contribution to environmental sustainability by reducing carbon dioxide emissions that otherwise would have occurred in the absence of the project. The project activity reduces emissions of greenhouse gas (GHG) by avoiding electricity

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[1] WSSD Plan of Implementation, Paragraph 19 (e): "*Diversify energy supply by developing advanced, cleaner, more efficient, affordable and cost-effective energy technologies, including fossil fuel technologies and renewable energy technologies, hydro included, and their transfer to developing countries on concessional terms as mutually agreed. With a sense of urgency, substantially increase the global share of renewable energy sources with the objective of increasing its contribution to total energy supply, recognizing the role of national and voluntary regional targets as well as initiatives, where they exist, and ensuring that energy policies are supportive to developing countries' efforts to eradicate poverty, and regularly evaluate available data to review progress to this end.*"

generation from fossil fuel sources (and CO_2 emissions), which would be generated (and emitted) in the absence of the project.

The project consists of the construction of a small hydropower plant ("PCH", from the Portuguese *Pequena Central Hidrelétrica*) with 21 MW of installed capacity and a reservoir area of 0.29 km^2. The plant is located in the Ibirama municipality, State of Santa Catarina, Brazil's Southern region. Commercial operation is estimated to start by February 2011.

Ibirama Energética S.A., the company that controls Ibirama Small Hydropower Plant, is owned by Empreendimentos Energéticos e Participações Ltda. and MM Energia Ltda. Empreendimentos Energéticos e Participações Ltda. is the major shareholder of Ibirama Energética S.A. and is owned by the Brennand Group.

The Brennand Group started its activities related to energy generation projects with the construction of three small hydropower plants: Antônio Brennand, Indiavaí and Ombreiras, which are already registered under CDM Project Activity (ARAPUtanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project, CDM 0530[2]).

Prior to the implementation of the project activity no small hydropower plant was operational in the location where the Ibirama project is being built. The project activity will reduce emissions of GHG by avoiding electricity generation from fossil fuel sources, which would be generated (and emitted) in the absence of the project. In conclusion, the baseline scenario and the scenario without the project activity are the same.

Ibirama SHPP Project can be seen as a solution by the private sector to the Brazilian electricity crisis of 2001, contributing to sustainable development and having a positive effect for the country beyond the evident reductions in GHG.

Although Ibirama does not have a relevant positive impact in the host country given its size, it is without reasonable doubt part of a greater idea. The project contributes to sustainable development since it meets the present needs without compromising the ability of future generations to meet their own needs, as defined by the Brundtland Commission (1987). In other words, the implementation of small hydroelectric power plants ensures renewable energy generation, reduces the national electric system demand, avoids negative social and environmental impact caused by the construction of large hydros with large reservoirs and fossil fuel thermo power plants, and drives regional economies, increasing quality of life in local communities.

Therefore, indisputably the project has reduced negative environmental impacts and has developed the regional economy, resulting, consequently, in better quality of life. In other words, environmental sustainability combined with social and economic justice, undeniably contribute to the host country's sustainable development.

A.3. Project participants:

[2] Source: United Nations Framework Convention on Climate Change (UNFCCC) website. Available at: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1152891235.76/view.

Table 1 - Party(ies) and private/public entities involved in the project activity

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the Party involved whishes to be considered as project participant (Yes/No)
Brazil (host)	Ibirama Energética S.A. (Private entity)	No
	Ecopart Assessoria em Negócios Empresariais 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.		

Detailed contact information on party(ies) and private/public entities involved in the project activity is listed in Annex 1.

A.4. Technical description of the project activity:

By legal definition established by the Brazilian Power Regulatory Agency – ANEEL – through the Resolution nr. 652/2003[3], a small hydro consists of a utility with an installed capacity between 1 MW and 30 MW, and have a reservoir area smaller than 3 km².

Ibirama Small Hydropower Plant Project Activity is under construction in Itajaí do Norte River, Itajaí-Açu River Basin, located in the municipality of Ibirama, State of Santa Catarina. It has an installed capacity of 21 MW and a reservoir area 0.29 km^2 (power density of 72.41 W/m^2), which stores water in order to generate electricity for short periods of time. Hence, it complies with ANEEL's definition. Furthermore, it is also classified as a new hydro electric project with a new reservoir and a power density greater than 4 W/m^2, according to ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Additionally, the plant is considered a run-of-river project which does not include significant water storage, and must make complete use of the water flow. A typical run-of-river scheme involves a low-level diversion dam and is usually located on swift flows (Figure 1 -).

[3] ANEEL – *Agência Nacional de Energia Elétrica*. Resolução Nr. 652, de 9 de Dezembro de 2003. Available at <http://www.aneel.gov.br/cedoc/res2003652.pdf>.

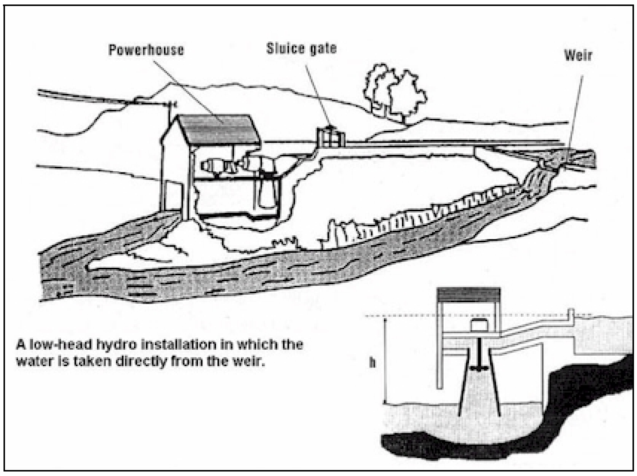

Figure 1 - Schematic view of run-of-river power plant

According to Eletrobrás (1999), run-of-river projects are defined as "*projects where the river's dry season flow rate is the same or higher than the minimum required for the turbines*", as it is the case of Ibirama Small Hydro Power Plant Project:

Itajaí do Norte river's dry season flow rate: 35.2 m^3/s

Minimum flow rate required by the project turbines (9.3 m^3/s x 3 turbines): 27.9 m^3/s

Another way to characterize run-of-river power plants, also applicable to the project activity, comes from the definition of the World Commission of Dams (WCD, 2000): *"Run-of-river dams are dams that create a hydraulic head in the river to divert some portion of the river flows. They have no storage reservoir or limited daily pondage. Within these general classifications there is considerable diversity in scale, design, operation and potential for adverse impacts."*

Table 2 – Reservoir and turbine data of the project activity

Maximum volume of reservoir (m^3)	906,000
Average volume of reservoir (m^3)	544,000
Dry season average flow rate (m^3/s)	35.2
Days of pondage at maximum volume of reservoir	0.30
Days of pondage at average volume of the dam	0.18

Considering data above, water in Ibirama's reservoir has limited daily pondage; it remains in the reservoir less than 1 day. Therefore, to the understanding of the Project Participants (PPs), PCH Ibirama can be considered a run-of-river power plant according to the presented criteria.

Finally, small hydro electric power projects are considered to be some of the most cost effective power plants in Brazil, given the possibility of generating distributed power and to supply small urban areas, rural regions and remote areas of the country.

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil.

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

State of Santa Catarina.

A.4.1.3. City/Town/Community etc:

Ibirama.

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

Ibirama Small Hydropower Plant Project Activity is located in the Ibirama municipality, Santa Catarina State, Brazil’s Southern region (Figure 2) and explores the hydrological potential of the Itajaí do Norte River. The Project’s geographical coordinates are 27° 02’ South and 49° 33’ West.

Figure 2 - Political division of Brazil showing the State of Santa Catarina and the city of Ibirama

Source: GOOGLE EARTH, 2009

The city of Ibirama has 16,716 inhabitants and an area of 247 km^2 (IBGE, 2008).

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

Sectoral Scope: 1 - Energy industries (renewable - / non-renewable sources).

Category: Renewable electricity generation for a grid.

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

The Francis turbines, used in Ibirama Small Hydropower Plants Project Activity, are the most widely used among water turbines (Figure 2).

The Francis turbine is a type of hydraulic reaction turbine in which the flow exits the turbine blades in the radial direction. They are common in power generation and are used in applications where high flow rates are available at medium hydraulic head. Water enters the turbine through a spiral tank and is directed onto the blades. The low momentum water then exits the turbine through a ducting known as suction tube. In the model, water flow is supplied by a variable speed centrifugal pump. A load is applied to the turbine by

means of a magnetic brake, and torque is measured by observing the deflection of calibrated springs. The performance is calculated by comparing the output energy to the energy supplied.

