CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

A. General description of the small-scale project activity

B. Baseline methodology

C. Duration of the project activity / Crediting period

D. Monitoring methodology and plan

E. Calculation of GHG emission reductions by sources

F. Environmental impacts

G. Stakeholders comments

Annexes

Annex 1: Information on participants in the project activity

Annex 2: Information regarding public funding

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

Eldorado Cogeneration Project (hereafter referred to as “Eldorado Project”).
PDD version number: 01.
Date (DD/MM/YYYY): 29/11/2006.

A.2. Description of the small-scale project activity:

The primary objective of Eldorado Cogeneration 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 the environmental, social and economic sustainability by increasing renewable energy’s share of the total Brazilian (and the Latin America and the Caribbean region’s) electricity consumption.

The Latin America and the Caribbean region countries have expressed their commitment towards achieving a target of 10% renewable energy of the total energy use in the region. Through an initiative of 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].

Eldorado Cogeneration Project consists in the construction of a sugar mill, which is in operation since June 2006, capable of generating power surplus for sale (Figure 1) and, at the same time, generating carbon credits contributing to the sustainable development.

The cogeneration project will generate enough energy not only for powering the sugar mill (thus eliminating the consumption of energy from the grid), but also for delivering surplus energy to the national grid. This electricity given to the grid will displace energy that the government would have provided with a strong use of fossil fuels. This displacement of energy thus creates a reduction of greenhouse gases emissions. This project also creates social and economical benefits that constitute a real contribution to Brazil’s sustainable development

Eldorado Cogeneration Project is owned by Energética Eldorado Ltda., which is composed by Colorado Agropecuária Ltda. and three members from Coutinho’s family. The objective of Energética Eldorado Ltda. is to produce electric energy and steam through the transformation of the sugar-cane bagasse and straw, besides the biogas.

[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.*"

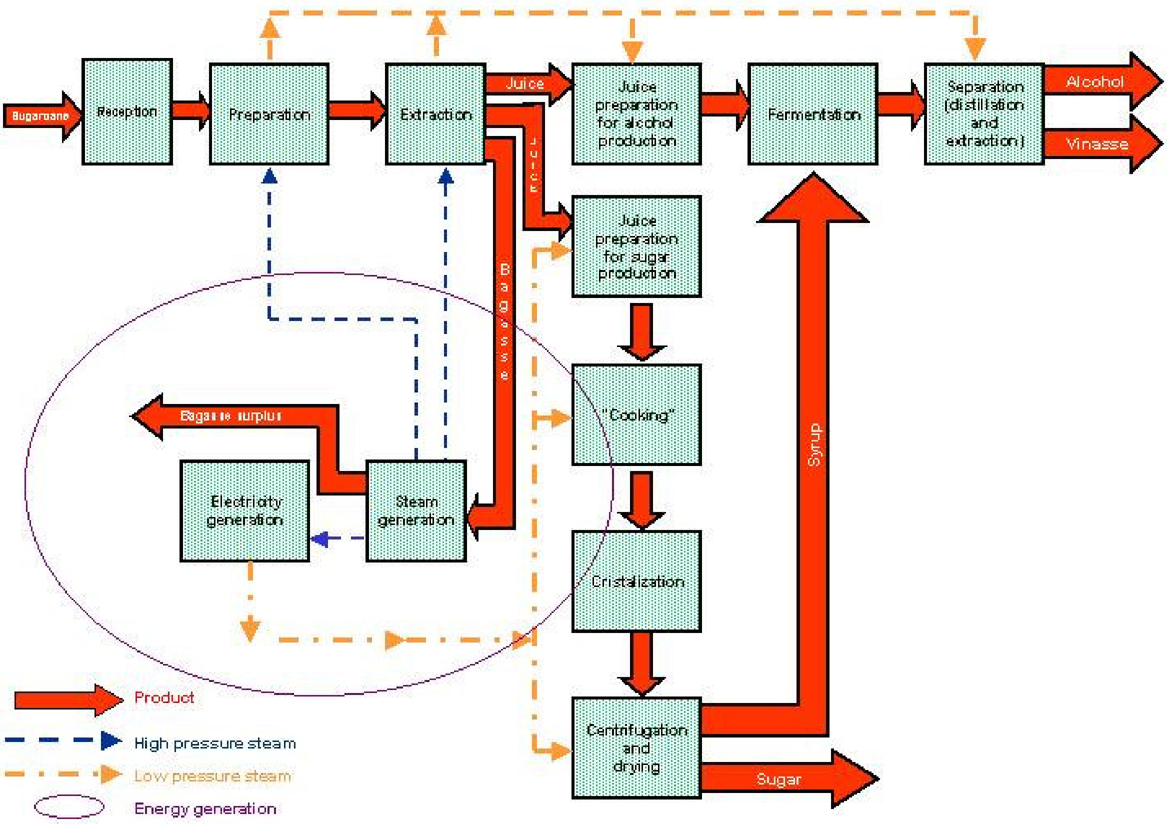

Figure 1 - Flowchart of the electricity generation inside a Sugar and Alcohol Production (Source: Codistil)

This indigenous and cleaner source of electricity will also have an important contribution to environmental sustainability by reducing carbon dioxide emissions that would have occurred otherwise in the absence of the project. The project activity reduces emissions of greenhouse gas (GHG) by avoiding electricity generation by fossil fuel sources (and CO_2 emissions), which would be generating (and emitting) in the absence of the project.

The Project can be seen as an example of a solution by the private sector to the Brazilian electricity crisis of 2001, contributing to the sustainable development of the country. Eldorado Cogeneration Project thus comes to prove that with the commercialization of CERs, it is viable to develop a generation project in Brazil. This will have a positive effect for the country beyond the evident reductions in GHG emissions.

The revenues obtained from the sale of the CERs will also help Eldorado to continue supporting the community. Usina Eldorado has a strong social responsibility evidenced in numerous initiatives, including Anjo da Guarda project, an initiative that has as objective the social integration of children, with medical consultation and leisure, and the recuperation of permanent preservation area with partnership with a NGO - SOS Mata Atlântica - and Click Árvore. This revenue distribution and social efforts must be added to the environmental benefits when evaluating the contribution to sustainable development of this project activity.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the Party involved whishes to be considered as project participant (Yes/No)
Brazil (host)	Energética Eldorado Ltda. (Private)	No
	Ecoinvest Carbon Brasil 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.		

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

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

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Brazil.

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

Mato Grosso do Sul state (Midwest of Brazil).

A.4.1.3. City/Town/Community etc:

Rio Brilhante city.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

The project is located in the midwest of Brazil, state of Mato Grosso do Sul, in Rio Brilhante city. It has 26,816 inhabitants and 3,988 km^2 (Figure 3). Following the geographic coordinates of the project:

Latitude: 21^o 51' 49" S
Altitude: 345 m
Longitude: 54^o 01' 15" W

Figure 3 - Political division of Brazil showing Rio Brilhante city (Source: City Brazil, 2006).

A.4.2. Type and category(ies) and technology of the small-scale project activity:

Small-scale project activity.

Type 1: Renewable energy projects.

Category I.D.: Renewable energy generation for a grid.

Eldorado Cogeneration Project supply electricity to a distribution system (Brazilian South-Southeast-Midwest interconnected grid) and has 12 MW of installed capacity (below the eligibility limit of 15 MW for small scale projects). The equipment used in the project was developed and manufactured in Brazil.

Biomass power conversion technologies for power production can be classified into one of the three following categories: direct combustion technologies, gasification technologies, and pyrolysis. Direct combustion technologies, such as the used in Usina Eldorado, are probably the most widely known option for simultaneous power and heat generation from biomass. It involves the oxidation of biomass with excess air in a process that yields hot gases that are used to produce steam in boilers. The steam is used to produce electricity in a Rankine cycle turbine. Rankine cycle configurations could also be classified into two: condensing and backpressure, depending on the proportion of the steam used for industrial processes and where in the turbine that steam is obtained. Typically, electricity only is produced in a "condensing" steam cycle, while electricity and steam are co-generated in an "extracting" steam cycle.

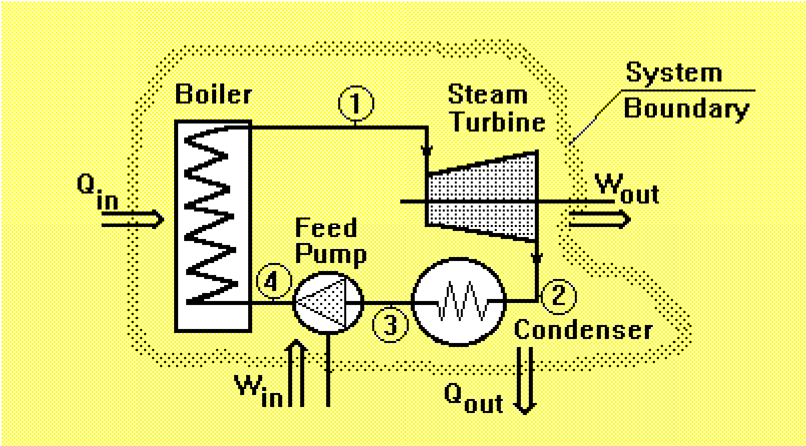

Figure 2 - Rankine Cycle

The project will operate with a configuration using 1 boiler, 1 generator and 1 turbo-generator. It will displace energy from the grid by both avoiding the consumption of power from the grid in the project and by delivering clean energy to the grid.

Table 1 - Technical Description of Energy Generation Equipments

	Boiler	***Turbo-reductor***	***Generator***
Quantity	1	1	1
Manufacturer	Dedini	TGM-Turbinas	WEG
Type	AZ-200	TM-10000	SPW 900
Manufactured Year	2005		
Pressure	42KG		
Temperature	420°C		
Leakage			
Power		12MW	15000KVA
Frequency			
Nominal Tension			13800 V

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

Eldorado Cogeneration Project, a greenhouse gas (GHG) free power generation project, will result in GHG emissions reductions by displacing electricity generation from fossil-fuel thermal plants that would have otherwise dispatched to the grid, besides will generate enough energy for powering the sugar mill (thus eliminating the consumption of energy from the grid).

