



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)**

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

Santa Elisa Bagasse Cogeneration Project (SEBCP).

Version 2 B

Date of the document: December 02nd, 2005.

The only changes made to this version of the PDD compared to the PDD version Rev.3 dated 26/08/2005 referred to in the letter of approval of the DNA of Brazil are related to the recalculation of the build margin emission factor with the plant efficiencies recommended by the CDM Executive Board at its 22nd meeting.

A.2. Description of the project activity:

This project activity consists of increasing efficiency in the bagasse (a renewable fuel source, residue from sugarcane processing) cogeneration facility at **Companhia Energética Santa Elisa S/A (CESE)**, a Brazilian sugar mill. With the implementation of this project, the mill has been able to sell electricity to the national grid therefore avoiding fossil-fuelled thermal plants to be dispatched the same amount of energy to that grid. By that, the initiative avoids CO₂ emissions, also contributing to the regional and national sustainable development.

By investing to increase steam efficiency in the sugar and alcohol production and increase the efficiency at burning the bagasse (more efficient boilers), CESE generates surplus steam and use it exclusively for electricity production (through turbo-generators).

Furthermore, bagasse cogeneration also plays an important role on the country's economic development, as Brazil's sugarcane-based industry provides for approximately 1 million jobs and represents one of the major agribusiness products within the trade balance of the country. The Brazilian heavy industry has developed the technology to supply the sugarcane industry with equipments to provide expansion for the cogeneration, therefore such heavy industry development also helps the country creating jobs and achieving the sustainable development.

Bagasse cogeneration is important for the energy strategy of the country. Cogeneration is an alternative to postpone the installation and/or the dispatch of electricity produced by fossil-fuelled generation utilities. The sale of the CER generated by the project will boost the attractiveness of bagasse cogeneration projects, helping to increase the production of this energy and decrease dependency on fossil fuel.

CESE also believes that sustainable development will be achieved not only by the implementation of a renewable energy production facility, but carrying out activities which corresponds to the company social and environmental responsibilities.



Social Contribution

CESE is a Brazilian private company whose history started in 1936 with the company “Irmãos Biagi & Pagano”. In that year, the company produced 18 thousand 50 kg sacs of sugar. In 1951, the company changed its name for the second time, being then called “Usina Santa Elisa S.A”. In 1975, Usina Santa Elisa played an important role in the creation of Proálcool, the worldwide known Brazilian program for utilization of ethanol as a car fuel, and was the first company to have a project approved for the Program. In 1997, Usina Santa Elisa merged with Usina São Geraldo, another sugar mill, and with investments from Bradesco, the biggest Brazilian private bank, constituted Companhia Energética Santa Elisa, CESE. In 2001, CESE was certified under the SA 8000 series, for social responsibility programs.

To encourage the company’s employees to be deeply engaged with the results of the company, CESE has always supported the development of human resources. The employees’ contribution to increase the quality of the products is heavily dependent on their quality of life. In order to achieve a higher quality human resource management, the company focuses special attention on the social responsibility, work safety and health care.

CESE truly believes that taking care of its employees provides consistent results, and therefore promotes many social responsibility related programs such as: continued education program, technical formation and professional training, human development and professional formation, Santa Elisa’s census, healthy people program, family income management program, family-company integration program, motivational program, voluntary work incentive, among many other safety and social programs.

These investments accounted for R\$ 8 million in 2002, and in its 65 years the company has invested more than R\$ 1 billion in social actions. The results are immense. An example is the 100% rate of alphabetization among its employees, which certainly is not the usual situation for an agro company.

The social responsibility orientation of CESE reaches the highest international standards. It was the 4th company in the Americas to have a certification in human resources, the social accountability certification SA 8000 of the SAI (Social Accountability International). Only 65 companies in the world have it and only five agro industries follow the norm that is recognized by the UN and regulates the social responsibility policy of the company.

CESE provided 5,000 job positions directly and many others were created and/or maintained indirectly during the 2001 crop season. Considering the great number of farmers who benefit from the company, and employ some other people to maintain their cane plantation, it is possible to say that CESE is the most important job creator in that city where it is located.

Environmental Contribution

CESE’s industrial processes are also a matter of care for the company, and quality is on top of that care. The company has defined programs for eventual certification of all its processes in compliance with ISO norms as a way to incorporate technology and quality practices. The result was the company’s certification with the ISO 9002 in November 2000 by Det Norske Veritas.

SEBCP is not the first attitude towards the environment CESE establishes. CESE has complied with the Environment State Secretary requirements for SEBCP, including the plantation of 1,350 plants required, among the 65,000 thousands already planted and the 29,900 to be planted, both voluntarily. Through all its history, Santa Elisa has never had an environmental accident due to its preoccupation and investments in environment preservation and life quality improvement in its region, nearby rural and urban areas.

**A.3. Project participants:**

Companhia Energética Santa Elisa S/A (CESE), Brazilian private company.
Econergy Brasil Ltda, Brazilian private company.
Swedish Energy Agency.