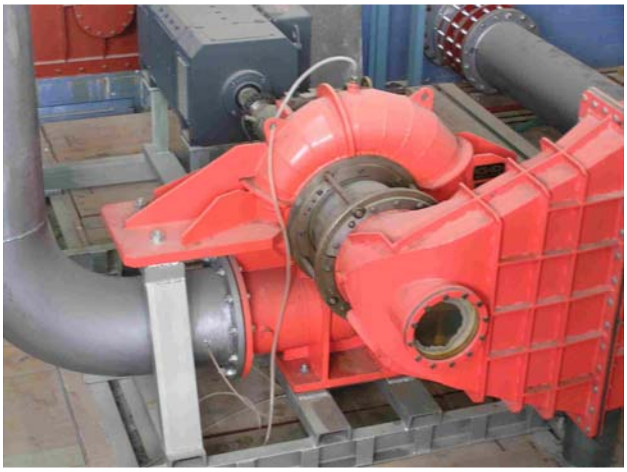

Figure 3 - Example of a Francis Turbine

Source: NTUA, 2009

As mentioned earlier on section A.2., in the absence of the project activity all the energy would be imported from the interconnected grid. Hence, the baseline scenario is identified as the continuation of the current (previous) situation of electricity. Prior to the implementation of the project activity there was no hydro operational in the same location of the project activity. Hence, the baseline scenario and the scenario without the project activity are the same.

The equipment and technology used in Ibirama Small Hydropower Plants CDM Project Activity has been successfully applied to similar projects in Brazil and around the world. Technical description of the facility follows:

Table 3 - Technical configuration of Ibirama SHPP

Description		**Ibirama SHPP**
Turbines	Type	Francis
	Quantity	3
	Nominal power (MW)	7.250
	Manufacturer	Voith Siemens
Generators	Type	Syncronos
	Quantity	3
	Nominal power (MW)	7.810
	Nominal tension (kV)	6.9

	Manufacturer	Gevisa S/A

It is important to mention that the main equipment used in Ibirama project was produced in Brazil. This contributes to the energy sector development resulting in more research and increasing capacity of the industrial sector.

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

Emissions reductions estimations were calculated considering the arithmetic average of the monthly dispatch analysis emission factor released by the Brazilian DNA[4] for the years 2006, 2007 and 2008 (0.2326 tonCO_2e/MWh), applicable to grid-connected renewable power generation project activities in Brazil.. Full implementation of the project will generate the estimated annual reductions as presented in the table below.

Table 3 - Project Emission Reductions Estimation

Years	Annual estimation of emission reductions in tonnes of CO_2e
Year 1 - (2011)*	25,951
Year 2 - (2012)	28,310
Year 3 - (2013)	28,310
Year 4 - (2014)	28,310
Year 5 - (2015)	28,310
Year 6 - (2016)	28,310
Year 7 - (2017)	28,310
Year 7 - (2018)**	2,359
Total estimated reductions (tonnes of CO_2e)	198,173
Total number of crediting years	7
Annual average over the first crediting period of estimated reductions (tonnes of CO_2e)	28,310

*Since February 01st

**Until January 31th

A.4.5. Public funding of the project activity:

[4] URL: http://www.mct.gov.br/index.php/content/view/73318.html (accessed on 04/02/2009).

There is no recourse to any public funding by the PPs in the proposed project activity. The project proponents hereby confirm that there is no divergence of Official Development Assistance (ODA) to the proposed project activity.

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:

ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 10)[5].

ACM0002 refers to the latest approved versions of the following tools:

- Tool to calculate the emission factor for an electricity system (Version 1.1);
- Tool for the demonstration and assessment of additionality (Version 5.2);
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 2).
- Combined tool to identify the baseline scenario and demonstrate additionality (version 2.2).

The *tool to calculate project or leakage* CO_2 *emission from fossil fuel combustion* and *combined tool to identify the baseline scenario and demonstrate additionality* are not applicable to the project activity, and therefore are not used.

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

The methodology ACM0002 is applicable to projects consisting of *"the installation or modification/retrofit 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"*.

Moreover, for hydro power plants that result in new reservoirs, the power density of the power plant shall be greater than 4 W/m^2.

Ibirama Small Hydropower Plant Project meets all the criteria established by the ACM0002 methodology, consisting of a new small hydro project interconnected to the Brazilian electricity grid with a run-of-river reservoir and with power density 72.41 W/m^2 - greater than 4 W/m^2. Detailed information of power density calculation is presented in section B.6.3.

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

5 Available at: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

As described in ACM0002 methodology, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system which the CDM project power plant is connected to.

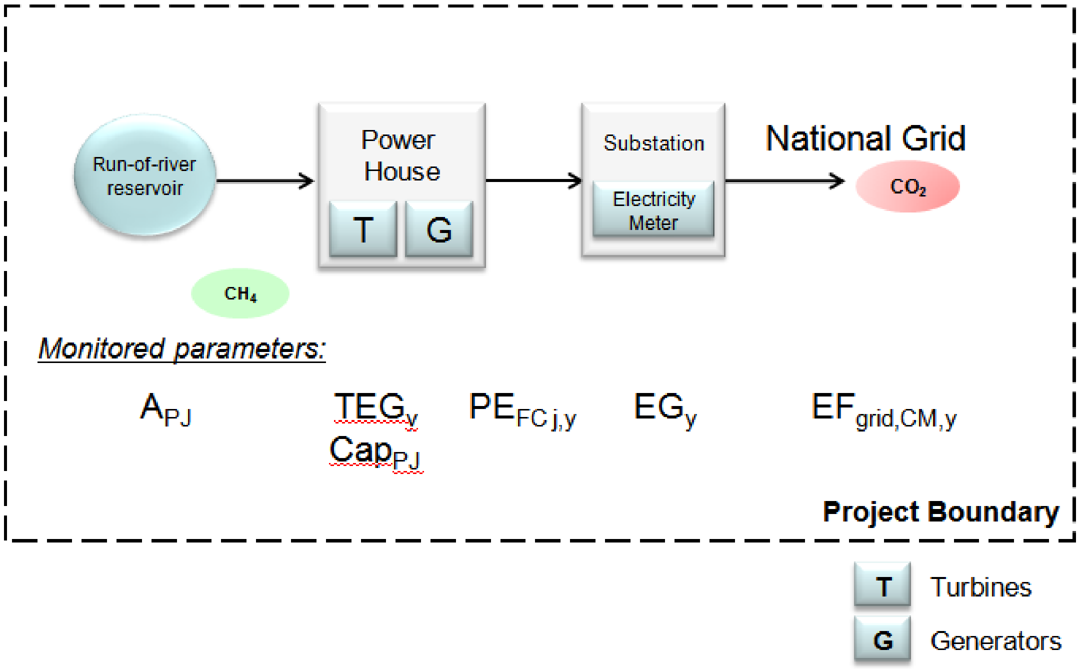

Figure 4 - Project Boundary of the project activity

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

Table 4 – greenhouse gases and emission sources included or excluded in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small

Project Activity	Emissions of CH_4 from the reservoir.	CO_2	No	Excluded for simplification. This emission source is assumed to be very small
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small

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

The project activity does not modify or retrofit any existing electricity generation facility. Hence, accordingly to ACM0002 the baseline scenario is the following:

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

In the absence of the project activity, all the energy would be imported from the interconnected grid. The project activity reduces emissions of greenhouse gas (GHG) by avoiding electricity generation by fossil fuel sources (and CO_2 emissions), which would be generated (and emitted) in the absence of the project. According to ANEEL (2008), 71.2 % of the Brazil's installed capacity is composed by hydro and 24.2 % by thermal power stations.

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):

The CDM glossary of terms defines the starting date of a non A/R project activity as "*the earliest date at which either the implementation or construction or real action of a project activity begins*".

From the above definition, the following dates were analyzed:

Dates	Actions
20/03/2007	Transfer of Ibirama Energética S/A (PCH Ibirama owner) from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda. [6]
31/08/2007	First order of the main equipment (turbines and generators)

[6] Public information available at ANEEL website. ANEEL Resolution nr. 852, dated March 20th, 2007.

06/12/2007	PPA signature
18/02/2009	Construction permit (installation license)
01/06/2009*	EPC contract sgnature
20/06/2009*	Financing contract signature

* Estimated dates

As can be seen, the transfer of the Ibirama project from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda. occurred first. Although there was no major commitment at this point[7], it will be conservatively considered as the project starting date. All documents related to the dates presented above are available with PPs and will be presented to DOE during validation.

The consideration of CDM incentive is dated April 10th, 2006. This can be demonstrated through the Minutes of Meeting held by Empreendimentos Energéticos e Participações Ltda., the major shareholder of Ibirama Energética S.A.