Usina Eldorado utilizes bagasse as biomass. All this biomass is a by product in different agricultural processes.

For the estimation of emission reductions from electrical energy, a baseline emission factor is calculated as a combined margin of the operating and build margin emission factors. To determine these two data, the project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. Similarly, the connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system and in which power plants can be dispatched without significant transmission constraints.

The estimated emission reductions of CO2 for the first crediting period are 85,800 tonnes.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO2
2007 (starting in 19th June)	12,257
2008	12,257
2009	12,257
2010	12,257
2011	12,257
2012	12,257
2013 (until 18th June)	12,257
Total Estimated Emissions Reductions	85,800
Total number of crediting years	7
Annual average over the crediting period of estimated reductions	12,257

A.4.4. Public funding of the small-scale project activity:

This project does not receive any public funding and it is not a diversion of ODA.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM projects activities Debundling is defined as the fragmentation of a large project activity into smaller parts.

A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

· With the same project participants;

· In the same project category and technology/measure; and

· Registered within the previous 2 years; and

· Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

Since the project activity do not corresponds to any of the above-mentioned points, it not shall be considered as part of a larger project activity.

SECTION B. Application of a baseline methodology:

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

AMS-1.D Grid connected renewable electricity generation (version 9, July 28, 2006)

B.2 Project category applicable to the small-scale project activity:

Category I.D –Renewable electricity generation for a grid.

This is a type I small-scale CDM project activity: a renewable energy project activity with a maximum output capacity equivalent to up to 15 megawatts.

The capacity of the proposed project activity is 12 MW, and will not increase beyond 15 MW.

The baseline scenario is the continuation of the current situation of electricity supplied by large hydro and thermal power stations using fossil fuel.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The project fulfils all the "additionality" prerequisites (see application of the "tool for the demonstration and assessment of additionality[2]", hereafter referred to simply as "additionality tool," below) demonstrating that it would not occur in the absence of the CDM.

The "additionality tool" shall be applied to describe how the anthropogenic emissions of GHG are reduced below those that would have occurred in the absence of the Eldorado Cogeneration Project. The additionality tool provides a general step-wise framework for demonstrating and assessing additionality. These steps, numbered from 0 to 5, include:

0. Preliminary screening
1. Identification of alternatives to the project activity
2. Investment analysis and/or
3. Barrier analysis
4. Common practice analysis
5. Impact of CDM registration

The application of the additionality tool to the Eldorado Cogeneration Project follows.

Step 0. Preliminary screening based on the starting date of the project activity:

Not applicable.

---

[2] *Tool for the demonstration and assessment of additionality.* UNFCCC, , 28 November 2005, version 2.

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

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

To define the alternatives to the project activity, there are two-sided analysis, taking into consideration the perspective of the project owner and the perspective of the country.

From the country's perspective, the alternative to the project activity is the continuation of the current (previous) situation of electricity supplied by large hydro and thermal power stations using fossil fuel. Brazil is increasingly depending on thermal plants (mainly natural gas fired).

As an alternative for Enegetica Eldorado, there is the investment in other opportunities, like the financial market. Given the main project sponsor had no previous experience with the power market, in terms of alternatives to investor the most feasible scenario is the investment of surplus capital in the financial market or in his traditional business.

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

Both the project activity and the alternative scenario are in compliance with all applicable regulations.

Step 2. Investment analysis

Not applicable.

Step 3. Barrier analysis

3.a. Identify barriers that would prevent the implementation of type of the proposed project activity

The considered barriers are the following:

- Lack of investment sources to finance the private sector in the country, and the high costs of the available alternatives, as indicated by the project debt structure, which is mostly dependent to the equity capital. The creation of PROINFA is a strong indication that without a financial support, investments in alternative sources of energy for power generation ambit would not be made otherwise;
- Regulatory uncertainty, once a completely new power sector regulation is under development since January 2002.

To support the barrier analysis a brief overview of the Brazilian electricity market in the last years is first presented.

Until the beginning of the 1990's, the energy sector was composed almost exclusively of state-owned companies. From 1995 on due to the increase in international interest rates and the lack of investment capacity of the State, the government was forced to look for alternatives. The solution recommended was to initiate a privatization process and the deregulation of the market.

The four pillars of the privatization process initiated in 1995 were:

- Building a competition friendly environment, with the gradual elimination of the captive consumer. The option to choose an electricity services supplier which began in 1998 for the largest consumers, and should be available to the entire market by 2006;

- Dismantling of the state monopolies, separating and privatizing the activities of generation, transmission and distribution;
- Allowing free access to the transmission lines, and
- Placing the operation and planning responsibilities to the private sector.

At the same time three entities were created, the Electricity Regulatory Agency, ANEEL set up to develop the legislation and to regulate the market; the National Electric System Operator, ONS, to supervise and control the generation, transmission and operation; and the Wholesale Electricity Market, MAE, to define rules and commercial procedures of the short-term market.

At the end of 2000, after five years of the privatization process, results were modest (Figure 5). Despite high expectations, investments in new generation did not follow the increase in consumption.

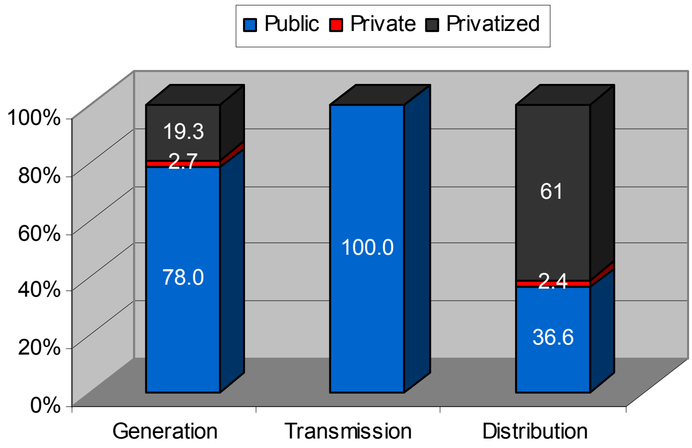

Figure 5 - Participation of private capital in the Brazilian electricity market in December 2000 (BNDES, 2000)

The decoupling of GDP (PIB – Produto Interno Bruto) (average of 2% increase in the period of 1980 to 2000) from electricity consumption increase (average of 5% increase in the same period) is well known in developing countries, mainly due to the broadening of supply services to new areas and the growing infra-structure. The necessary measures to prevent bottlenecks in services were taken. These include an increase of generation capacity higher than the GDP growth rate and strong investments in energy efficiency. In the Brazilian case, the increase in the installed generation capacity (average of 4% in the same period) did not follow the growth of consumption as can be seen in Figure 6.

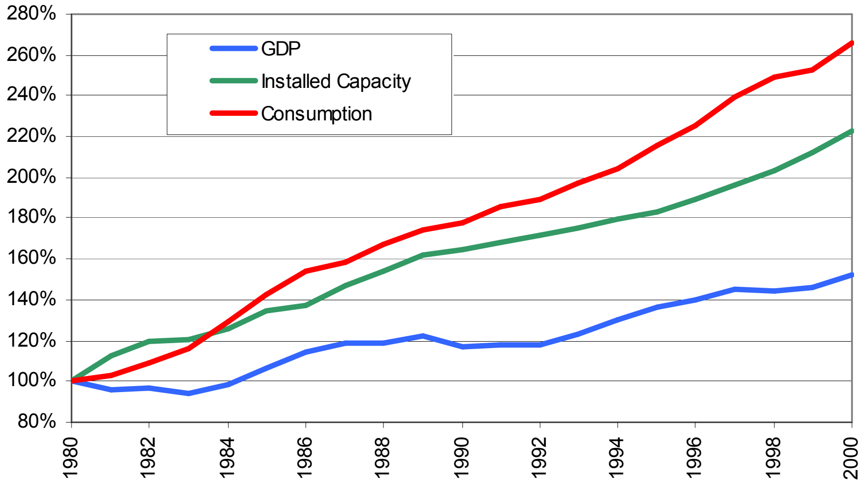

Figure 6 - Cumulated variation of GDP, electricity supply (installed capacity) and demand (consumption) (Source: Eletrobrás, http://www.eletrobras.gov.br; IBGE, http://www.ibge.gov.br/)

Without new installed capacity, the only alternatives were energy efficiency improvements or higher capacity utilization (capacity factor). Regarding energy efficiency, the government established in 1985 PROCEL (the National Electricity Conservation Program).

The remaining alternative, to increase the capacity factor of the old plants was the most widely used, as can be seen in Figure 7. To understand if such increase in capacity factor brought positive or negative consequences one needs to analyze the availability and price of fuel. In the Brazilian electricity model the primary energy source is water accumulated in the reservoirs. Figure 10 shows what has happened to the levels of "stored energy" in the reservoirs from January 1997 to January 2002. It can be seen that reservoirs which were planned to withstand 5 years of less-than-average rainy seasons, almost collapsed after a single season of low rainfall (2000/2001 experienced 74% of historical average rainfall. This situation depicts a very intensive use of the country's hydro resources to support the increase in demand without increase of installed capacity. Under the situation described there was no long-term solution for the problems that finally caused shortage and rationing in 2001.