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:****A.4.1.1. Host Party(ies):**

Brazil.

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

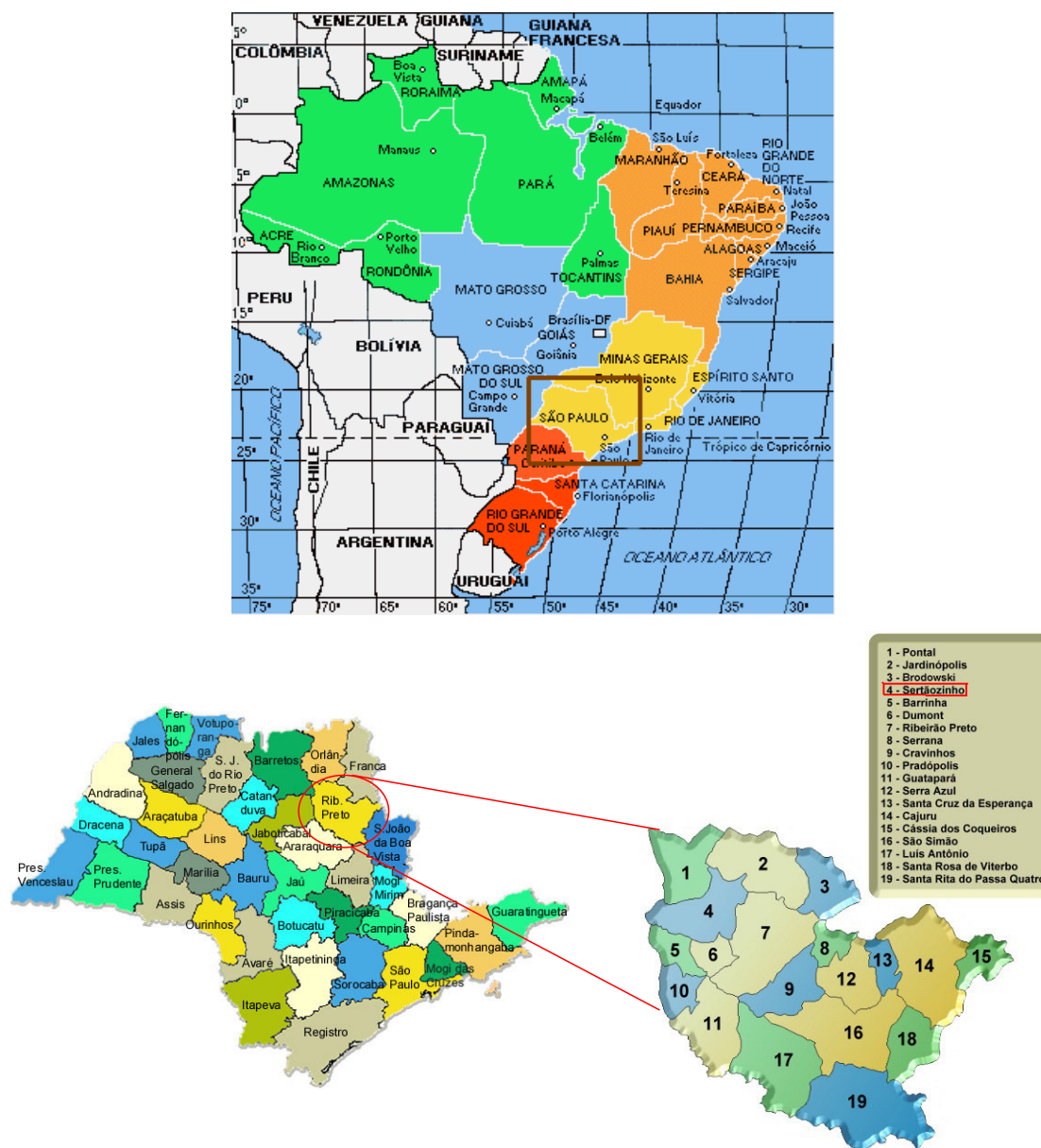
São Paulo.

A.4.1.3. City/Town/Community etc:

Sertãozinho.

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

Sertãozinho is located northeast in the State of São Paulo, in the agricultural region of Ribeirão Preto, as can be seen in Figure 1.