The objective of the meeting mentioned above was to present results of the feasibility study made for Ibirama small hydroelectric project. The president of Empreendimentos Energéticos e Participações Ltda. Mr. Mozart de Siqueira Campos Araújo and his secretary Mr. Pedro Pontual Marletti were present. From this meeting, the Board members decided to undertake the project acquisition, considering the fact that the project could be registered under CDM and generate carbon credits. The CDM revenues were considered essential to overcome risks related to the high volatility of energy price in Brazil.

Two conditions were important for the Board's approval of the Ibirama project: legal and regulatory aspects and the possibility of generating CERs, which would make the project feasible. With the successful development of ARAPUtanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project[8] (three small hydropower plants – Antônio Brennand, Indiavaí and Ombreiras – registered under CDM), owned by the same PPs, the CDM process was better known and the decision to implement another project considering the CDM revenues was reinforced.

Empreendimentos Energéticos e Participações Ltda. is a Brennand Group Company. On March 20th, 2007, Empreendimentos Energéticos e Participações Ltda. was incorporated by Ibirama Energética S.A., the concurrent owner of the PCH. This can be demonstrated through ANEEL Resolution nr. 852/2007[9]. All evidence will be presented to DOE and is available with PPs.

As mentioned above, it is important to highlight that Brennand Group has three small hydropower plants - Antônio Brennand, Indiavaí and Ombreiras - which are also registered CDM Project Activity

[7] Undoubtedly, Brennand Group could have sold Ibirama project if legal/regulatory aspects were not favourable for the project implementation and CDM revenues were considered unfeasible at that time. In reality, this is not uncommon and a project is purchased more than once.

[8] Ref.: CDM 0530. Available at UNFCCC's website: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1152891235.76/view

[9] ANEEL – *Agência Nacional de Energia Elétrica*. Resolução Autorizativa Nº. 852, de 20 de Março de 2007.

(ARAPUtanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project, CDM 0530[10]). This is further evidence of Brennand Group's confidence in the CDM and in the certified emission reductions potential to help projects overcoming implementation barriers. Additionally, Ouro Energética S/A had already contracted Ecopart Assessoria Ltda. to advise them as to the CDM process for PCH Ibirama project on July 6th, 2005. At that time, Ibirama Energética S.A was controlled by Guascor Geratec Ltda. Besides the evidence mentioned above, a timeline of actions taken by the PPs demonstrating prior consideration of CDM for the Ibirama project is as follows:

Dates	Actions
10/04/2006	Empreendimentos Energéticos e Participações Ltda. minutes of meeting
01/02/2007	Ecopart asked preliminary information for issuance of CDM services proposal
21/11/2007	Ecopart sent complete questionnaire to be responded by Brennand Group for PDD elaboration
23/01/2008	Brennand Group sent responses for the questionnaire
14/02/2008	Ecopart requested validation proposals for DOEs
28/05/2008	Signature of the contract between Ecopart and Ibirama Energética S/A
17/06/2008	Ecopart sent letters for stakeholders' comments
18/03/2009	Ecopart requested validation proposals for DOEs (for the second time)
24/04/2009	Ecopart sent letters for stakeholders' comments (for the second time)

Although Ibirama Energética S/A signed a contract with Ecopart Assessoria Ltda. for developing the CDM process of the small hydropower plant project on July 6th, 2005, for a conservative analysis, the date on which Empreendimentos Energéticos e Participações Ltda. held a meeting, deciding to buy Ibirama Energética S/A from Guascor Geratec Ltda. (on April 10th, 2006) considering carbon credits revenues, was considered for CDM considerations purpose.

For the demonstration of additionality, the proposed baseline methodology refers to the Additionality Tool (here version 5.2, the most recent one at the time PDD is being developed) approved by the Executive Board. The tool considers some important steps necessary to determine whether the project activity is additional and to demonstrate how the emission reductions would not occur in the absence of PCH Ibirama Project. The application of the above mentioned tool is described in the next paragraphs.

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[10] Source: United Nations Framework Convention on Climate Change (UNFCCC) website. Available at: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1152891235.76/view.

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

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

Scenario 1: The alternative to the project activity is the continuation of the current (previous) situation of electricity supplied by the existing power plants from the interconnected system.

Scenario 2: The proposed project activity undertaken without being registered as a CDM project activity.

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

Both alternatives, the project activity and the alternative scenario, are in compliance with all regulations according the following entities:

- National Electric System Operator (ONS from the Portuguese *Operador Nacional do Sistema Elétrico*);
- Electricity Regulatory Agency (ANEEL from the Portuguese *Agência Nacional de Energia Elétrica*);
- Mines and Energy Ministry (in a free translation from the Portuguese *Ministério de Minas e Energia – MME*);
- Chamber of Electrical Energy Commercialization (in a free translation from the Portuguese *Câmara de Comercialização de Energia Elétrica – CCEE*);
- Santa Catarina Environmental Agency (from the Portuguese *FATMA - Fundação do Meio Ambiente*);
- The CDM Executive Board.

SATISFIED/PASS – Proceed to Step 2

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method:

Once the project activity generates other financial benefit other than CDM related income (sale of energy) Option I could not be chosen. Option III is more appropriate when compared to Option II because there are no other options of investment from the project owner perspective. Therefore, additionality is demonstrated here through an investment benchmark analysis (option III).

Sub-step 2b and 2c– Option III - benchmark analysis

Financial indicator identified for PCH Ibirama Project Activity is the project Internal Rate of Return – IRR. There are two benchmarks considered in this analysis: Brazilian Prime Rate, known as SELIC rate, and the cost of equity (Ke) based on Capital Asset Pricing Model (CAPM).

Brazilian Prime Rate – SELIC Rate

For Ibirama project implementation, SELIC rate from the period of the project acquisition decision (first semester of 2006 year) was analyzed.

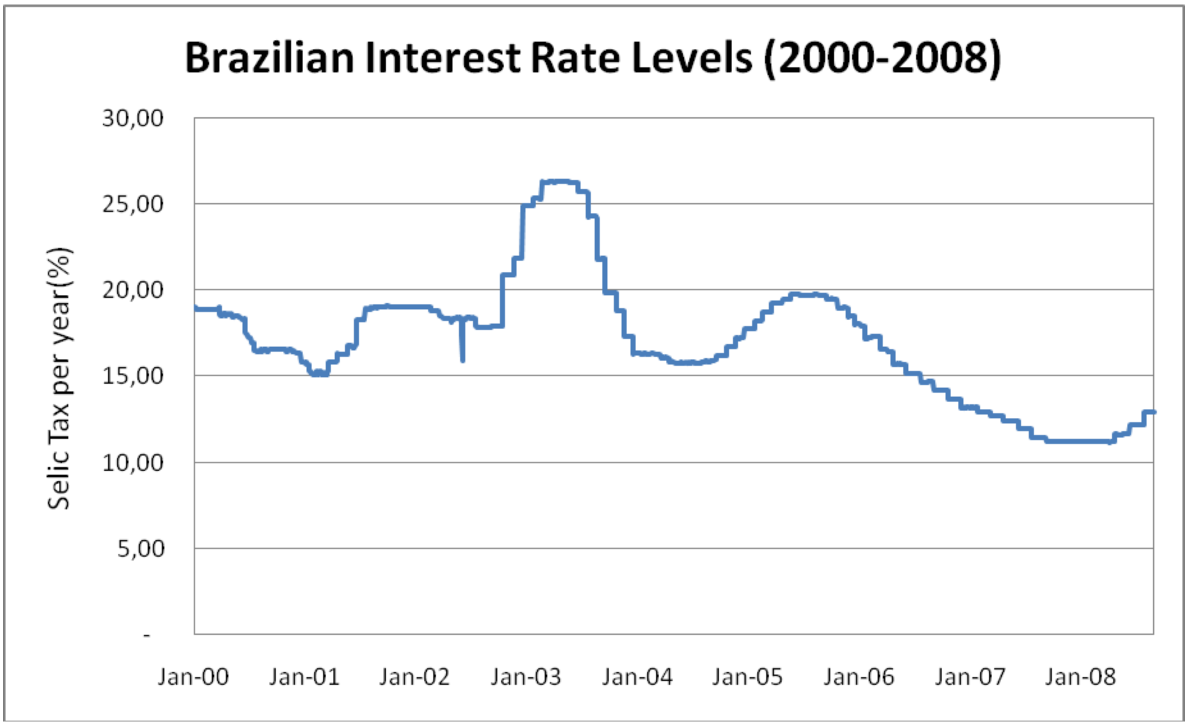

Figure 4 – Brazilian interest rate (SELIC)

Source: Banco Central do Brasil, 2009

Considering the first semester of 2006 before the decision to implement the project, SELIC rate average was 16.74%.