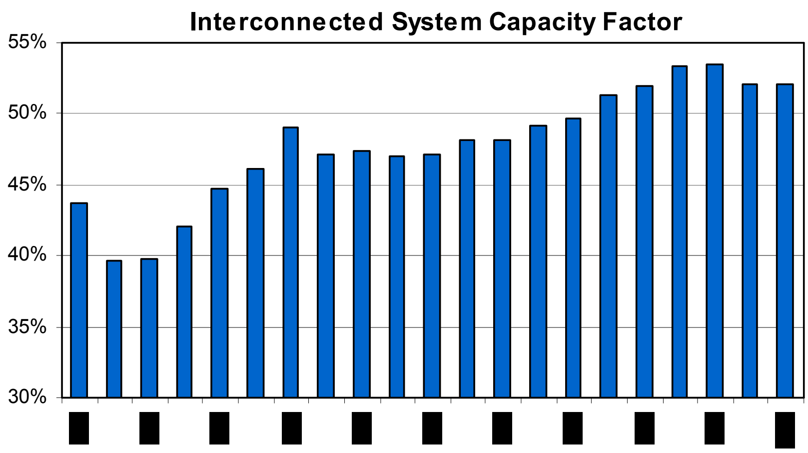

Figure 7 - Evolution of the rate of generated energy to installed capacity

(Source: Eletrobrás, http://www.eletrobras.gov.br/).

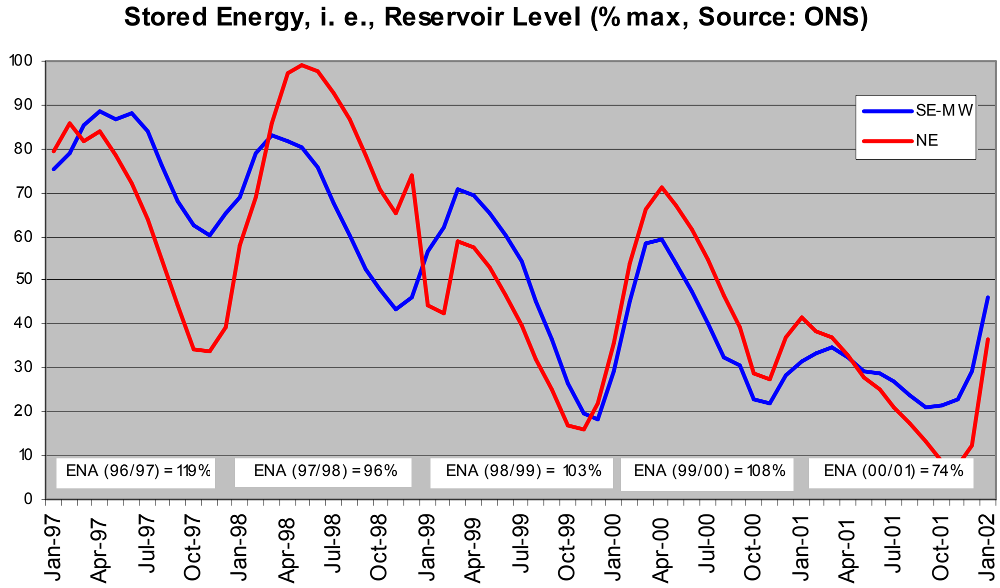

Figure 8 - Evolution of the water stored capacity for the Southeast/Midwest (SE-MW) and Northeast (NE) interconnected subsystems and intensity of precipitation in the rainy season (ENA) in the southeast region compared to the historic average (Source: ONS, http://www.ons.org.br/)

Aware of the difficulties since the end of the 1990's, the Brazilian government signalized that it was strategically important for the country to increase thermoelectric generation and consequently be less dependent of hydropower. With that in mind the federal government launched in the beginning of the year of 2000 the Thermoelectric Priority Plan (PPT, *Plano Prioritário de Termelétricas*, Federal Decree 3,371 of February 24th, 2000, and Ministry of Mines and Energy Directive 43 of February 25th, 2000), originally planning the construction of 47 thermo plants using Bolivian natural gas, totalizing 17,500 MW of new installed capacity by December of 2003. During 2001 and the beginning of 2002 the plan was reduced to 40 plants and 13,637 MW to be installed by December 2004 (Federal Law 10,438 of April 26th, 2002, Article 29). As of December 2004, 20 plants totalizing around 9,700 MW were operational

During the rationing of 2001 the government also launched the Emergency Energy Program with the short-term goal of building 58 small to medium thermal power plants until by end of 2002 (using mainly diesel oil, 76,9%, and residual fuel oil, 21.1%), totalizing 2,150 MW power capacity (CBEE, 2002).

It is clear that hydroelectricity is and will continue as the main source for the electricity base load in Brazil. However, most if not all-hydro resources in the South and Southeast of the country have been exploited, and most of the remaining reserves are located in the Amazon basin, far from the industrial and population centers (OECD, 2001). Clearly, new additions to Brazil's electricity power sector are shifting from hydro to natural gas plants (Schaeffer *et al.,* 2000). With discoveries of vast reserves of natural gas in the Santos Basin in 2003 the policy of using natural gas to generate electricity remains a possibility and it will continue to generate interest from private-sector investors in the Brazilian energy sector.

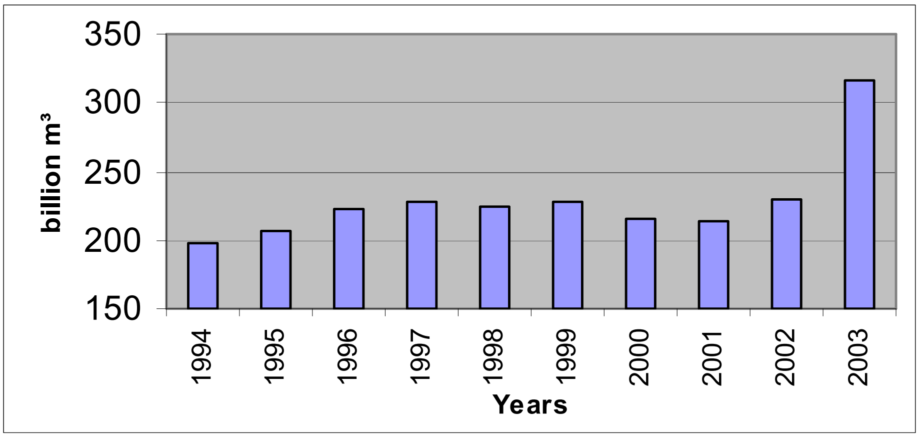

Figure 9 – Evolution of the Brazilian natural gas proved reserves (Source: Petrobras, http://www.petrobras.com.br/)

In power since January 2003, the newly elected government decided to fully review the electricity market institutional framework. Congress approved a new model for the electricity sector in March 2004. The new regulatory framework for the electricity sector has the following key features (OECD, 2005):

- Electricity demand and supply will be coordinated through a “Pool” Demand to be estimated by the distribution companies, which will have to contract 100 per cent of their projected electricity demand over the following 3 to 5 years. These projections will be submitted to a new institution called Energy Planning Company (*Empresa de Planejamento Energético*, EPE), which will estimate the required expansion in supply capacity to be sold to the distribution companies through the Pool. The price at which electricity will be traded through the Pool is an average of all long-term contracted prices and will be the same for all distribution companies.

- In parallel to the “regulated” long-term Pool contracts, there will be a “free” market. Although in the future, large consumers (above 10 MW) will be required to give distribution companies a 3-year notice if they wish to switch from the Pool to the free market and a 5-year notice for those moving in the opposite direction a transition period is envisaged during which these conditions will be made more flexible. If actual demand turns out to be higher than projected, distribution companies will have to buy electricity in the free market. In the opposite case, they will sell the excess supply in the free market. Distribution companies will be able to pass on to end consumers the difference between the costs of electricity purchased in the free market and through the Pool if the discrepancy between projected and actual demand is below 5%. If it is above this threshold, the distribution company will bear the excess costs.

- The government opted for a more centralized institutional set-up, reinforcing the role of the Ministry of Mines and Energy in long-term planning. EPE will submit to the Ministry its desired technological portfolio and a list of strategic and non-strategic projects. In turn, the Ministry will submit this list of projects to the National Energy Policy Council (*Conselho Nacional de Política Energética*, CNPE). Once approved by CNPE, the strategic projects will be auctioned on a priority basis through the Pool. Companies can replace the non-strategic projects proposed by EPE, if their proposal offers the same capacity for a lower tariff. Another new institution is a committee (*Comitê de Monitoramento do Setor Elétrico*, CMSE), which will monitor trends in power supply and demand. If any problem is identified, CMSE will propose corrective measures to avoid energy shortages, such as special price conditions for new projects and reserve of generation capacity. The Ministry of Mines and Energy will host and chair this committee. No major further privatizations are expected in the sector.

Although the new model reduces market risk, its ability to encourage private investment in the electricity sector will depend on how the new regulatory framework is implemented. Several challenges are noteworthy in this regard. *First,* the risk of regulatory failure that might arise due to the fact that the government will have a considerable role to play in long-term planning should be avoided by preventing from political interference. *Second,* rules will need to be designed for the transition from the current to the new model to allow current investments to be rewarded adequately. *Third,* because of its small size, price volatility may increase in the short-term electricity market, in turn bringing about higher investment risk, albeit this risk will be attenuated by the role of large consumers. The high share of hydropower in Brazil's energy mix and uncertainty over rainfall also contribute to higher volatility of the short-term electricity market. *Fourth,* although the new model will require total separation between generation and distribution, regulations for the unbundling of vertically integrated companies still have to be defined. Distribution companies are currently allowed to buy up to 30 per cent of their electricity from their own subsidiaries (self-dealing). *Finally,* the government's policy for the natural gas sector needs to be defined within a specific sectoral framework.

Investment Barrier (Long-term funding)

In order to analyze accurately the investment environment in Brazil, the Brazilian Prime Rate, known, as SELIC rate, as well as the CDI – Interbank Deposit Certificate, which is the measure of value in the short-term credit market, need to be taken into account. Real interest rates have been extraordinarily high since the Real plan stabilized inflation in 1994.

As a consequence of the long period of inflation, the Brazilian currency experienced a strong devaluation, effectively precluding commercial banks from providing any long-term debt operation. The lack of a long-term debt market has caused a severe negative impact on the financing of energy projects in Brazil.