Source: Elaborated from Coordenadoria de Assistência Técnica Integral (CATI)¹

Figure 1: Geographical position of the city of Sertãozinho

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

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

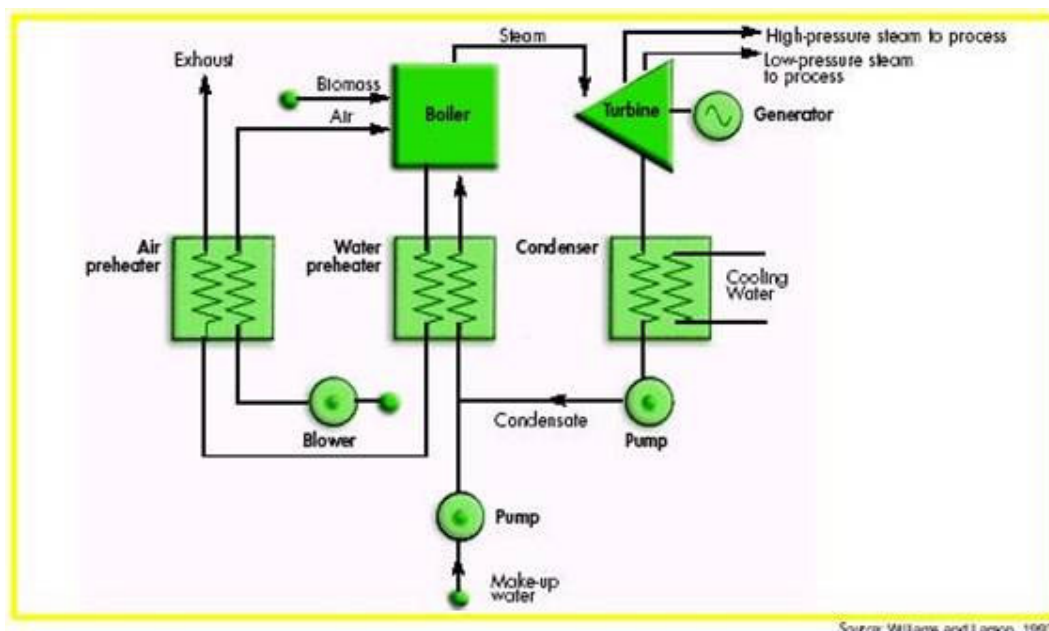
¹ <http://www.cati.sp.gov.br/>

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

The predominant technology in all parts of the world today for generating megawatt (MW) levels of electricity from biomass is the steam-Rankine cycle, which consists of direct combustion of biomass in a boiler to raise steam, which is then expanded through a turbine. Most steam cycle plants are located at industrial sites, where the waste heat from the steam turbine is recovered and used for meeting industrial-process heat needs. Such combined heat and power (CHP), or cogeneration, systems provide greater levels of energy services per unit of biomass consumed than systems that generate power only.

The steam-Rankine cycle involves boiling pressurized water, with the resulting steam expanding to drive a turbo-generator, and then condensing back to water for partial or full recycling to the boiler. A heat exchanger is used in some cases to recover heat from flue gases to preheat combustion air, and a de-aerator must be used to remove dissolved oxygen from water before it enters the boiler.

Steam turbines are designed as either "backpressure" or "condensing" turbines. CHP applications typically employ backpressure turbines, wherein steam expands to a pressure that is still substantially above ambient pressure. It leaves the turbine still as a vapor and is sent to satisfy industrial heating needs, where it condenses back to water. It is then partially or fully returned to the boiler. Alternatively, if process steam demands can be met using only a portion of the available steam, a condensing-extraction steam turbine (CEST) might be used. This design includes the capability for some steam to be extracted at one or more points along the expansion path for meeting process needs (see **Figure 2**). Steam that is not extracted continues to expand to sub-atmospheric pressures, thereby increasing the amount of electricity generated per unit of steam compared to the backpressure turbine. The non-extracted steam is converted back to liquid water in a condenser that utilizes ambient air and/or a cold-water source as the coolant².



Source: Williams and Larson, 1993

Figure 2: Schematic diagram of a biomass-fired steam-Rankine cycle for cogeneration using a condensing-extraction steam turbine

² Williams & Larson, 1993 and Kartha & Larson, 2000, p.101



The steam-Rankine cycle uses different boiler designs, depending on the scale of the facility and the characteristics of the fuel being used. The initial pressure and temperature of the steam, together with the pressure to which it is expanded, determine the amount of electricity that can be generated per kilogram of steam. In general, the higher the peak pressure and temperature of the steam are, the more efficient, sophisticated, and costly, the cycle is.

CESE intended with SEBCP to reduce the amount of steam consumption at the sugar production process to 400 kg of steam per tone of cane crushed. SEBCP's expansion plan is described as follows:

- **Phase 1 (2003):**

CESE installed a high efficiency 65 bar boiler providing 200 tones of steam per hour at 510 °C (the first of this kind in the sugar industry in Brazil), therefore consuming less bagasse per ton of steam generated. Also, the mill is installing 2 new backpressure turbo generators of 15 MW each and 2 new condensing-type turbo generators of 6 MW each. The design of the new cogeneration facility included also building a new powerhouse, a new sub-station with a new measurement equipment and a transmission line. All this investment in infrastructure increased the efficiency to exploit biomass energy significantly.

CESE deactivated the less efficient old generators: two of 2.5 MW each, one of 4 MW and one of 6 MW. It also deactivated 3 less efficient 21 bar boilers. Therefore, the new production capacity increased to 58 MW, with a capacity factor of 0.82, an available capacity of 41 MW, an internal consumption of 16 MW and a grid supply capacity of around 31 MW during the harvest season in the year 2003.