The benchmark considered for Ibirama project is the SELIC rate as can be evidenced through the CDM project already registered by the Group (ARAPUtanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project, Ref.: 0530).

Considering the "Tool for the demonstration and assessment of additionality" (version 5.2): "*…the financial/economic analysis shall be based on parameters that are standard in the market, considering the*

specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer", PPs decided to calculate the Cost of Equity (Ke) – at the time of Ibirama implementation decision – , which considers parameters that are standard in the market. Therefore, Ke calculation is presented below.

Cost of Equity (Ke)

The Capital Asset Pricing Model (CAPM) is one of the most widely accepted models used to determine the (theoretically appropriate) required rate of return on equity. The CAPM calculates a newly introduced asset's non-diversifiable risk. CAPM takes into account the asset's sensitivity to non-diversifiable risk, better referred to as beta (**β**). Embedded in the model is also the market premium which can be tracked using historical data from the local or relevant equity market.

The rate which should be charged for the equity component of a project is calculated through the formula: **Ke = Rf + β*(Rm - Rf)** where **Ke** represent the suggested rate of return for equity investments. **Rf** stands for the risk free rate and beta, or **β,** stands for the average sensitivity of comparable companies in that industry to movements in the underlying market.

(Rm – Rf) represents the market premium, or higher return, expected by market participants in light of historical spreads attained from investing in equities versus risk free assets such as the US treasury.

The risk-free rate used for **Ke** calculation was based on the US Treasury bond, which are long term titles of a mature market. Over this rate, Brazilian country risk have been considered and resulted in the risk-free rate applied to the calculation.

β derives from the correlation between returns of US companies from the sector and the performance of the returns of the US market. **β** have been adjusted to the leverage of Brazilian companies in the sector, reflecting both structural and financial risks. **β** adjusts the market premium to the sector.

The market premium is estimated based on the historical difference between the S&P 500 returns and the long term US bonds returns. The spread over the risk-free rate is the average of the difference between those returns.

Cost of Equity	
(Rf) Yield of Sovereign BB Debt[11]	6.44%p.a.
(Rm) International Market Equity Risk Premium[12]	6.47%p.a.

[11] Global 34 (Reabertura) - 28-year Brazilian Federal Bond - appropriate to the project cash flow period. Source: Banco Central do Brasil (BACEN). Financial indicators report. May, 2009. Available at <http://www.bcb.gov.br/pec/indeco/Port/ie5-27.xls>. For the Rf calculation, US inflation was considered < http://www.federalreserve.gov/releases/h15/data/Annual/H15_TCMII_Y10.txt>.

[12] Historical S&P500 premium over US-Treasury Bond. Available at Damodaran website: <http://pages.stern.nyu.edu/~adamodar/>.

(β) Adjustment to Market Equity Risk[13]	6.33%p.a.
Cost of Equity with Brazilian Country Risk	19.25%p.a.

Considering table above, cost of equity is 19.25% p.a. Each assumption made and all data used to estimate the Ke through CAPM will be presented to the DOE. The spreadsheet used for calculation of the Ke will be also provided to the DOE.

Financial Indicator, Internal rate of return (IRR)

Ibirama cash flow demonstrates that the IRR of the project 11.44 is lower than SELIC rate (16.74%) and the cost of equity (19.25) %. This demonstrates that the project activity is not financially attractive to investor:

SHPP	IRR (%)	Cost of Equity (%)	SELIC rate (%)
Ibirama	11.4	19.2	16.7

Sub-step 2d: Sensitivity analysis

A sensitivity analysis was conducted by altering the following parameters:

- Increase in project revenue (energy price)
- Reduction in running costs (operation costs and investments)

Financial analyses were performed altering each of these parameters by 10%, and assessing what the impact on the IRR would be. The results of the sensitivity analysis are shown in the table below. As it can be seen, the equity IRR remains below both benchmarks even in the case where the parameters change in favor of the project.

Table 4 - Sensitivity analysis

Scenario	% change	IRR (%)
Original	-	11.44
Increase in project revenue	10 %	14.04
Reduction in project costs	10 %	11.94
Reduction in project investments	10%	14.15

[13] Average unlevered Beta of Electric-Generators in the USA re-levered to sectoral leverage in Brazil. Available at Damodaran website: < http://pages.stern.nyu.edu/~adamodar/>.

It is important to note that the average for Brazilian inflation in 2006 was equal to 3.14%[14]. The use of 10% of variation, around three times the 2006 inflation rate, in the variation of costs and revenues of the project activity was chosen as a very conservative value.

Outcome: The IRR of the project activity without being registered as a CDM project is below the SELIC rate and cost of equity, evidencing that project activity is not financially attractive. The knowledge of the CDM registering benefits was the key points to decision-making to implement the project activity.

SATISFIED/PASS – Proceed to Step 3

Step 3. Barrier analysis

Not applicable.

Step 4. Common practice analysis
Sub-step 4a. Analyze other activities similar to the proposed project activity:

According to the additionality tool (version 5.2), "*projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc*". Thus, the following criteria were considered in order to choose the projects that are similar to Ibirama:

- ***Country/region:*** Brazil has an extension of 8,514,876.599 square kilometres[15] (with over 4,000 km distance in the north-south as well as in the east-west axis) and 6 distinct climate regions: sub-tropical, semi-arid, equatorial, tropical, highland-tropical and Atlantic-tropical (humid tropical). These varieties of climate obviously have strong influence in the technical aspects related to a small hydropower plant implementation.

  In addition, hydroelectric projects can differ significantly from each other considering the region to be implemented, climate, topography, availability of transmissions lines, river flow regularity, etc. For those reasons alone it is extremely difficult and not reasonable to compare different hydropower potential and plants. Moreover, hydro-power plants cannot be optimally placed (close to load centers and transmission lines) and easily transferred (moved to a new region where a better tariff is offered) as, for example, modular fossil-fuel-fired (diesel, natural gas) power plants. Differences may be even larger if no big water storage is possible, as in the case of small hydropower plants.

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[14] The IPCA is used as a parameter for the inflation targeting system. In 2006 IPCA's accumulated growth was equal to 3.14%. This index is published by several institutions in the country. One of these institutions is the Central Bank of Brazil in its annual bulletins available at http://www.bcb.gov.br/?BOLETIM2006.

[15] Available at: http://www.ibge.gov.br/english/geociencias/cartografia/default_territ_area.shtm.

Considering information above, only small hydropower plants located in the same region of Ibirama project – Santa Catarina state – were analyzed.

- ***Scale:*** As mentioned in section A, according to the Brazilian regulations, small scale hydropower plants are defined as plants with an installed capacity within 1 and 30MW[16]. Therefore, no large scale hydropower plants (e.g. installed capacity over 30MW) were considered. Furthermore, only plants with installed capacity 50% lower and 50% higher than Ibirama project were analyzed (i.e. between 10.5 and 31.5 MW).
- ***Same environment with respect to regulatory framework*****:** Until the beginning of the 1990's, the energy sector was composed almost exclusively of state-owned companies. From 1995 onwards, due to the increase in international interest rates and the lack of state investment capacity, the government started the privatization process. However, by the end of 2000 results were still modest. Although further initiatives, aiming to improve electric generation in the country, were taken between the 1990's and 2003, they did not attract new investment to the sector. In 2003, the recently elected government decided to fully review the electricity market institutional framework in order to boost investments in the electric energy sector. Market rules were changed and new institutions were created such as Energetic Research Company (in a free translation from the Portuguese *Empresa de Pesquisa Energética – EPE*) – an institution responsible for the long term planning of the electricity sector with the role of evaluating, on a perennial basis, the safety of the supply of electric power – and Chamber for the Commercialization of Electric Power (CCEE) – an institution responsible for the management of electric power commercialization within the interconnected system. This new structure was approved by the House of Representatives and published in March of 2004[17]. Given the new *regulatory framework,* PPs considered only projects started after March of 2004.
- ***Same environment with respect to investment climate, access to technology and financing*****:** As mentioned in item "country/region" above, depending on the project location, differences related to the technical aspects of small hydropower plant projects have influence in their implementation, even if small hydro projects are located in the same region. Considering that these technical differences obviously have an influence in the investment/financing of a project and project sponsors have different investment capacity, financial information should be considered when small hydro projects were analyzed. As financial information of similar projects is not accessible for PPs, these projects should be excluded from this analysis following the additionality tool. However, PPs decided to do their upmost in making a reasonable comparison for the purpose of common practice analysis even without investment information available.

Considering the criteria mentioned above, PPs researched generating units of small hydro power plants in Brazil that started operations from April 2004 to June 2009 (the most recent data available until the elaboration of this PDD) in Rio Grande do Sul state. Also small hydros that received some kind of incentive (PROINFA[18] and/or CDM) were identified.