Interest rates for local currency financing are significantly higher than for US Dollar financing. The National Development Bank, BNDES, is the only supplier of long-term loans. Debt funding operations from BNDES are made primarily through commercial banks. As the credit market is dominated by shorter maturities (90-days to 01-year) there are rare long-term credit lines being made available except for the strongest corporate borrowers and for special government initiatives. Credit is restricted to the short-term in Brazil or the long-term in dollars offshore.

Financial domestic markets with a maturity of greater than a year are practically non-existent in Brazil. Experience has shown that in moments of financial stress the duration of savings instruments have contracted to levels close to one day with a massive concentration in overnight banking deposits. Savers do not hold long-term financial contracts due to the inability to price-in the uncertainty involved in the preservation of purchasing power value (Arida et al., 2004). Also, the capital market is not well develop in the country to provide stock market public funding.

The lack of a local long-term market results not from a disinterest of financial investment opportunities, but from the reluctance of creditors and savers to lengthen the horizon of their placements. It has made savers look for the most liquid investment and place their money in short-term government bonds instead of investing in long-term opportunities that could finance infrastructure projects.

The most liquid government bond is the LFT (floating rate bonds based on the daily Central Bank reference rate). As of January 2004, 51.1% of the domestic federal debt was in LFTs and had duration of one day. This bond rate is almost the same as the CDI - Interbank Deposit Certificate rate that is influenced by the SELIC rate, defined by COPOM[3].

The SELIC Rate has been oscillating since 1996 from a minimum of 15% p.a. in January 2001 to a maximum of 45% p.a. in March 1999 (Figure 10).

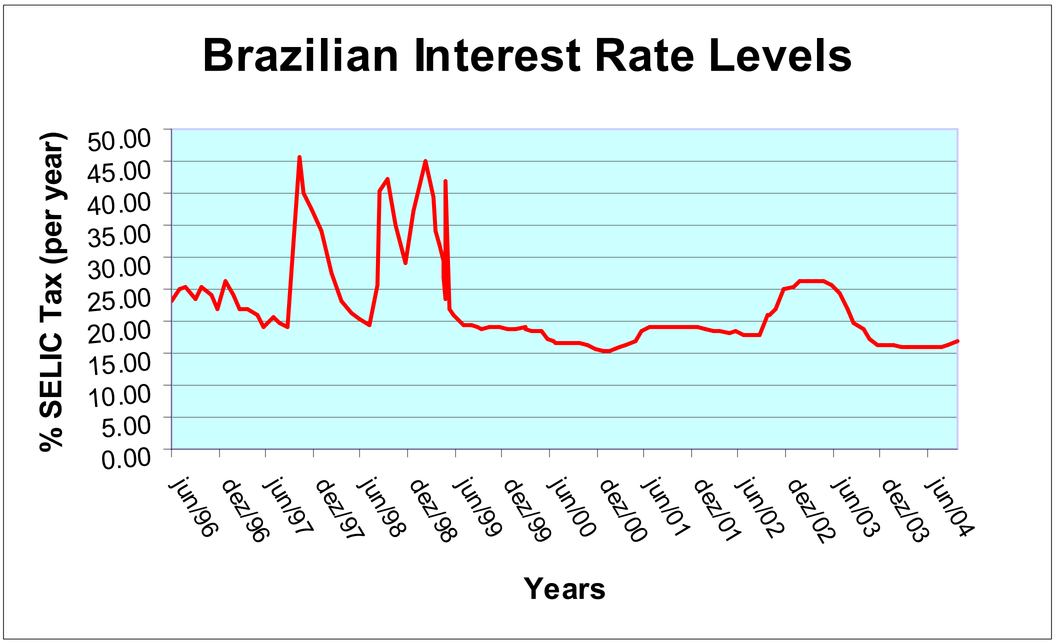

Figure 10 – Brazilian Interest Rate Levels (Source: *Banco Central do Brasil*)

The project activity is under development with its own capital. To finance construction, project sponsors didn't take advantage of any financing line as BNDES.

This investment analysis takes a look at the factors relating to potential certified emission reductions (CERs) and the incentives derived from them in the project investment decision taking process. Thus, in taking the decision to undertake the project, the investment profitability studies considered the potential monetization of CO2 credits that the project would produce.

The project was set up with an expected financial IRR (Internal Rate of Return) of approximately 15.2 % per year, without the benefit of the CER revenues. This average project IRR is very different to the SELIC rate, set on the 25.3 % level on the first semester of 2003 (when Eldorado started construction), although the project is a much riskier investment as compared to Brazilian government bonds. The inclusion of the revenues from CERs makes the project's IRR increase by approximately 2.3 basis points from 15.2% to 17.5 % (IRR calculation under request). Such increase in return would partially compensate for the additional risk the investor would take with this project.

In addition, the increase of 2.3 basis points, the CER revenues would bring the project additional benefits due to the fact that they are generated in hard currencies (US Dollar or EURO). That revenue allows the project sponsors to hedge its debt cash flow against currency devaluation. Moreover, the CER Free Cash Flow, in US dollars or euro, could be discounted at an applicable discount interest rate, thus increasing the project leverage.

The Table 4 below shows the CER revenues attractiveness of the project, based on the project IRR.

[3] COPOM – *Comitê de Politica Monetária* (Monetary Policy Committee).

Plant	IRR with CER	IRR without CER
Eldorado	15.2	17.5%

Table 4: Project Financial Analysis

It is important to notice that the direct comparison between the SELIC rate and the IRR is not accurate and the idea is not to introduce a benchmark analysis, but to set a parameter as a reference. Given a small hydro power project is a much riskier investment than a government bond, it is necessary to have a much higher financial return, compared to the SELIC reference rate. Given the circumstances, rationale and distortions of the Brazilian economy, it is not straightforward to define the meaning of this difference of rates, and a developer might feel more comfortable than others, depending on the situation.

The high level of guarantees required to finance an energy project in Brazil is a barrier for developing new projects. Insurance, financial guarantees, financial advisories are requirements that increase the cost of the project and are barriers to the project financeability. Also, the project is generally not financed on a project finance basis, and then the developer is exposed to an extra financing risk.

Other financial barriers may be related to the power purchase agreement (PPA). The PPA is required in order to obtain long-term financing from a bank and the lack of adequate commercial agreements from the energy buyers may influence directly the negotiation between the bank and the project developer. Most of the utilities in Brazil do not have a satisfactory credit risk, thus representing a barrier to obtain long-term funding.

Given the various programs and incentives which were considered along the last years, but never successfully implemented, it is easy to notice the difficulty and barriers to implement small hydro projects in the country. The first one was called PCH-COM structured by the end 2000/beginning 2001. In February/2001 the tariff was planned to be R$ 67.00/MWh, which was the reference price of the so-called "competitive power source", or the average regular power generation addition cost, but the reference market price for the PCH source at that time was around R$ 80.00/MWh. Despite of the lower tariff, the incentive relied on the PPA guarantee and the special financing source. The program was not successful because of the guarantees needed and the clauses of the contract. I.e., the project was not considered as a project finance basis and the lender demanded for direct guarantees from the developer (other than the project itself).

In April 2002, the Proinfa Law was issued to incentive the sector. During the Proinfa first Public Hearing in beginning 2003, the PCH tariff was planned to be of R$ 125.09/MWh (base June 2003, and to be escalated by the inflation index IGP-M). But on March 30th, 2004, the Ministry of Mines and Energy (MME) issued the Portaria no. 45, which set the tariff in R$ 117.02/MWh (base March 2004, and escalated by IGP-M). In January 2005, it was around R$ 129.51/MWh. In 2005, BNDES presented the last final version of its financing incentive line to Proinfa, which is different from the one first considered for the program that was not considered sufficient. It means that for the last 5 years, the government had to present a new proposition (or incentive) per year, in order to convince the developers to invest in the small hydro sector. Eldorado Cogeneration Project is not assessing Proinfa.Proinfa has incentives like 20 years PPA with Eletrobrás and specific financing line with BNDES. These incentives are usually not as good for PPAs outside Proinfa.

Due to all the difficulties exposed, and in spite of all government incentives, there are 265 approved SHP projects in Brazil[4], between 1998 and 2005, which have not started construction yet. And only 1.43% of the power generated in the country comes from SHPs. So, the difficulties described here regarding investment barriers are common practice in Brazil.

Considering that Eldorado Cogeneration Project has not a PPA and a support through a financing line, besides being outside of Proinfa, the conclusion is that CDM incentives play an important role in overcoming financial barriers.

Institutional Barrier

As described above, since 1995 government electricity market policies have been continuously changing in Brazil. Too many laws and regulations were created to try to organize and to provide incentives for new investments in the energy sector. The results of such regulatory instability were the contrary to what was trying to be achieved. During the rationing period electricity prices surpassed BRL 600/MWh (around USD 200/MWh) and the forecasted marginal price of the new energy reached levels of BR$ 120 – 150/MWh (around USD 45). In the middle of 2004 the average price was bellow BRL 50/MWh (less than USD 20/MWh). This relatively high volatility of the electricity price in Brazil, although in the short term, contributes to the difficult the analysis of the market by the developers. Carbon credits and CDM were taken into account. They are as a guarantee for this power plant, take into account that they need to be validated and approved.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives:

As described above, the main alternative to the project activity is to continue the status quo, the sugarcane mills only concentrating their investments on sugar and ethanol. Therefore the barriers above have not affected the investment in other opportunities

Step 4. Common practice analysis:

One of the points to be considered when analyzing a small hydro project investment is the possibility to participate the Proinfa Federal Government Program. Although some projects started construction independently from Proinfa, the program is considered one of the more viable financing alternatives for these projects, which will provide long-term PPAs and special financing conditions. Eldorado Cogeneration Project is not participating in the program and is addressing the market risk as it structures its projects.