- **Phase 2 (2006):**

By the year 2005, during the harvest season, CESE intends to continue the investments started in 2002, to reach a higher capacity and efficiency for exploiting biomass through the acquisition of another 15 MW turbo generator, another 65 bar boiler and targeting the steam consumption to 400 kg per ton of sugarcane crushed. The forecast is to have an additional supplying capacity of 15 MW to supply the regional grid during the harvest season.

Notwithstanding the PPA CESE signed with CPFL (*Companhia Paulista de Força e Luz*), a local distributor, does not consider the additional 15 MW to be implemented in Phase 2 of SEBCP, the mill can sell the electricity in the Wholesale Electricity Market (MAE³).

Table 1 shows how CESE's cogeneration infrastructure will be updated according to SEBCP phases, while Figure 3 shows an energy balance diagram for CESE.

³ *Mercado Atacadista de Energia.*



	Active / Activating				Deactivating		
Before the Expansion Plan	Two 8 MW backpressure turbo generators	Two 2.5 MW condensing type turbo generators	One 6 MW backpressure turbo generator	One 4 MW backpressure turbo generator			
2002	Seven 21 Bar boilers	One 42 bar boiler					
Phase 1	Two 15 MW backpressure turbo generators	Two 6 MW condensing type turbo generators	Two 8 MW backpressure turbo generators		Two 2.5 MW condensing type turbo generators	One 6 MW backpressure turbo generator	One 4 MW backpressure turbo generator
2003	One 65 bar boiler	Four 21 Bar boilers	One 42 bar boiler		Three 21 Bar boilers		
Phase 2	One 15 MW backpressure turbo generator	Two 15 MW backpressure turbo generators	Two 6 MW condensing type turbo generators	Two 8 MW backpressure turbo generators	Four 21 Bar boilers		
2006	One 65 bar boiler	One 65 bar boiler	One 42 bar boiler				

Table 1: CESE's cogeneration equipment upgrades

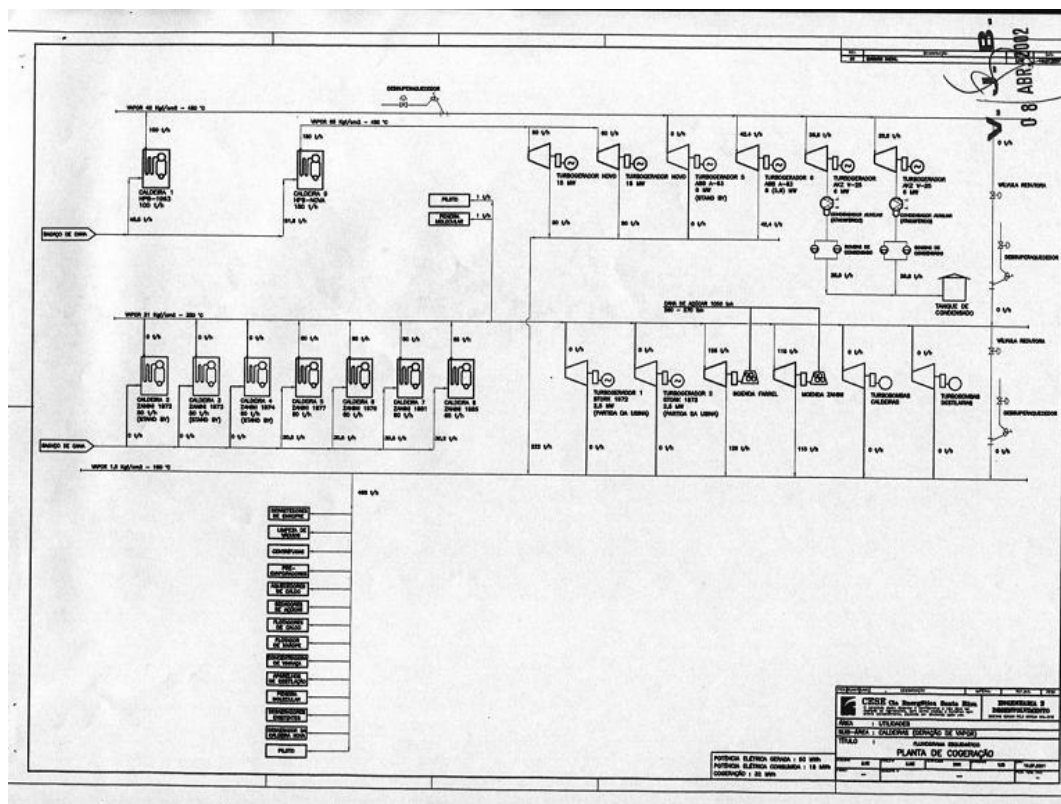


Figure 3: CESE's Energy Balance Diagram

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

By dispatching renewable electricity to a grid, electricity that would otherwise be produced using fossil fuel is displaced. This electricity displacement will occur in the system's margin, i.e. this CDM project will displace electricity that is produced by marginal sources - fossil fueled thermal plants - , which have higher electricity dispatching costs and are solicited only over the hours that baseload sources (low-cost or must-run sources) cannot supply the grid.