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[16] *ANEEL – Agência Nacional de Energia Elétrica. Resolution # 652, issued on December 9th, 2003.*

[17] http://www.planalto.gov.br/CCIVIL/_Ato2004-2006/2004/Lei/L10.848.htm.

[18] Alternative Electricity Sources Incentive Program (in a free translation from the Portuguese *Programa de Incentivo às Fontes Alternativas de Energia Elétrica – PROINFA*), created through the Law # 10,438 dated April 26th, 2002.

Table 5 – Operations start of SHPPs from 2004 to 2009

Operations start	Project	Installed power	Incentive
2004	-		
2005	-		
2006	-		
2007	Flor do Sertão	16.5	Proinfa
	Ludesa	30	Proinfa
	Santa Laura	15	Proinfa
2008	Alto Benedito Novo I	15	CDM
	Alto Irani	21	Proinfa
	Plano Alto	16	Proinfa
2009	-		

Source: ANEEL (2009), UNFCCC (2009) and Eletrobrás (2009)

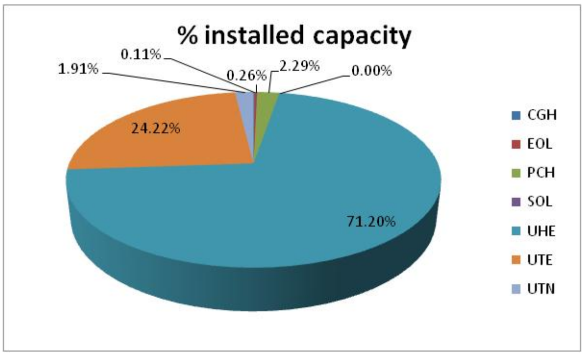
Spreadsheet with complete research of the common practice analysis is available with the PPs and will be presented to DOE during validation.

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

Considering research above, all projects that have started operation since April 2004 publicly receive some kind of incentive (CDM and/or PROINFA). This result demonstrates that risks related to this type of project are higher, as discussed in Step 2 – Investment Analysis and that a strong incentive is required to promote the construction of renewable energy projects in Brazil, where it includes small hydropower plants.

It is worth mentioning that 71.2 % of Brazil's generation is composed of large hydro and 24.22 % of thermal power stations. Only 2.29 % of Brazil's installed capacity comes from small hydro power sources (2.6 GW out of a total of 105.65 GW).

Among others, one of the initiative's goals is to increase the renewable energy sources share in the Brazilian electricity market, thus contributing to a greater environmental sustainability. In order to achieve such goals, the Brazilian government has designated the federal state-owned power utility Eletrobrás (Centrais Elétricas Brasileiras S/A) to act as the primary off-taker of electric energy generated by alternative energy facilities in Brazil, by entering into long-term Power Purchase Agreements with alternative energy power producers, at a guaranteed price of at least 80% of the average energy supply tariff charged to ultimate consumers. Also, the Brazilian Decree # 5,025 dated March 30th, 2004, which regulates the Law # 10,438, states that PROINFA aims for the reduction of greenhouse gases as established by the United Nations Framework Convention on Climate Change (UNFCCC) under Kyoto Protocol, contributing to the sustainable development. Therefore, the program is clearly a "Type E-" policy.



Legend	
CGH	Hydroelectric Generator Center
CGU	Undi-Eletric Generator Center
EOL	Wind Generator Center
PCH	**Small Hydroelectric Power Plant**
SOL	Solar Generation Center Photovoltaic
UHE	Hydroelectric Power Plant
UTE	Thermoelectric Power Plant
UTN	Thermonuclear Power Plant

Figure 4 – Share of installed capacity

Source: ANEEL, 2008

Moreover, in the most recent energy auctions, which took place between 2005 and 2007, from the total of 9,594 MW sold, 5,888 MW (61.3%) will come from fossil fuel fired thermal power plants, from which 2,152 MW come from natural gas and 2,514 MW fuel oil fired thermal power plants, i.e., 22.4% and 26.2% of the total sold respectively (Esparta, 2008).

In summary, this project activity is clearly not common practice, because no similar project started operation during the above mentioned period without some kind of incentive. With the financial benefit derived from the CERs, it is anticipated that other project developers will benefit from this new source of revenue and further will decide to develop such projects. CDM has made it possible for investors to set up their small hydro plants and sell their electricity to the grid.

SATISFIED/PASS – Project is ADDITIONAL

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" was chosen. The chosen methodology is applicable to grid-connected renewable power generation projects, under the condition of electricity capacity additions from run-of-river hydro power plants, as is the case with the Arapucel Project.

Emission reductions calculation (ER_y)

According to the selected approved methodology ACM0002, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$ **Equation 1**

Where:

ER_y = Emission reductions in year y (tCO_2e/yr);

BE_y = Baseline emissions in year y (tCO_2e/yr);

PE_y = Project emissions in year y (tCO_2e/yr);

LE_y = Leakage emissions in year y (tCO_2e/yr).

Baseline emissions calculation (BE_y)

Baseline emissions are calculated using the annual generation (project annual electricity dispatched to the grid) times the CO_2 average emission rate of the estimated baseline, as follows:

Monitored project power generation	(MWh)	(A)
Baseline emission rate factor	(tCO_2/MWh)	(B)
(A) x (B)	(tCO_2)	

The emission reductions by the project activity (ER_y) during a given year y are achieved through the equation below:

$$BE_y = EF_y \times EG_y \qquad \textbf{Equation 2}$$

Where:

EF_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_2e/MWh);

EG_y = Electricity supplied by the project activity to the grid (MWh).

<u>*Baseline Emission Factor Calculation* ($EF_{grid,CM,y}$)</u>

According to the selected approved methodology (ACM0002, 2009), the baseline emission factor (EF_y) is calculated using the methodological tool "Tool to calculate the emission factor for an electricity system". According to this tool PPs shall apply the following six steps to the baseline calculation:

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.

- **STEP 1** - Identify the relevant electric power system

According to the tool, "*If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. If such delineations are not available, project participants should define the project electricity system and any connected electricity system and justify and document their assumptions in the CDM-PDD*".

Brazilian DNA has published the Resolution nr. 8 issued on 26th May, 2008, which defines the Brazilian Interconnected Grid as a single system that covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest). Hence, this figure will be used to calculate the baseline emission factor of the grid.

- **STEP 2** - Select an operating margin (OM) method

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The Brazilian DNA made available the operating margin emission factor calculated following the "Tool to calculate the emission factor for an electricity system", approved by the CDM Executive Board. The calculation uses option c – Dispatch data analysis OM. This option does not permit the vintage of *ex-ante* calculation of the emission factor. Therefore, the chosen option was ***ex-post*** calculation. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA. More information of the methods applied can be obtained in the DNA's website (http://www.mct.gov.br/index.php/content/view/4016.html) and vintage will be used in the project activity.

- **STEP 3** - Calculate the operating margin emission factor according to the selected method

The dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$.

It will be calculated using the below formulae:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$ **Equation 3**

Where:

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour *h* of the year *y* (MWh);

$EF_{EL,DD,h}$ = CO_2 emission factor for power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh);

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year *y* (MWh);

h = Hours in year *y* in which the project activity is displacing grid electricity;

y = Year in which the project activity is displacing grid electricity.

As mentioned above, the host country's DNA will provide $EF_{EL,DD,h}$ in order for PPs to calculate the operating margin emission factor. Hence, this data will be updated annually applying the number published by the Brazilian DNA. For estimation purposes, the data of the most recent year available in the DNA website will be used.

- **STEP 4 -** Identify the cohort of power units to be included in the build margin (BM)

The sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

- **STEP 5 –** Calculate the build margin mission factor ($EF_{BM,y}$)

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$ **Equation 4**

Where:

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

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year *y* (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year *y* (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

The Brazilian DNA made available the operating margin emission factor calculated following the "Tool to calculate the emission factor for an electricity system", approved by the CDM Executive Board. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA. The number is published on the website and for estimation purposes the data for the most recent year will be used.

- **STEP 6** – Calculate the combined margin (CM) emissions factor $EF_{y.}$

The combined margin is calculated as follows:

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$ **Equation 5**

Where:

w_{OM} = weighting of operating margin emissions factor (%);

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

w_{BM} = weighting of build margin emissions factor (%);

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

Weights are determined by the emission factor calculation tool. Alternative weights can be proposed for consideration by the Executive Board, as long as $w_{OM} + w_{BM} = 1$, and the values applied by PPs should be fixed for a crediting period and may be revised at the renewal of the crediting period.