Both process of negotiating a PPA with utility companies and obtaining funding from BNDES are frequently very cumbersome. The developers perceive BNDES requiring excessive guarantees in order to provide financing. Although this might be the Bank role as a financing institution to mitigate risk, it is understood as a market barrier. Other risks and barriers are related to the operational and technical issues associated with small hydros, including their capability to comply with the PPA contract and the potential non-performance penalties.

Regardless of the risks and barriers mentioned above, the main reason for the reduced number of similar project activities is the economic cost. Project feasibility requires a PPA contract with a utility company,

---

4 Source: ANEEL - *Agência Nacional de Energia Elétrica* (Brazilian power regulatory agency).

but the utilities frequently do not have the incentives or motivation to buy electricity generated by small hydro projects.

Most of the developers that funded their projects outside of Proinfa have taken CDM as decisive factor for completing their projects. To the best of our knowledge the majority of similar projects being developed in the country are participating in the Proinfa Program and not in the CDM. Nevertheless, there is no official restraint for projects derived from public policies to participate in the CDM.

The power sector suffered with more than one year (2003-2004) without regulation, and even today the legislation is not already clear for all the investors and players. The prevailing business practice in Brazil as far as obtaining financing and financial guarantees to project is a barrier to investment in renewable energy projects in the country. The access of long-term funding for renewable energy projects is difficult, mainly because of the guarantees needed and the lack of a real project finance structure. The high cost of capital in Brazil is a barrier for projects to be developed.

As an example, a quick analysis over the installation of small hydro power plants in Brazil since 2001, shows that the incentives for this source were inexistent, or rather, not effective, indicating a market/financial barrier[5]:

Installation of SHP

Year	MW
2001	69.07
2002	51.46
2003	267.68
2004	67.79
2005 (until March)	25.20

Because of the reasons mentioned above, only 1.43% of Brazil's installed capacity comes from small hydro sources (1.3 GW out of a total of 95.8 GW). Also, from the 3.4 GW under construction in the country, only 738 MW are small hydro. In 2004, only 9 small-hydro projects, a total of just 5.22 MW, were authorized by the regulatory agency[6]. Many other projects are still under development, waiting for better investment opportunities.

Common practice in Brazil has been the construction of large-scale hydroelectric plants and, more recently, of thermal fossil fuel plants, with natural gas, which also receive incentives from the government. Already 21.3% of the power generated in the country comes from thermal power plants, and this number tends to increase in the short term, since 41% of the projects approved between 1998 and 2005 are thermal power plants (compared to only 14% of SHPs)[7].

These numbers show that incentives for the construction of thermal power plants have been more effective than those for SHPs. The use of natural gas has been increasing in Brazil since the construction of GASBOL (the Brazil-Bolivia pipeline). Besides, obtaining the licenses required by the Brazilian environmental regulation takes much longer for hydropower plants (years) than for thermal (two months).

---

[5] Source: Agência Nacional de Energia Elétrica – ANEEL (Brazilian Power Regulatory Agency).

[6] ANEEL – *Agência Nacional de Energia Elétrica* (Brazilian power regulatory agency)

[7] ANEEL – *Agência Nacional de Energia Elétrica* (Brazilian power regulatory agency)

The recent nationalization of the natural gas industry by the Bolivian government might change this situation, but perspectives are not clear so far.

In the most recent energy auction, which took place on December 16th, 2005, in Rio de Janeiro, 20 concessions for new power plants were granted, of which only two are for SHPs (28 MW). From the total of 3,286 MW sold, 2,247 MW (68%) will come from thermal power plants, from which 1,391 come from natural gas fired thermal power plants, i.e., 42% of the total sold[8].

In summary, this project cannot be considered common practice and therefore is not a business as usual type scenario.

Step 5. Impact of CDM Registration

The sugarcane plantation is part of the country's colonization period. The commercialization of sugarcane has become part of the Brazilian culture was introduced during the XVI century when the Portuguese colonized the country. Brazil became the first producer and exporter of sugar in the world. Since then, sugarcane has been an important part of the Brazilian agricultural industry.

Currently in Brazil, there are more than 5 million hectares of land producing sugarcane and there are more than 320 sugar mills producing sugar, ethanol and electricity to supply their own energy consumption. Consequently the potential to generate electricity for commercialization (exporting to the grid), is estimated at around 12 GW. This potential has always existed and has grown as the sugarcane industry has grown. However the investments to expand the sugar mills' power plants have only occurred since 2000. Although a flexible legislation allowing independent energy producers has existed since 1995, it was only after 2000 that sugar producers started to study this proposed project activity as an investment alternative for their power plants in conjunction with the introduction of the CDM.

The CDM has made it possible for the mills set up their cogeneration plants and export excess electricity to the grid by helping to overcome financial barriers through the financial benefits obtained from CDM revenues; this is summarized in Table 3. Additionally, CDM has helped to overcome institutional and cultural barriers since the CDM has made the project sponsors take more seriously into consideration the generation of renewable electricity.

Therefore, the registration of the proposed project activity will have a strong impact in paving the way for similar projects to be implemented in Brazil, which may bring about among other things development in technologies.

This kind of activity will be encouraged once this project activity gets registered.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

[8] Rosa, Luis Pinguelli. Brazilian. Newspaper "Folha de São Paulo", December 28, 2005.

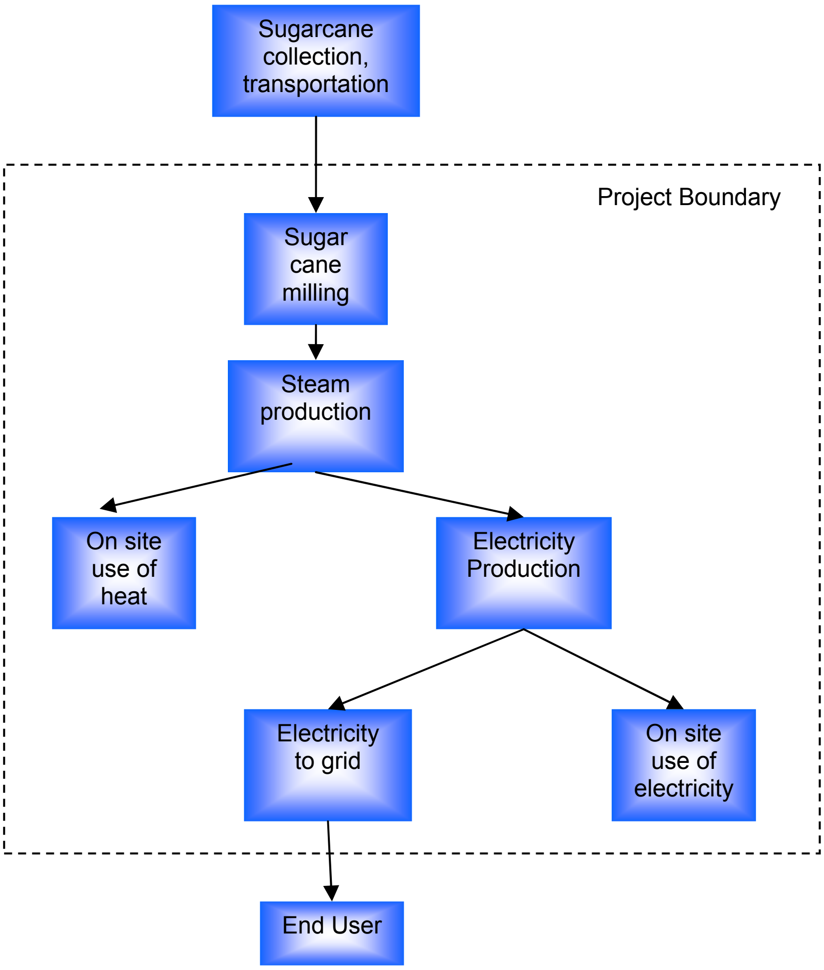

Figure 3 – Eldorado Cogeneration Project Boundary

The Eldorado Cogeneration Project boundaries are defined by the emissions targeted or directly affected by the project activities, construction and operation. It encompasses the physical, geographical site of the hydropower generation source, which is represented by the respective river basin of each project close to the power plant facility and the interconnected grid.

Brazil is a large country and is divided in five macro-geographical regions, North, Northeast, Southeast, South and Midwest. The majority of the population is concentrated in the regions South, Southeast and Northeast. Thus the energy generation and, consequently, the transmission are concentrated in three subsystems. The energy expansion has concentrated in three specific areas:

- Northeast: The São Francisco River basically supplies the electricity for this region. There are seven hydro power plants at the river with total installed capacity around 10.5 GW.
- South/Southeast/Midwest: The majority of the electricity generated in the country is concentrated in this subsystem. These regions also concentrate 70% of the GDP generation in Brazil. There are more than 50 hydro power plants generating electricity for this subsystem.

- North: 80% of the Northern region is supplied by diesel. However, in the city of Belém, capital of the state of Pará where the mining and aluminum industries are located, electricity is supplied by Tucuruí, the second biggest hydro plant in Brazil.

The boundaries of the subsystems are defined by the capacity of transmission. The transmission lines between the subsystems have a limited capacity and the exchange of electricity between those subsystems is difficult. The lack of transmission lines forces the concentration of the electricity generated in each own subsystem. Thus the South-Southeast-Midwest interconnected subsystem of the Brazilian grid (Figure 10) where the project activity is located is considered as a boundary.