Bagasse is a fibrous biomass by-product from sugarcane processing, which accounts for about 25 percent on weight of fresh cane and approximately one third of the cane's energy content. In a typical Brazilian sugarcane mill, burning bagasse for generation of process heat and power production is a practice already established. It is estimated that over 700 MW of bagasse-based power capacity are currently installed in the state of São Paulo only⁴. The energy produced from these facilities is almost all consumed for their on purpose. Because of constraints that limited the access of independent power producers to the electric utilities market, there is no incentive for sugarcane mills to operate in a more efficient way. Low-pressure

⁴ São Paulo. Secretary of Energy, 2001.



boilers, very little concern with optimal use and control of steam, crushers mechanically activated by steam, energy intensive distillation methods, are a few examples of inefficient methods applied to the sugar industry as normal routine.⁵

The Brazilian electric sector legislation currently recognizes the role of independent power producers, which has triggered interest in improving boiler efficiency and increasing electricity generation at mills, allowing the production of enough electricity not only to satisfy sugar mills' need but also a surplus amount for selling to the electricity market. Furthermore, the ever increasing electricity demand opens an opportunity for some bagasse cogeneration power plants in Brazil. Additionally, the feature of electricity generation from sugarcane coinciding with dry months of the year, when hydroelectric generation system - the most important electricity source in the country - is under stress, should provide a considerable complementary energy and make the bagasse cogeneration electricity attractive for any potential purchasers.

Nevertheless, some barriers pose a challenge for implementation of this kind of projects. In most cases, the sponsors' culture in the sugar industry is very much influenced by the commodities – sugar and ethanol – market. Therefore, they need an extra incentive to invest in electricity production due to the fact that it is a product that can never be stored in order to speculate in price. The Power Purchase Agreement requires different negotiation skills, which is not the core of the sugar industry. For instance, when signing a long-term electricity contract, the PPA, a given sugar mill has to be confident that it will produce sufficient biomass to supply its cogeneration project. Although it seems easy to predict, the volatility of sugarcane productivity may range from 75 to 95 ton of sugarcane per hectare annually depending on the rainfall. So, the revenue from GHG emission reductions and other benefits associated with CDM certification offer a worthy financial comfort for the sugar mills, like CESE, which is investing to expand its electric power generation capacity and to operate in a more rationale way under the above mentioned new electric sector circumstances.

This project activity is to reduce **320.604 tCO₂e** over 7 years.

⁵ Nastari, 2000.

**A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:**

This project activity is to reduce **320.604 tCO₂e** over 7 years.

Years	Annual estimation of emission reductions in tonnes of CO ₂ e
07/04/2003	31.446
2004	26.438
2005	31,428
2006	57.823
2007	57.823
2008	57.823
2009	57.823
06/04/2010	0
Total estimated reductions (tonnes of CO₂e)	320.604
Total Number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO₂e)	45.801

A.4.5. Public funding of the project activity:

There is no Annex I public funding involved in SEBCP.

SECTION B. Application of a baseline methodology**B.1. Title and reference of the approved baseline methodology applied to the project activity:**

AM0015: Bagasse-based cogeneration connected to an electricity grid.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

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This methodology is applicable to SEBCP due to the fact that (i) the bagasse is produced and consumed in the same facility – CESE -; (ii) the project would never be implemented by the public sector, as well as it would not be implemented in the absence of CDM, as shown in the additionality chapter following; (iii) there is not increase on the bagasse production due to the project activity itself/ and (iv) there will be not bagasse storage for more than one year.

B.2. Description of how the methodology is applied in the context of the project activity:

The project activity follows the steps provided by the methodology taking into account the (b) Simple Adjusted OM calculation for the STEP 1, since there would be no available data for applying to the preferred option – (c) *Dispatch Data Analysis OM*. For STEP 2, the option 1 was chosen. The following table presents the key information and data used to determine the baseline scenario.

ID number	Data type	Value	Unit	Data Source
1. EG _y	Electricity supplied to the grid by the Project.	Obtained throughout project activity lifetime.	MWh	Project owner
2. EF _y	CO ₂ emission factor of the Grid.	0,2677	tCO ₂ e/MWh	Calculated
3. EF _{OM,y}	CO ₂ Operating Margin emission factor of the grid.	0,4310	tCO ₂ e/MWh	This value was calculated using data information from ONS, the Brazilian electricity system manager.
4. EF _{BM,y}	CO ₂ Build Margin emission factor of the grid.	0,1045	tCO ₂ e/MWh	This value was calculated using data information from ONS, the Brazilian electricity system manager.
10. λ _y	Fraction of time during which low-cost/ must-run sources are on the margin.	λ ₂₀₀₂ = 0,5053 λ ₂₀₀₃ = 0,5312 λ ₂₀₀₄ = 0,5041	-	This value was calculated using data information from ONS, the Brazilian electricity system manager.