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

Estimated quantity of net electricity generation supplied by the project plant/unit to the grid is presented in section B.6.3 below.

Project emissions calculation (PE_y)

The proposed project activity may involve project emissions that can be significant. In this sense, according to the selected CDM methodology these emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$ **Equation 1**

Where:

PE_y = Project emissions in year *y* (tCO2e/yr);

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO2/yr);

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO2e/yr);

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* (tCO2e/yr).

Emissions from fossil fuel combustion ($PE_{FF,y}$)

Considering that there is no fossil fuel combustion in the proposed project activity, $PE_{FF,y}$ = 0 tCO_2/year.

Emissions from the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y}$)

Considering that the proposed project activity consists on the construction of a small hydropower plant, there are no emissions of non-condensable gases from the operation of geothermal power plants. Therefore, $PE_{GP,y}$ = 0 tCO_2/year.

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

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

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

$$PE_y = \frac{EF_{\mathrm{Res}} \times TEG_y}{1000}$$ **Equation 6**

Where:

PEy = Emission from reservoir expressed as tCO_2e/year;

EF_{Res} = is the default emission factor for emissions from reservoirs, and the default value as perEB23 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 (*PD*) of the project is greater than 10W/m^2, PEy = 0. The power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ **Equation 7**

Where:

PD = Power density of the project activity, in W/m^2;

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

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

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

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

Leakage calculation (LE_y)

Indirect emissions can result from project construction, transportation of materials and fuel and other upstream activities. Nevertheless, no significant net leakage from these activities was identified.

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

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data used:	Project site
Value applied:	0
Justification of the	The methodology that this value shall be applied for new hydro power plants.

choice of data or description of measurement methods and procedures actually applied :	
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.
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied:	The methodology that this value shall be applied for new hydro power plants.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Emission reductions calculation (ER_y)

According to the selected approved methodology ACM0002, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{Equation 2}$$

Baseline calculation (BE_y)

As described in section B.6.1, baseline calculation (*BE*) in this project are calculated directly from electricity supplied by the project to the grid (*EG*) multiplied by the emission factor (*EF*).

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

For the estimated purposes, emission factor data provided by the Brazilian DNA for the years 2006, 2007 and 2008 was applied. When applying the published numbers in the formula presented in step 3 of section B.6.1., the $EF_{grid,OM\text{-}DD,y}$ obtained was:

$$EF_{grid,OM\text{-}DD,\ 2006\text{-}2008} = 0.3636\ tCO_2e/MWh.$$

The building margin average for the years 2006, 2007 and 2008 published by the DNA is:

$$EF_{BM,\ 2006\text{-}2008} = 0.1016\ tCO_2e/MWh.$$

With these numbers, applying in the formula presented in step 6 of section B.6.1., we have:

$$EF_y = 0.5 \times 0.3636 + 0.5 \times 0.1016$$

$$EF_y = 0.2326\ tCO_2e/MWh.$$

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

The expected annual electricity delivery to the grid by the project is 121,713 tCO_{2e}/year.

Project emissions calculation (PE_y)

Emissions from fossil fuel combustion ($PE_{FF,y}$)

Considering that there is no fossil fuel combustion in the proposed project activity, $PE_{FF,y}$ = 0 tCO_2/year.

Emissions from the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y}$)

Considering that the proposed project activity consists on the construction of a small hydropower plant, there are no emissions of non-condensable gases from the operation of geothermal power plants. Therefore, $PE_{GP,y}$ = 0 tCO_2/year.

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

According to ACM0002, new hydro electric power projects with reservoirs, shall account for project emissions based on its power density (PD):

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ **Equation 7**

Considering Ibirama project data: Cap_{PJ} = 21 MW; Cap_{BL} = 0; A_{PJ} = 0.29 km^2 and A_{BL} = 0 km^2, the *PD* is 72.4 MW/km^2 or 72.4 W/m^2. As Ibirama power density (*PD*) is greater than 10 W/m^2, PE_y is 0 tCO_2/year.

Leakage calculation (LE_y)

Indirect emissions can result from project construction, transportation of materials and fuel and other upstream activities. Nevertheless, no significant net leakage from these activities was identified.

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

Table 7- Estimated emission reductions of the project

Years	**Estimation of project activity emissions** (tonnes of CO_2e)	**Estimation of baseline emissions** (tonnes of CO_2e)	**Estimation of leakage** (tonnes of CO_2e)	**Estimation of overall emission reductions** (tonnes of CO_2e)
Year 1 - (2011)*	0.00	25,951	0.0	25,951
Year 2 - (2012)	0.00	28,310	0.0	28,310
Year 3 - (2013)	0.00	28,310	0.0	28,310
Year 4 - (2014)	0.00	28,310	0.0	28,310
Year 5 - (2015)	0.00	28,310	0.0	28,310
Year 6 - (2016)	0.00	28,310	0.0	28,310
Year 6 - (2017)	0.00	28,310	0.0	28,310
Year 7 - (2018)**	0.00	2,359	0.0	2,359
Total (tonnes of CO_2e)	0.00	**198,173**	**0.0**	**198,173**

*starting on 01st February
**until 31th January

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

B.7.1 Data and parameters monitored:

Data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	EGy
Data unit:	MWh/year
Description:	Electricity generation of the Project delivered to grid.
Source of data:	Project activity site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	121,713
Description of measurement methods and procedures to be	Hourly measurement and monthly recording.

applied:	
QA/QC procedures to be applied:	Electricity supplied by the project activity to the grid. Double checked by internal control and sales receipt or by Câmara Comercializadora de Energia Elétrica – CCEE evidences. Energy metering QA/QC procedures are explained in section B.7.2 (the equipments used have by legal requirements extremely low level of uncertainty).
Any comment:	-

Data / Parameter:	*TEGy*
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 applied for the purpose of calculating expected emission reductions in section B.5	121,939
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording.
QA/QC procedures to be applied:	Electricity supplied by the project activity to the grid. Checked by internal control. Energy metering QA/QC procedures are explained in section B.7.2 (the equipments used have by legal requirements extremely low level of uncertainty).
Any comment:	-

Data / Parameter:	Cap_{PJ}
Data unit:	MW
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data:	Project site.
Value of data applied for the purpose of calculating expected emission reductions in	21

section B.5	
Description of measurement methods and procedures to be applied:	Determine the installed capacity based on recognized standards.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	km^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:	Project site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.29
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EF_{grid.CM.y}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year *y*
Source of data to be used:	Calculated following the steps provided by the "Tool to calculate the emission factor for an electricity system" applying the numbers published by the Brazilian DNA website: (http://www.mct.gov.br/index.php/content/view/4016.html)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.2326
Description of measurement methods and procedures to be applied:	Calculated based on Operating and Build margin emission factors.
QA/QC procedures to	-

be applied:	
Any comment:	For estimative purpose, the average of 2006, 2007 and 2008 was used.

Data / Parameter:	$EF_{grid.OM.y}$
Data unit:	tCO_2/MWh
Description:	Operating Margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data used:	Calculated following the steps provided by the "Tool to calculate the emission factor for an electricity system" applying the numbers published by the Brazilian DNA website: (http://www.mct.gov.br/index.php/content/view/4016.html)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.3636
Description of measurement methods and procedures to be applied:	The selected option to calculate the operating margin was the dispatch analysis which does not permit the vintage of *ex-ante* calculation of the emission factor. Therefore. the chosen option was ***ex-post*** calculation. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA.
QA/QC procedures to be applied:	
Any comment:	For estimative purpose, the average of 2006, 2007 and 2008 was used.

Data / Parameter:	$EF_{grid.BM.y}$
Data unit:	tCO_2/MWh
Description:	Build margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data used:	Calculated following the steps provided by the "Tool to calculate the emission factor for an electricity system" applying the numbers published by the Brazilian DNA website: (http://www.mct.gov.br/index.php/content/view/4016.html)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.1016

Description of measurement methods and procedures to be applied:	Option 2 of the tool was chosen. Hence. this parameter will be ***ex-post*** up-dated applying the numbers provided by the Brazilian DNA.
QA/QC procedures to be applied:	
Any comment:	For estimative purpose, the average of 2006, 2007 and 2008 was used.

Data / Parameter:	$FC_{i,m,y}$, $FC_{i,y}$, $FC_{i,j,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$ ***and*** $FC_{i,n,h}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by power plant / unit *m, j, k* or *n* (or in the project electricity system in case of $FC_{i,y}$) in year *y* or hour *h*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the “Tool to calculate the emission factor for an electricity system”.
Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/ mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the “Tool to calculate the emission factor for an electricity system”.

Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	***$EF_{CO2i,y}$ and $EF_{CO2m,i,y}$***
Data unit:	tCO_2/GJ
Description:	CO2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the “Tool to calculate the emission factor for an electricity system”.
Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	***$EG_{m,y}$, EG_y, $EG_{j,y}$, $EG_{k,y}$ and $EG_{n,h}$***
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant / unit *m, j, k* or *n* (or in the project electricity system in case of EG_y) in year *y* or hour *h*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)

Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the “Tool to calculate the emission factor for an electricity system”.
Description of measurement methods and procedures to be applied:	Data monitored hourly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$EG_{PJ,h}$
Data unit:	MWh
Description:	Electricity displaced by the project activity in hour *h* of year *y*
Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the “Tool to calculate the emission factor for an electricity system”.
Description of measurement methods and procedures to be applied:	Data monitored hourly.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\eta_{m,y}$
Data unit:	-
Description:	Average net energy conversion efficiency of power unit *m* in year *y*

Source of data used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated by the Brazilian DNA according to the "Tool to calculate the emission factor for an electricity system".
Description of measurement methods and procedures to be applied:	Data monitored yearly.
QA/QC procedures to be applied:	
Any comment:	

B.7.2 Description of the monitoring plan:

As of the procedures set by the "Approved consolidated monitoring methodology ACM0002" – "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources".

It consists of using meter equipment projected to register and verify bidirectionally the energy generated by the facility. This energy measurement is fundamental to verify and monitor the GHG emission reductions. The Monitoring Plan permits the calculation of GHG emissions generated by the project activity in a straightforward manner, applying the baseline emission factor.

The project will proceed with the necessary measures for the power control and monitoring. Together with the information produced by both ANEEL and ONS, it will be possible to monitor the power generation of the project and the grid power mix. Beyond that, information about power generation and energy supplied to the grid are controlled by the Chamber of Electric Energy Commercialization CCEE (from the Portuguese *Câmara de Comercialização de Energia Elétrica*). CCEE makes feasible and regulates the electricity energy commercialization.

There will be four energy meters specified by CCEE. Each SHPP will have a meter and there will be two meters (principal and backup) utilized for billing from Centrais Elétricas Matogrossenses S/A. Before the operations start, CCEE demands that these meters are calibrated by an entity with Rede Brasileira de Calibração (RBC) credential. Measurements will be controlled in real time by the Operation and Management Center (COG) in Cuiabá, capital of Mato Grosso state. Measurement data will be compared between the meters, so that any problems can be detected. In case of any problem, plant personnel will be put in action.

Brennand Group will be responsible for the calibration (each 2 years) and maintenance of the monitoring equipment, for dealing with possible monitoring data adjustments and uncertainties, for review of reported results/data, for internal audits of GHG project compliance with operational requirements and for corrective actions.

Brennand is responsible for the project management, as well as for organising and training the staff in the appropriate monitoring, measurement and reporting techniques. Also, Brennand is preparing an operation, maintenance and emergency manual. Technicians will be trained on mounting and start-up.

ANEEL can visit the plant to inspect the operation and maintenance of the facilities.

Brennand Group, the company that controls Ibirama Energética S.A., has hired expert companies to execute their environmental programs. After the beginning of commercial operations, renovation of degraded areas and of permanent preservation areas will be done according to the regulations of the environmental agencies, through a team of environmental experts, that will also monitor the compliance with the environmental agencies' regulations. Studies done during the design phase of the project activities have shown the environmental impacts and the interference on the social development in the region of the plant, indicating the mitigation measures to be adopted during the construction phase. These measures are being taken rigorously. Data about environmental impact are being archived by the SHPPs and the environmental agencies.

Data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

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 and the monitoring methodology (DD/MM/YYYY): 22/05/2009.

Name of person/entity determining the baseline:

Company:	Ecopart Assessoria em Negócios Empresariais Ltda.
Address:	Rua Padre João Manoel, 222
Zip code + city:	01411-000 São Paulo, SP
Country:	Brazil
Contact person:	Karen M. Nagai
Telephone number:	+55 (11) 3063-9068
Fax number:	+55 (11) 3063-9069
E-mail:	karen.nagai@ecopart.com.br

Ecopart Assessoria em Negócios Empresariais Ltda. is Project Advisor and Project Participant.

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:

(DD/MM/YYYY) 20/03/2007.

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

20y-0m

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:

(DD/MM/YYYY) 01/02/2011 or on the date of registration of the CDM project activity, whichever is later.

C.2.1.2. Length of the first crediting period:

7y-0m

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:

In Brazil, the sponsor of any project that involves construction, installation, expansion or operation of any polluting or potentially polluting activity or any other capable to cause environmental degradation is obliged to secure a series of permits from the relevant environmental agency (federal and/or local, depending on the kind of project and location).

The environmental impact of the Project is considered small by the host country definition of small-hydro plants. By legal definition of the Brazilian Electricity Regulatory Agency (ANEEL), Resolution nr. 652, December 9th, 2003, small hydro in Brazil must have installed capacity greater than 1 MW but not more than 30 MW and with reservoir area less than 3 km², but not greater than 13 km².

Although small hydro projects has reduced environmental impacts given the smaller dams and reservoir size, project sponsors have to obtain all licenses required by the Brazilian environmental regulation (Resolution CONAMA - *Conselho Nacional do Meio Ambiente* (National Environmental Council) nr. 237/97):

- The preliminary license (*Licença Prévia* or LP),
- The construction license (*Licença de Instalação* or LI); and
- The operating license (*Licença de Operação* or LO).

The environmental permit process has an administrative nature and was implemented by the National Environmental Policy, established by the Law n. 6938 dated on October 31st, 1981. Additionally, other norms and laws were issued by CONAMA and local state agencies.

In order to obtain all environmental licenses every small hydro projects shall mitigate the following impacts:

- Inundation of Indian lands and historical areas of slavery – the authorization for that depends on National Congress decision;
- Inundation of environmental preservation areas, legally formed as National Parks and Conservation Units;
- Inundation of urban areas or country communities;
- Reservoirs where there will be urban expansion in the future;
- Elimination of natural patrimony;
- Expressive losses for other water uses;
- Inundation of protected historic areas; and
- Inundation of cemeteries and other sacred places.

The process starts with a previous analysis (preliminary studies) by the local environmental department. After that, if the project is considered environmentally feasible, the sponsors have to prepare the Environmental Assessment, which is basically composed by the following information:

- Reasons for project implementation;
- Project description, including information regarding the reservoir;
- Preliminary Environmental Diagnosis, mentioning main biotic, and anthropic aspects;

- Preliminary estimation of project impacts; and
- Possible mitigating measures and environmental programs.

The result of those assessments is the Preliminary License (LP), which reflects the environmental local agency positive understanding about the environmental project concepts.

In order to obtain the Construction License (LI) it is necessary to present (a) additional information about previous assessment; (b) a new simplified assessment; or (c) the Environmental Basic Project, according to the environmental agency decision informed at the LP.

The Operation License (LO) is a result of pre-operational tests during the construction phase to verify if all exigencies made by environmental local agency were completed.

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 plant possesses the preliminary and construction licenses issued by the Santa Catarina Environmental Agency (FATMA - Fundação do Meio Ambiente).

The project does not imply in significant negative transboundary environmental impacts, on the contrary the licenses would not be issued. All documents related to operational and environmental licensing are public and can be obtained at the state environmental agency (FATMA) and with the PPs.

SECTION E. Stakeholders' comments

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

Brazilian Designated National Authority "*Comissão Interministerial de Mudanças Globais do Clima*", requests comments from local stakeholders, and the validation report issued by an authorized DOE according to the Resolution nr. 1, issued on 11th September 2003, in order to provide the letter of approval.

The Resolution determines the direct invitation for comments sent by the project proponents at least to the following agents involved in and affected by project activities and at least 15 days before the GSP:

- Municipal governments and City Councils;
- State and Municipal Environmental Agencies;
- Brazilian Forum of NGOs and Social Movements for Environment and Development;
- Community associations;
- State Attorney for the Public Interest (state and federal);

Invitation letters were sent to the following agents (copies of the letters and post office confirmation of receipt communication are available upon request and will be supplied to the DOE validating the Project Activity):

- City Hall of Ibirama;
- Municipal Assembly of Ibirama;
- Environmental Agency of Ibirama;
- Communitarian Association;
- Environmental Agency of Santa Catarina;
- State Attorney for the Public Interest of Santa Catarina State;
- Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento e Meio Ambiente (Brazilian Forum of NGOs and Social Movements for the Development and Environment).

No concerns were raised in the public calls regarding the project neither in the local (demanded by the DNA) nor in the global stakeholders' process (demanded by the CDM modalities and procedures).

E.2. Summary of the comments received:

No comments were received.