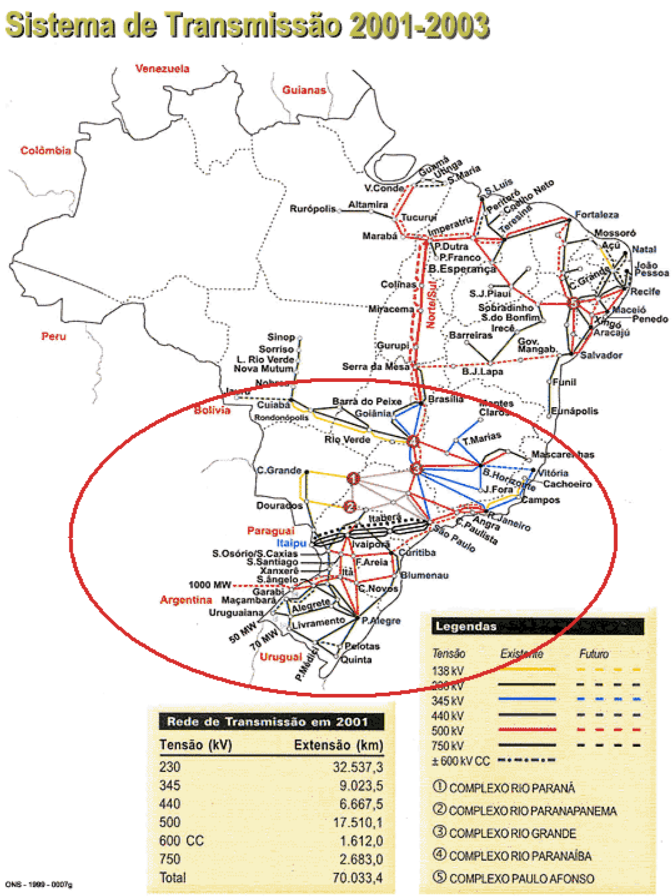

Figure 10 - Brazilian Interconnected System (Source: ONS, http://www.ons.org.br/)

Part of the electricity consumed in the country is imported from other countries. Argentina, Uruguay and Paraguay supply a very small amount of the electricity consumed in Brazil. In 2003 around 0.1% of the electricity was imported from these countries. Actually, in 2004 Brazil exported electricity to Argentina that was in a shortage period. So the energy imported from other counties does not affect the boundary of the project and the baseline calculation.

B.5. Details of the baseline and its development:

The project will have an installed capacity of 12 MW, hence this is a small-scale CDM project. and the Simplified M&P for Small-Scale CDM Project Activity, Category I. D. is applicable.

According to approved methodology AMS-1.D (version 9, July 28, 2006), there are the following options that can be applied in the selected project category.

"For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh) calculated in a transparent and conservative manner as:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered;

OR

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix. The data of the year in which project generation occurs must be used."

Considering option (a) and according ACM0002 (version 6), a baseline emission factor (*EFy*) is calculated as a combined margin (*CM*), consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors according to the following three steps:

- **STEP 1 -** Calculate the operating margin emission factor(s), based on one of the following methods
  - Simple operating margin
  - Simple adjusted operating margin
  - Dispatch data analysis operating margin
  - Average operating margin.

The second alternative, simple adjusted operating margin, will be used here.

The simple adjusted operating margin emission factor ($EF_{OM,adjusted,y}$ in tCO_2/MWh) is a variation on the simple operating margin, where the power sources (including imports) are separated in low-cost/must-run power sources (*k*) and other power sources (*j*):

$$EF_{OM,simple-adjusted,y} = (1-\lambda_y)\frac{\sum_{i,j} F_{i,j,y}\cdot COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y \cdot \frac{\sum F_{i,k,y}\cdot COEF_{i,k}}{\sum_k GEN_{k,y}}$$ **Equation 1**

Where:

- λ_y is the share of hours in year *y* (in %) for which low-cost/must-run sources are on the margin.
- $\sum_{i,j} F_{i,j,y}$ is the amount of fuel *i* (in mass or volume unit) consumed by relevant power sources *j* (analogous for sources *k*) in year(s) *y*,

- $COEF_{i,j}$ is the CO_2e coefficient of fuel *i* (tCO_2e/mass or volume unit of the fuel), taking into account the carbon dioxide equivalent emission potential of the fuels used by relevant power sources *j* (analogous for sources *k*) and the percent oxidation of the fuel in year(s) *y* and,
- $\sum_j GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j* (analogous for sources *k*),

- **STEP 2** – Calculate the build margin mission factor ($EF_{BM,y}$) as the generation weighted average emission factor (tCO_2e/MWh) of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_m GEN_{m,y}} \qquad \textbf{Equation 2}$$

Where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method (ACM0002, 2006) for plants *m*, based on the most recent information available on plants already built . The sample group m consists of either:

- The five power plants that have been built most recently, or
- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use from these two options that sample group that comprises the larger annual generation.

- **STEP 3** – Calculate the baseline emission factor EF_y, as the weighted average of the operating margin factor ($EF_{OM,y}$) and the build margin factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad \textbf{Equation 3}$$

Where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{OM} = 0.5$). Alternative weights can be used, as long as $w_{OM} + w_{BM} = 1$, and appropriate evidence justifying the alternative weights is presented.

Date of completing the final draft of this baseline section *(DD/MM/YYYY): 28*/08/2006.

Name of person/entity determining the baseline:

Company:	Ecoinvest Carbon Brasil Ltda.
Address:	Rua Padre João Manoel, 222
Zip code + city address:	01411-000 São Paulo - SP
Country:	Brazil
Contact person:	(Mr.) Ricardo Esparta
Job title:	Director
Telephone number:	+55 (11) 3063-9068
Fax number	+55 (11) 3063-9069
Personal e-mail:	esparta@ecoinvestcarbon.com

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

C.1.1. Starting date of the small-scale project activity:

19/06/2007.

C.1.2. Expected operational lifetime of the small-scale project activity:

30y-0m.

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

C.2.1. Renewable crediting period:

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

19/06/2007.

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. Application of a monitoring methodology and plan:

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

According to option (a) of Type I, Category D of CDM small-scale project activity categories contained in Appendix B of the simplified M&P for CDM small-scale project activity, monitoring shall consist of metering the electricity generated by the renewable technology.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

This Monitoring Plan has been chosen as it is suggested in the option (a) of Type I, Category D of CDM small-scale project activity categories contained in Appendix B of the simplified M&P for CDM small-scale project activity and applies to electricity capacity additions from small-scale hydro power plants with reservoir.

D.3 Data to be monitored:

Bagasse cogeneration is considered a clean technology. Therefore, the project's emissions (PEy) are zero and no formulas for calculation of direct emissions are necessary.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (Electronic/ paper)	Comment
1. Net quantity of electricity generated by the project plant	Total energy generation minus auxiliary consumption	Energy metering connected to the internal grid and to the auxiliary systems	MWh	(m)	Daily and monthly recording	100%	Electronic and paper.	The electricity delivered to the auxiliary systems is monitored by the Project. Data will be archived during the crediting period and two years after.
2. EFy	Emission Factor	Calculated	tCO2/MWh	(c)	Updated annually *ex-post* for the first crediting period	0%	Electronic	Data is available under request. Factors were calculated according to option (a) of Type I, Category D of CDM small-scale project activity categories.

3. EFom,y	Emission factor	Calculated	tCO2/MWh	(c)	Updated annually *ex-post* for the first crediting period	0%	Electronic	Data is available under request. Factors were calculated according to option (a) of Type I, Category D of CDM small-scale project activity categories.
4. EFBM,y	Emission factor	Calculated	tCO2/MWh	(c)	Updated annually *ex-post* for the first crediting period	0%	Electronic	Data is available under request. Factors were calculated according to option (a) of Type I, Category D of CDM small-scale project activity categories.
5. λy	Fraction of time during which low-cost/must-run sources are on the margin	Calculated	Non dimensional	(c)	Updated annually *ex-post* for the first crediting period	0%	Electronic	Data is available under request. Factors were calculated according to option (a) of Type I, Category D of CDM small-scale project activity categories.
6. Quantity of bagasse combusted in the project plant	Quantity of bagasse combusted in the project plant	Reports of the sugar cane quantity measured daily.	Tonnes	(m)(e) Estimated as shown in section E.4.	Sugar cane quantity is measured and reported daily by Energética Eldorado Ltda	100%	Electronic and paper.	Data is available under request. Data will be archived during the crediting period and two years after.

7. εel,project plant,y	Net energy efficiency of electricity generation in the project plant	Reports of the sugar cane quantity used daily and measurement of the net quantity of electricity generated by the project plant	Non dimensional	(c) Calculated as shown in item E.4	Monthly and yearly recording	100%	Electronic and paper.	Data is available under request. Data will be archived during the crediting period and two years after.

Credit owner and project operator, the special purpose company Energética Eldorado Ltda. (listed under A.3. Project participants), is author and the responsible for all activities related to the project management, registration, monitoring, measurement and reporting.

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

Data *(Indicate table and ID number e.g. 3.1; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	Low	Data is being monitored by Energética Eldorado Ltda.
2	Low	Data acquired from ONS and ANEEL and will be updated annually *ex-post* for the first crediting period
3	Low	Data acquired from ONS and ANEEL and will be updated annually *ex-post* for the first crediting period
4	Low	Data acquired from ONS and ANEEL and will be updated annually *ex-post* for the first crediting period.
5	Low	Data acquired from ONS and ANEEL and will be updated annually *ex-post* for the first crediting period
6	Low	Data is being measured and estimated by Energética Eldorado Ltda.
7	Low	Data is being calculated by Energética Eldorado Ltda.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

The project will proceed with the necessary measures for the power control and monitoring. Together with the information produced by Brazilian Power Regulatory Agencies, ANEEL and ONS, it will be possible to monitor the power generation of the project and the grid power mix.

As the project is neither associated with leakage effects nor with new emissions of pollutants and all other pertinent data is necessary to be analyzed and presented only at the validation phase of the project, the only data that has to be monitored going forward during the life of the contract are the net quantity of electricity generated by the project plant, the net energy efficiency of electricity generation in the project plant electricity supplied to the grid by the project ($EG_{project\ plant,y}$) and the quantity of biomass used yearly.

The project owner will continuously measure these values.