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 CDM project activity:

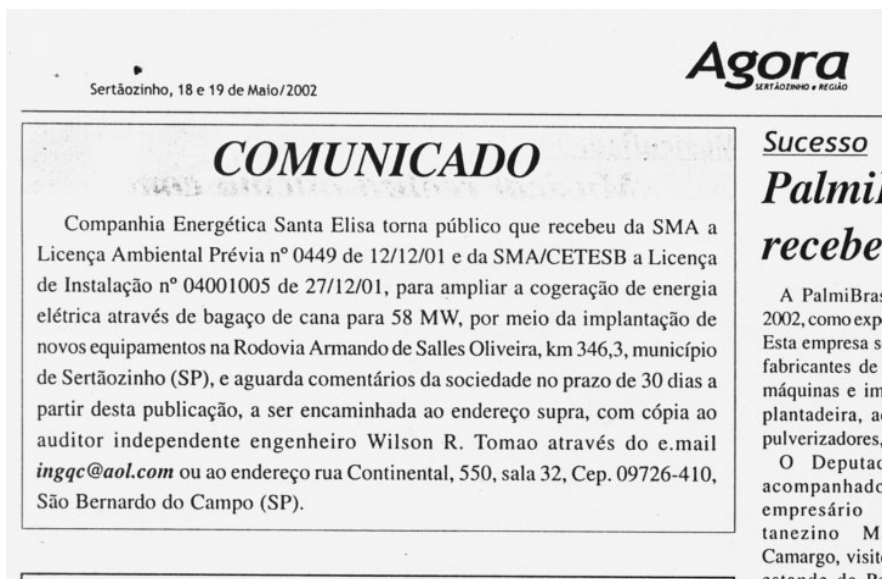
Application of the Tool for the demonstration and assessment of additionality of Santa Elisa.

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

(a) The starting date of this project activity occurred in year 2003, which is evidenced by the purchase of



the major equipment - the boiler - in 31st December 2002. Moreover, as part of the licensing process the project was open for local stakeholder comments during 30 days, which is shown in request for comments published in the local newspaper amongst others, following.



(b) Mr. Maurílio Biagi, who founded CESE, is also one of the founders of Cia Açúcareira Vale do Rosário, therefore the successful development of the Vale do Rosário CDM project was promptly incorporated as source of funding for cogeneration expansion by CESE. Adding to that the fact the Rabobank, a Dutch Bank deeply involved in the global warming solution, was bidding to design the project finance for CESE cogeneration project, the information on CDM was since the very beginning a solution for supporting SEBCP. In this way, not only Rabobank was interested to develop the project finance as a whole, as well as it sponsored the PDD development for CESE. As evidence that the CDM was seriously considered the Rabobank contract to develop the PDD was signed in 29 November 2001 by Mr. Alexandre Kossoy, from Rabobank, Mr. Frederick Renner, Vice-President from Econergy, Mr. Marcelo S. D. Junqueira, from AGROP which was representing Econergy for Brazilian territory at that time, and Mr. Maurílio Biagi Filho, President CESE at that time.

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

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

1. There were only two possibilities to implement this project activity: one was to continue the current situation of the sugar mill, focusing only on the production of sugar and alcohol and thus investing to enhance the efficiency and increasing the scale of its core business. The other option was the project activity undertaken, which is the investment made to increase steam efficiency and production for electricity sales purposes by acquiring high-efficiency boilers and turbo-generators.

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

2. The alternative, which is to continue with the BAU situation before the decision of implementing this CDM project activity is consistence with the applicable laws and regulations.



3. Non applicable.

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

Step 3. Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of type of the proposed project activity

1. and 2. According to COELHO (1999)⁶, “large scale cogeneration program in sugar-alcohol sector has not yet occurred, due to several barriers, mainly economic, political and institutional”, such as:

I. Technological Barriers

Technological barriers represent a very important issue for increasing bagasse cogeneration in Brazil, for despite of the fact that Rankine-cycle is a well known technology, the cogeneration units operate with low-efficiency and are not competitive comparing to other generation options. In this way there is a tricky issue about technology and economic value for such technology. Although this technology is well developed, the economic value for its application is not for projects on the scale similar to the sugar mills in Brazil. COELHO (1999) justifies that by highlighting that the unitary costs (\$/installed MW) are significantly influenced by scale-effect. As the bagasse cogeneration unit should have a small scale due to the high cost for transportation of the fuel (bagasse), investments are high. Therefore, as a lower cost of capital is wanted, the result is a simplified installation and lower efficiency.

COELHO (1999) also states that the great majority of the sugar mills still rely on inefficient technology, such as on 22 bar pressure boilers, even in the state of São Paulo, the most industrialized in Brazil. Moreover, when there is a necessity to change equipments, it is usual not consider purchasing high-efficiency boilers due to conservativeness, lack of knowledge or even lack of interest to generate surplus steam for electricity sales purposes.