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

No comments were received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Ibirama Energética S.A.
Street/P.O.Box:	Av. Marechal Mascarenhas de Morais, 3905 – 1º andar – sala 38
Building:	
City:	Recife
State/Region:	Pernambuco
Postfix/ZIP:	50741-904
Country:	Brazil
Telephone:	+55 (81) 2121-0369
FAX:	+55 (81) 2121-0340
E-Mail:	
URL:	http://www.brennandenergia.com.br
Represented by:	Mr. Ricardo Rêgo
Title:	Administrative-Finance Director
Salutation:	Mr.
Last Name:	Rêgo
Middle Name:	
First Name:	Ricardo
Department:	
Mobile:	+55 (81) 9973-9897
Direct FAX:	+55 (81) 2121-0340
Direct tel:	+55 (81) 2121-0340
Personal E-Mail:	ricardo.rego@brennandenergia.com.br

Organization:	Ecopart Assessoria em Negócios Empresariais Ltda.
Street/P.O.Box:	Rua Padre João Manoel 222
Building:	
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	01411-000
Country:	Brazil
Telephone:	+55 (11) 3063-9068
FAX:	+55 (11) 3063-9069
E-Mail:	info@ecopart.com.br
URL:	http://www.ecopart.com.br/
Represented by:	Mrs. Melissa Sawaya Hirschheimer
Title:	
Salutation:	Mrs.
Last Name:	Hirschheimer
Middle Name:	Sawaya
First Name:	Melissa
Department:	
Mobile:	
Direct FAX:	+55 (11) 3063-9069
Direct tel:	+55 (11) 3063-9068
Personal E-Mail:	focalpoint@ecopart.com.br

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the present project.

This project is not a diverted ODA from an Annex 1 country.

Annex 3

BASELINE INFORMATION

The Brazilian electricity system, for the purpose of CDM activities, was delineated as a single interconnected system comprehending the five geographical regions of the country (North, Northeast, South, Southeast and Midwest). This was determined by the Brazilian DNA through its Resolution nr. 8 dated May 26th, 2008. The Brazilian DNA has also published the build and operating margin for the Brazilian Interconnected System for the years 2006, 2007 and 2008 (Table 4).

Table 4 – Summary of operating margin (monthly) and build margin (annual) published by the Brazilian DNA

Emission Factor, Combined Margin, Brazilian Interconected System ($EF_{CM} = 0.5 \times EF_{OM} + 0.5 \times EF_{BM}$) [$tCO_2$/MWh]												
--- 2006 ---	January	February	March	April	May	June	July	August	September	October	November	December
EF_{OM}	0.3218	0.3462	0.3373	0.2752	0.3173	0.3058	0.3507	0.3360	0.3834	0.3598	0.2651	0.2802
EF_{BM}	0.0814											
EF_{CM} (montlhy)	0.2016	0.2138	0.2094	0.1783	0.1993	0.1936	0.2160	0.2087	0.2324	0.2206	0.1732	0.1808
EF_{CM} (annual)	**0.2023**											
--- 2007 ---	January	February	March	April	May	June	July	August	September	October	November	December
EF_{OM}	0.2292	0.1954	0.1948	0.1965	0.1606	0.2559	0.3096	0.3240	0.3550	0.3774	0.4059	0.4865
EF_{BM}	0.0775											
EF_{CM} (montlhy)	0.1533	0.1364	0.1361	0.1370	0.1190	0.1667	0.1935	0.2007	0.2163	0.2274	0.2417	0.2820
EF_{CM} (annual)	**0.1842**											
--- 2008 ---	January	February	March	April	May	June	July	August	September	October	November	December
EF_{OM}	0.5727	0.6253	0.5794	0.4529	0.4579	0.5180	0.4369	0.4258	0.4102	0.4369	0.3343	0.4686
EF_{BM}	0.1458											
EF_{CM} (menthly)	0.3593	0.3856	0.3626	0.2994	0.3019	0.3319	0.2913	0.2858	0.2780	0.2913	0.2401	0.3072
EF_{CM} (annual)	**0.3112**											

The option chosen by the DNA to calculate the operating margin was option C) dispatch data analysis. Therefore, the emission factor has to be up-dated annually. Consequently, the emission factor can only be estimated *ex-ante* assuming a constant generation of the electricity by the project's plant.

Brazil, however, possesses a large share of hydroelectricity and during the years when an atypical short rainy season is observed the generation of electricity by the thermal power plants fuelled with fossil fuels rises. This was observed, for instance, in the year 2008 when the calculated emission factor was significantly higher when compared to those for 2006 and 2007 (Table 5).

Table 5 – Brazilian Interconnected System's Emission Factor for the year 2006, 2007 and 2008

	EF_{OM}	EF_{BM}	EF_{CM}
--- 2006 ---	0.3232	0.0814	0.2023
--- 2007 ---	0.2909	0.0775	0.1842
--- 2008 ---	0.4766	0.1458	0.3112
			0.2326

For this reason, to avoid significant discrepancies between emission reductions estimated in the PDD and the verified ones during the crediting period of the project activity, an average of the emission factor of the

last three years – 0.2326 tCO_2e/MWh - was used to calculate the expected Emission Reductions by the proposed CDM Project Activity.

More information is available at the Brazilian DNA website (http://www.mct.gov.br/upd_blob/0024/24719.pdf).

Annex 4

MONITORING INFORMATION

Methodology applicable to this project is the approved consolidated monitoring methodology ACM0002 – "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources". More information can be seen at section B.7.2 – Description of the monitoring plan.

Annex 5

REFERENCES

ACM0002 (2009). Approved Consolidated Baseline Methodology 0002 – Consolidated Methodology for grid-connected electricity generation from renewable sources. Version 10. Available at http://cdm.unfccc.int/.

ANEEL (2008). Banco de Informações de Geração - BIG. Capacidade de Geração. Agência Nacional de Energia Elétrica. Available at http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp

BERNARDO, A. E.; CHOWDHRY, B.; GOYAL, A. (2005). Growth options, beta and cost of capital. UCLA Working Paper, Los Angeles, March 2005. Available at http://www.anderson.ucla.edu/document/areas/fac/finance/24-05.pdf .

BNDES (2000). O setor elétrico – Desempenho 1993/1999. Banco Nacional de Desenvolvimento Econômico e Social. Informe Infra-estrutura, nº 53. Available at http://www.bndes.gov.br/.

CAMACHO, F. (2004). Custo de capital de indústrias reguladas no Brasil. Revista do BNDES, Rio de Janeiro, v. 11, n. 21, p.139-164, junho 2004.

CCEE (2007). Histórico de preços semanais. Câmara de Comercialização de Energia Elétrica. Available at: http://www.ccee.org.br/

DAMODARAN, A. (2003). Country risk and company exposure: theory and practice. Journal of Applied Finance, Tampa, p. 63-76, Fall/Winter.

ELETROBRÁS (1999). Diretrizes para estudos e projetos de pequenas centrais hidrelétricas. Centrais Elétricas Brasileiras S/A. Available at http://www.eletrobras.gov.br/.

ELETROBRÁS (2009). Centrais Elétricas Brasileiras S/A. Programas e fundos setoriais. Proinfa. Relação de empreendimentos contratados e extratos de contratos e termos aditivos celebrados. Available at: <http://www.eletrobras.com/elb/data/Pages/LUMISABB61D26PTBRIE.htm>. Accessed on August 5th, 2009.

ESPARTA, A. R. J. (2008). Redução de emissões de gases de efeito estufa no setor elétrico brasileiro: a experiência do Mecanismo de Desenvolvimento Limpo do Protocolo de Quioto e uma visão futura. March 2008.

IBGE (2007). Banco de dados Cidades@,. Instituto Brasileiro de Geografia e Estatística. Available at http://www.ibge.gov.br/cidadesat/default.php.

NTUA (2009). Department of mechanical engineering. Fluids section. National Technical University of Athens. Available at: <http://www.fluid.mech.ntua.gr/lht/PB0303011.JPG>. Accessed on April 30th, 2009.

STOWE, J. D. et al.(2002). Analysis of equity investments: valuation. 1 ed. Baltimore: AIMR, 2002. 318 p.

UNEP-LAC (2002). Final Report of the 7th Meeting of the Inter-Sessional Committee of the Forum of Ministers of Environment of Latin America and the Caribbean. United Nations Environment Programme, Regional Office for Latin America and the Caribbean. 15 to 17 May, 2002, São Paulo (Brazil).

UNFCCC (2008). United Nations Framework Convention on Climate Change. Available at http://cdm.unfccc.int/index.html.

WCD (2000). Dams and development: a new framework for decision making. World Commission on Dams. Earthscan Publications. London, U.K.