Eldorado will hired a company to be responsible for the calibration 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.

The sugar mill hired an expert company to execute their Basic Environmental Project.

D.6. Name of person/entity determining the monitoring methodology:

Company:	Ecoinvest Carbon Brasil Ltda.
Address:	Rua Padre João Manoel, 222
Zip code + city address:	01411-000 São Paulo, SP
Country:	Brazil
Contact person:	(Mr.) Ricardo Esparta
Job title:	Director
Telephone number:	+55 (11) 3063-9068
Fax number	+55 (11) 3063-9069
Personal e-mail:	esparta@ecoinvestcarbon.com

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

According to the baseline methodology activities contained in Appendix B of the simplified M&P for small-scale CDM project activities, as is the case of Eldorado Cogeneration Project, emission reductions are those that result from the application of the formula mentioned in item B.5.

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

Not applicable (GHG emissions by the project activity are zero).

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

No leakage was identified. Therefore, no calculation of estimate of GHG emissions is necessary.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

Not applicable (GHG emissions by the project activity are zero).

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

As explained in item B.5, the baseline emission factor will be calculated as the average of the “approximate operating” margin and the “build margin”, where:

(b) The average of the “approximate operating margin” and the “build margin”, where:

(i) The “approximate operating margin” emission factor ($EF_{OM,y}$) is the weighted average emissions (in kgCO_2e/MWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. Using the notation from approved methodology (ACM0002):

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad \textbf{Equation 4}$$

Where:

- $\sum_{i,j} F_{i,j,y}$ is the amount of fuel *i* (in mass or volume unit) consumed by relevant power sources *j* in year(s) *y*,
- $COEF_{i,j}$ is the CO_2e coefficient of fuel *i* (tCO_2e/mass or volume unit of the fuel), taking into account the carbon dioxide equivalent emission potential of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y* and,
- $\sum_{j} GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*,

The CO_2e coefficient $COEF_i$ is obtained as,

$$COEF_{i,j} = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad \textbf{Equation 5}$$

Where:

- NCV_i is the net calorific value (energy content) per mass or volume unit of fuel *i*,
- $OXID_i$ is the oxidation factor of the fuel *i*,
- $EF_{CO2,i}$ is CO_2e emission factor per unit of energy of the fuel *i*,

(ii) The "build margin" emission factor ($EF_{BM,y}$) is the weighted average emissions (in $kgCO_2$e/MWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants,

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad \textbf{Equation 6}$$

Where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described above for the operating margin for plants *m* (sample group *m* defined in (ii)), based on the most recent information available on plants already built.

The baseline emission factor EF_y is the average of the operating margin factor ($EF_{OM,y}$) and the build margin factor ($EF_{BM,y}$),

$$EF_y = 0.5 \cdot EF_{OM,y} + 0.5 \cdot EF_{BM,y} \qquad \textbf{Equation 7}$$

The National Dispatch Center (*Operador Nacional do Sistema Elétrico, Centro Nacional de Operação do Sistema, Acompanhamento Diário da Operação do Sistema Interligado Nacional*, daily reports from Jan. 1, 2002 to Dec. 31, 2004) supplied the raw dispatch data for the whole Brazilian interconnected grid. The following data sources were relevant for the calculation of the baseline:

- The Brazilian electricity system has been historically divided into two subsystems: the North-Northeast (N-NE) and the South-Southeast-Midwest (S-SE-CO). This is due mainly to the historical evolution of the physical system, which was naturally developed nearby the biggest consuming centers of the country.

The natural evolution of both systems is increasingly showing that integration is to happen in the future. In 1998, the Brazilian government was announcing the first leg of the interconnection line between S-SE-CO and N-NE. With investments of around US$700 million, the connection had the main purpose, in the government's view, at least, to help solve energy imbalances in the country: the S-SE-CO region could supply the N-NE in case it was necessary and vice-versa.

Nevertheless, even after the interconnection had been established, technical papers still divided the Brazilian system in two (Bosi, 2000):

"… where the Brazilian Electricity System is divided into three separate subsystems:

(i) The South/Southeast/Midwest Interconnected System;

(ii) The North/Northeast Interconnected System; and

(iii) The Isolated Systems (which represent 300 locations that are electrically isolated from the interconnected systems)"

Moreover, Bosi (2000) gives a strong argumentation in favor of having so-called *multi-project baselines*:

"For large countries with different circumstances within their borders and different power grids based in these different regions, multi-project baselines in the electricity sector may need to be disaggregated below the country-level in order to provide a credible representation of 'what would have happened otherwise".

Finally, one has to take into account that even though the systems today are connected, the energy flow between N-NE and S-SE-CO is heavily limited by the transmission lines capacity. Therefore, only a fraction of the total energy generated in both subsystems is sent one way or another. It is natural that this fraction may change its direction and magnitude (up to the transmission line's capacity) depending on the hydrological patterns, climate and other uncontrolled factors. But it is not supposed to represent a significant amount of each subsystem's electricity demand. It has also to be considered that only in 2004 the interconnection between SE and NE was concluded, i.e., if project proponents are to be coherent with the generation database they have available as of the time of the PDD submission for validation, a situation where the electricity flow between the subsystems was even more restricted is to be considered.

The Brazilian electricity system nowadays comprises of around 91.3 GW of installed capacity, in a total of 1,420 electricity generation enterprises. From those, nearly 70% are hydropower plants, around 10% are natural gas-fired power plants, 5.3% are diesel and fuel oil plants, 3.1% are biomass sources (sugarcane bagasse, black liquor, wood, rice straw and biogas), 2% are nuclear plants, 1.4% are coal plants, and there are also 8.1 GW of installed capacity in neighboring countries (Argentina, Uruguay, Venezuela and Paraguay) that may dispatch electricity to the Brazilian grid. (Aneel, 2005. http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp). This latter capacity is in fact comprised by mainly 6.3 GW of the Paraguayan part of Itaipu Binacional, a hydropower plant operated by both Brazil and Paraguay, but whose energy almost entirely is sent to the Brazilian grid.

The Small Scale Approved Methodology I.D asks project proponents to account for "all generating sources serving the system". In that way, when applying this methodology, project proponents in Brazil should search for, and research, all power plants serving the Brazilian system.

In fact, information on such generating sources is not publicly available in Brazil. The national dispatch center, ONS – *Operador Nacional do Sistema* – argues that dispatching information is strategic to the power agents and therefore cannot be made available. On the other hand, ANEEL, the electricity agency, provides information on power capacity and other legal matters on the electricity sector, but no dispatch information can be got through this entity.

In that regard, project proponents looked for a plausible solution in order to be able to calculate the emission factor in Brazil in the most accurate way. Since real dispatch data is necessary after all, the ONS was contacted, in order to let participants know until which degree of detail information could be provided. After several months of talks, plants' daily dispatch information was made available for years 2003, 2004 and 2005.

Project proponents, discussing the feasibility of using such data, concluded it was the most proper information to be considered when determining the emission factor for the Brazilian grid. According to ANEEL, in fact, ONS centralized dispatched plants accounted for 75,547 MW of installed capacity by 31/12/2004, out of the total 98,848.5 MW installed in Brazil by the same date (Aneel, 2005. http://www.aneel.gov.br/arquivos/PDF/Resumo_Gráficos_mai_2005.pdf), which includes capacity available in neighboring countries to export to Brazil and emergency plants, that are dispatched only during times of electricity constraints in the system. Therefore, even though the emission factor calculation is carried out without considering all generating sources serving the system, about 76.4% (76.4%) of the installed capacity serving Brazil is taken into account, which is a fair amount if one looks at the difficulty in getting dispatch information in Brazil. Moreover, the remaining 23.6% (23.6%) are plants that do not have their dispatch coordinated by ONS, since: either they operate based on power purchase agreements which are not under control of the dispatch authority; or they are located in non-interconnected systems to which ONS has no access. In that way, this portion is not likely to be affected by the CDM projects, and this is another reason for not taking them into account when determining the emission factor.

The amount of fuel consumed by relevant fossil-fuel-fired plants, are the ones collected in a research made by the International Energy Agency (Bosi et. al., 2002).

The emission coefficients of each fuel are the ones indicated by the IPCC (1996).

Using the above mentioned data, the numbers in Table 2 (in section E.2) and Table 4 (below) arise from the calculation of the baseline and the amount of emission reduction over the chosen crediting period. *EFy*=0.5x0.4349 + 0.5x0.0872=0.2611.

Emission factors for the Brazilian South-Southeast-Midwest interconnected grid				
Baseline (including imports)	EF_{OM} [tCO2/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
	Total (2003-2005) =	**906.373.081**	**856.109.626**	**5.463.113**
	$EF_{OM, simple-adjusted}$ [tCO2/MWh]	$EF_{BM,2005}$	Lambda	
	0,4349	0,0872	λ_{2003}	
	Alternative weights	Default weights	0,5312	
	w_{OM} = 0,75	w_{OM} = 0,5	λ_{2004}	
	w_{BM} = 0,25	w_{BM} = 0,5	0,5055	
	Alternative EF_y [tCO2/MWh]	Default EF_y [tCO2/MWh]	λ_{2005}	
	0,3480	**0,2611**	0,5130	

Table 4 - Brazilian South-Southeast-Midwest interconnected system baseline calculation

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

The emission reductions by the project activity (ER_y) during a given year *y* are the product of the baseline emissions factor (EF_y, in tCO_2e/MWh) times the electricity supplied by the project to the grid (EG_y, in MWh), as follows:

$$ER_y = EF_y \cdot EG_y$$ **Equation 8**

Since the project activity is not adding renewable energy capacity, nor a retrofit of an existing facility, *EGy* (electricity production) = *TEy* (actual electricity produced in the plant).

E.2 Table providing values obtained when applying formulae above:

Considering a baseline of 0.2611 tCO_2e/MWh, the implementation of Eldorado Cogeneration Project connected to the Brazilian interconnected power grid will generate an estimated annual reduction as shown in Table 2 below.