Moreover, SWISHER (1997)⁷ considers difficult to convince the local distributor that the energy to be acquired, generally generated during the harvest season, is sufficiently reliable to be accounted in the distributor's planning.

II. Institutional and Political Barriers

From the electric sector point of view, according COELHO (1999), acquiring electricity other than hydroelectric would not be a priority, arguing that for the electricity is generated only during the harvest season, no firm energy could be offered. However, the biggest advantage of the bagasse based electricity is that it is produced during the period where hydroelectric plants face difficulties due to the low level of rains. As a result, COELHO (1999) suggests that there is a significant prejudice and conservativeness of the distributors when deciding whether to purchase or not bagasse based energy.

⁶ Coelho, S. T. *Mecanismos para Implementação da Cogeração de Eletricidade a partir de biomassa. Um Modelo para os Estado de São Paulo*. Programa Interunidades de pós-graduação em Energia. São Paulo, Agosto de 1999.

⁷ Swisher, J. *Using Area-Specific Cost Analysis to Identify low Incremental-cost Renewable Energy Options: A Case Study of Co-generation Using Bagasse in the State of São Paulo*. Prepared for Global Environment Facility (GEF) Secretariat, Washington DC, 1997.



From the sugar mill point of view, save rare exceptions, COELHO (1999) says that the great majority of sugar mills do not consider investments in cogeneration (for electricity sale) as a priority. The sector “even in the new political context, does not seem to have motivation to invest in a process that it sees with mistrust and no guarantees that the product will have a safe market in the future. Moreover, it is a fact that “the sugar mills are essentially managed by families, which hurdles the association with external financial agents”, and allowing the sector to be more competitive and diversifying its investment.

From the point of view of the economic agents, the excessive level of the guarantees required to finance the projects, commonly is a barrier to achieve a financial feasibility stage, deeply discussed in SWISHER (1997).

Other barriers have more to do with the lack of adequate commercial contractual agreements from the energy buyers (i.e. bankable long-term contracts and payment guarantee mechanisms for non-creditworthy local public-sector and private customers) and that influences directly making more difficult to obtain a long-term financing from a bank and/or development bank. Some other financing barriers occur simply due to prohibitively high transaction costs, which include the bureaucracy to secure the environmental license.

Since 1997, according to SWISHER (1997), the announcement of a Cogeneration Decree has been awaited, and that was supposed to have this positive influence on corporate decision-making with respect to biomass project implementation. The original Cogeneration Decree proposal, which was never approved, called for mandatory purchase by the regional utilities - “*concessionárias*” - from cogenerating and self-generating facilities⁸. Instead of renewable energy, the government expansion plan for electric energy, approved in August is based on fossil fuel – Natural Gas. This expansion plan called Thermoelectricity Priority Plan (PPT) became a reality right before the energy crisis. The Thermoelectricity Priority Plan beneficiaries, which were mainly natural gas thermal plants, through the Ministry of Mines and Energy (MME) Decree 3,371 from December 2000, counted on guaranteed, long term and attractive price conditions on Natural Gas supply and Energy sales, together with financing from the national development bank BNDES. And though the PPT plan is not likely to be fully implemented, the public-sector policies for renewable energy are not considered reliable enough by the executives of the private sector to support cogeneration expansion in the sugar mills. This assumption is clearly shown in the following list of rules and/or regulations to the energy sector that have been set in the last 10 years:

- **March 1993:** Law 8.631 sets a tariff regulation for electric energy;
- **February 1995:** Law 8.987 establish public concession for energy;
- **July 1995:** Law 9.074 regulates concession for electric energy sector;
- **December 1996:** Law 9.427 creates National Energy Agency (ANEEL);
- **August 1997:** Law 9.478 sets the National Council for Energy Planning (CNPE);
- **October 1997:** Decree 2.335 regulates the ANEEL task;
- **December 1997:** Implements ANEEL;

⁸ Presidential Decree on the co-generation of electric energy, draft of 5 August 1997.



- **May 1998:** Law 9.648 establishes the Spot Market for Electric Energy (MAE) and the Operator National System (ONS);
- **July 1998:** Decree 2.655 regulates MAE and ONS tasks;
- **December 2000:** Decree 3.371 regulates the Thermoelectricity Priority Plan (PPT);
- **April 2002:** Law 10.438 sets the Program for Incentive Alternative Energy (PROINFA), stating that contracts shall be signed within 24 months from its date and that there will be different economic values for the acquisition of 3,300MW of electricity capacity from renewable sources by the state owned Eletrobrás, for plants starting operations before December 30, 2006;
- **August 2002:** MP 64 is a presidential act to change the constitution in order to permit the energy sector regulation including the PROINFA;
- **December 2002:** Resolution 4.541 from ANEEL regulates the implementation of PROINFA, stating that economic values would be defined within 90 days;
- **March 2003:** Decree 4.644 postponed for 180 days, from its date, the economic value and operational guidelines announcement;
- **June 2003:** Decree 4.758 indefinitely postponed the date for the economic value and operational guidelines announcement and revoked the above mentioned Decree 4.644.
- **November 2003:** Law 10.762 of 11 November/03 revised Law 10.438 of 26 April 2002 institutes PROINFA.
- **March 2004:** Decree 5.025 regulates the Law 10.438 as of 26 April 2002.