Years	Estimation of project activity emissions reductions (tonnes of CO2e)	Estimation of baseline emissions reductions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of emissions reductions (tonnes of CO2e)
Year 1 (2007, starting in 19th June)	0.00	12,257	0.00	12,257
Year 2 (2008)	0.00	12,257	0.00	12,257
Year 3 (2009)	0.00	12,257	0.00	12,257
Year 4 (2010)	0.00	12,257	0.00	12,257
Year 5 (2011)	0.00	12,257	0.00	12,257
Year 6 (2012)	0.00	12,257	0.00	12,257
Year 7 (2013)	0.00	12,257	0.00	12,257
Year 8 (2014, until 18th June)	0.00	0	0.00	0
Total (tonnes of CO2e)	0.00	85,800	0.00	85,800

Table 2 – Estimated Eldorado Cogeneration Project emissions reductions

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

As for the environmental permits, the proponent of any project that involves the construction, installation, expansion, and operation of any polluting or potentially polluting activity or any activity capable of causing environmental degradation is required to secure a series of permits from the respective state environmental agency. In addition, any such activity requires the preparation of an environmental assessment report, prior to obtaining construction and operation permits. Three types of permits are required. The first is the preliminary permit (*Licença Prévia* or L.P.) issued during the planning phase of the project and which contains basic requirements to be complied with during the construction, and operating stages. The second is the construction permit (*Licença de Instalação* or L.I.) and, the final one is the operating permit (*Licença de Operação* or L.O.).

The preparation of an Environmental Impact Assessment is compulsory to obtain the construction and the operation licenses. In the process a report containing an investigation of the following aspects was prepared:

- Impacts to climate and air quality.
- Geological and soil impacts.
- Hydrological impacts (surface and groundwater).
- Impacts to the flora and animal life.
- Socio-economical (necessary infra-structure, legal and institutional, etc.).

From the environmental process perspective there are two types of small hydro projects: (a) those ones that only have to prepare a Preliminary Environmental Assessment ("*Relatório Ambiental Preliminar*", RAP) and (b) those ones that have to further set up assessments called Environmental Impact Study ("*Estudo de Impacto Ambiental*", EIA.) and Environmental Impact Assessment ("*Relatório de Impacto Ambiental",* RIMA). Later on, the local environmental agency can request another assessment called Basic Environmental Project ("*Projeto Básico Ambiental*", P.B.A.) for both types of project.

In order to start the process of obtaining environmental licenses every hydro project has to confirm that the following will not occur:

- Inundation of Indian lands and slaves historical areas;
- Inundation of environmental preservation areas;
- Inundation of urban areas;
- Inundation of areas where there will be urban expansion in the foreseeable 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 was considered environmentally feasible, the sponsors have to prepare the Preliminary Environmental Assessment ("*Relatório Ambiental Preliminar*" – R.A.P.), which is basically composed by the following information:

- Reasons for project implementation;
- Project description, including information regarding the reservoir and the utility;
- Preliminary Environmental Diagnosis, mentioning main biotic, and anthropic aspects;
- Preliminary estimative of project impacts; and
- Possible mitigation measures and environmental programs.

The result of a successful submission of those assessments is the preliminary license (LP), which reflects the environmental local agency positive understanding about the environmental project concepts. To get the construction license (LI) it will be necessary to present either: (a) additional information into previous assessment; or (b) a new more detailed simplified assessment; or (c) the "Environmental Basic Project", according environmental local agency decision at the LP issued. The operation license (LO) will be obtained as result of pre-operational tests during the construction phase, carried out to verify if all exigencies made by environmental local agency were satisfied.

The power plant has the licenses emitted by Mato Grosso do Sul Environmental Agency, *SEMA - Secretaria Estadual do Meio Ambiente do Mato Grosso* and IMAP - *Secretaria de Estado de Meio Ambiente e Recursos Hídricos do Estado de Mato Grosso do Sul*. All documents related to operational and environmental licensing are public and can be obtained at the state environmental agency.

Given the project is below the environmental legislation criteria of a small-scale size up to 15 MW, it has a fast-track environmental assessment process due to its reduced impact.

SECTION G. Stakeholders' comments:

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

Public discussion with local stakeholders is compulsory for obtaining the environmental construction and operating licenses, and once the project already received the licenses, the project has consequently gone through a stakeholder comments process.

The legislation also requests the announcement of the issuance of the licenses (LP, LI and LO) in the local state official journal and in the regional newspaper to make the process public and allow public information and opinion.

Additionally, the Brazilian Designated National Authority for the CDM, *Comissão Interministerial de Mudanças Globais do Clima*, requires the compulsory invitation of selected stakeholders to comment the PDD sent to validation in order to provide the letter of approval.

The organizations and entities invited for comments on the project were:

- Rio Brilhante City Hall
- Rio Brilhante City Council
- State of Mato Grosso do Sul Environmental Agency
- Environmental Department of Rio Brilhante
- Rio Brilhante NGO – Non-Governmental Organization:

  Comercial and Industrial Association of Rio Brilhante (Associação Comercial e Industrial de Rio Brilhante)
- Mato Grosso do Sul State Public Attorney
- FBOMS – Fórum Brasileiro de ONGS e Movimentos Sociais para o Meio Ambiente e Desenvolvimento

Copies of the letters and post office confirmation of receipt communication are available upon request). The PDD of the project is open for comments at the validation stage in the United Nations Framework Convention on Climate Change website (http://www.unfccc.int/), since anyone can have access to the mentioned document from a legitimate source.

No concerns were raised so far in the public calls regarding the project.

G.2. Summary of the comments received:

No comments were received.

G.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:	Energética Eldorado Ltda.
Street/P.O. Box:	Rodovia MS 145, KM 49, Zona Rural
City:	Rio Brilhante
State/Region:	MS
Postfix/ZIP:	79130-000
Country:	Brazil
Telephone:	+55 (67) 3446-2800
FAX:	+55 (67) 3446-2805
URL:	
Represented by:	
Title:	Electric Department Manager
Salutation:	Mr.
Last name:	Morelli
Middle name:	
First name:	Luciano
Department:	
Mobile:	
Direct fax:	
Direct tel.:	
Personal e-mail:	luciano.morelli@bcoutinho.com.br

Organization:	Ecoinvest Carbon Brasil Ltda.
Street/P.O. Box:	Rua Padre João Manoel 222
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	01411-000
Country:	Brazil
Telephone:	+ 55 (11) 3063-9068
FAX:	+ 55 (11) 3063-9069
URL:	http://www.ecoinvestcarbon.com/
Represented by:	
Title:	Manager
Salutation:	Mr.
Last name:	Martins
Middle name:	de Mathias
First name:	Carlos
Department:	
Mobile:	
Direct fax:	+ 55 (11) 3063-9069
Direct tel.:	+ 55 (11) 3063-9068
Personal e-mail:	cmm@ecoinvestcarbon.com

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

BIBLIOGRAFY

ACM0002 (2006). *Approved Consolidated Baseline Methodology 0002. Consolidated Methodology for grid-connected electricity generation from renewable sources.*

Aneel (2005). *Matriz de energia elétrica – Empreendimentos em operação* (Retrieved July 22, 2005 from http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp).

Arida, P. E. L. Bacha, and A. L. Resende (2005). *Credit, Interest, and Jurisdictional Uncertainty: Conjectures on the Case of Brazil*. In F. Giavazzi, I. Goldfajn e S. Herrera (orgs.), Inflation Targeting, Debt, and the Brazilian Experience, 1999 to 2003. Cambridge, MA: MIT Press.

BNDES (2000). *O setor elétrico – Desempenho 1993/1999.* Banco Nacional de Desenvolvimento Econômico e Social. Informe Infra-estrutura, nº 53.

Bosi, M. (2000). *An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study*. International Energy Agency. Paris, 2000.

Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba (2002). *Road testing baselines for greenhouse gas mitigation projects in the electric power sector.* OECD and IEA information paper, October 2002.

CBEE, (2002). *Comercilizadora Brasileira de Energia Emergencial.*

City Brazil (2005). *City Brazil – Percorrendo o Brazil de A a Z.* (Retrieved June 6, 2005 from http://www.citybrazil.com.br/).

Eletrobrás (1999). *Diretrizes para estudos e projetos de pequenas centrais hidrelétricas.* Centrais Elétricas Brasileiras S.A.

IBGE (2004). *Banco de dados Cidades,* Instituto Brasileiro de Geografia e Estatística (http://www.ibge.gov.br/).

IPCC (1996). *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.* Intergovernmental Panel on Climate Change.

Kartha, S., M. Lazarus and M. Bosi (2002). *Practical baseline recommendations for greenhouse gas mitigation projects in the electric power sector.* OECD and IEA information Paper.

OECD (2001). *OECD Economic Surveys: Brazil.* Organization for Economic Co-Operation and Development, Paris, France.

OECD (2005). *Organization for Economic Co-Operation and Development*, Paris, France.

Oliveira, A. S. and L. S. Ribeiro (2001) [orgs.]. *Proposta de critérios e indicadores de elegibilidade para avaliação de projetos candidatos ao Mecanismo de Desenvolvimento Limpo.* Secretária de Qualidade Ambiental nos Assentamentos Humanos, Ministério do Meio Ambiente.

Schaeffer, R., J. Logan, A. S. Szklo, W. Chandler and J. C. de Souza (2000). *Electric Power Options in Brazil.* Pew Center on Global Climate Change.

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

WCD (2000). *Dams and development–A new framework for decision-making.* World Commission on Dams. November 2000.

Wikipedia (2005). *Wikipedia – The free Encyclopedia.* (Retrieved July 21, 2005 from http://en.wikipedia.org/).

WSSD (2006), *Changing unsustainable patterns of consumption and production.* World Summit on Sustainable Development, Plan of Implementation.