For this CDM project analysis purposes, by the time the project started there were no institutional incentive like PROINFA to be considered. Therefore, the company's decision on signing a long-term PPA with the local distributor undoubtedly represented a significant risk that the mill was willing to risk.

III. Economic and Investment Barriers

“There are several reasons for the Brazilian utilities' reluctance to offer higher prices for co-generated power. One important reason stems from their assumption that their costs are geographically uniform – i.e., that there is essentially a single value for their avoided cost in the industrial sector. If this cost value does not indicate that sufficient savings are available from buying co-generated power, and then there is little economic motivation, under either a public monopoly or a privatized competitive structure, for a utility to pay enough for co-generation to satisfy potential investors' financial criteria”⁹ as stated by SWISHER (1997). In fact, the economic cost is the reason that Brazilian utilities do not buy cogeneration electricity energy, at least, while the energy sector regulation does not guarantee them the right to pass such cost through the end user tariff. The cost of cogeneration electricity ranges from US\$ 35 to US\$ 105 per MWh, according to the Expansion Plan 2001-2010 from Brazil Government, which is described as higher than the marginal cost for electricity expansion in the system – US\$ 33/MWh¹⁰.

⁹ Joel Swisher personal communication with Rolls Royce Power Ventures project manager. Mark Croke, August 26, 1997. Swisher J. 1997 pg. 76.

¹⁰ “Como se pode observar, os custos unitários das fontes alternativas de energia ainda são altos comparados ao custo



COELHO (1999) also highlights one of the major problems of selling surplus energy to the grid as being the economic value paid to the sugar mills as not enough to remunerate the capital invested in the expansion of a cogeneration project. Furthermore, “the fee for accessing the grid does not contribute for making feasible the sale of the surplus energy to the distributors”.

Summarizing, SWISHER (1997) considers that the main difficulties are found in: (a) **small sizes of projects and installation costs**: besides the high cost for installation, the fix cost component is high and cannot be absorbed by the global economic project. (b) **availability of long-term financing**: traditionally, infrastructure projects use to have a wider access to long-term financing, situation that has changed after the electric sector privatization. (c) **lack of guarantees**: besides technical guarantees, investors require commercial guarantees establishing a paradox: privatization is to foster a market based economy but banks still require governmental guarantees to ensure long-term investments in the private sector, (d) **lack of local funding**: lack of familiarity with project finance tools and due to the high interest rates in Brazil.

IV. Cultural Barrier

Due to the nature of the business in the sugar industry the marketing approach is narrowed focused on commodity type of transaction. Therefore, the electricity transaction based on long-term contract (Power Purchase Agreement) represents a significant breakthrough on their business model. In this case, the electricity transaction has to represent a safe investment opportunity from both economical and social-environmental perspective for convincing the sugar mills to invest in.

There are also questions regarding the managerial capacity of the companies that comprise the Brazilian sugarcane industry. In many cases, they have demonstrated the will to undertake investments in new technologies, but without sufficient financial and entrepreneurial capacity to complete such projects, according to WALTER (1994)¹¹.

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity).

The other alternative to this project activity was to keep the current situation and focus strictly in its core business which is the production of sugar and alcohol. Therefore, as the barriers mentioned above are directly related to entering into a new business (electricity sale), there is no impediment for sugar mills to maintain (or even invest in) its core business.

Step 4. Common practice analysis.

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

The sugar sector, historically, always exploited its biomass (bagasse) in an inefficient manner by making use low-pressure boilers. Although they consume almost all of their bagasse for self-energy generation purposes, it is done in such a manner that no surplus electric energy is available for sale, and no sugar

marginal de expansão do sistema, hoje calculado em US\$33/MWh”. IN: Brazil, Ministry of Mines and Energy, 2001, pg. 80.

¹¹ Walter, A.C.S. *Viabilidade e Perspectivas da Co-geração e Geração Termelétrica no Setor Sucro-alcooleiro*. Tese de Doutorado. UNICAMP, Campinas, 1994.



company has ventured in the electricity market until the recent years.

Similar project activities have been implemented by leading companies in this industry, mainly after Vale do Rosário started to implement its project that clearly served as a sector benchmark. However, these are few examples in a universe of about 320 sugar mills. Currently, the other similar project activities under implementation are, for example, Santa Cândida, Moema, Equipav, Nova América. All together the similar projects in the sugar industry in Brazil are restricted to approximately 10% of the sugar industry, since the other 90% are still burning their bagasse for on-site use only in the old-fashioned inefficient way. That clearly shows that just a small part of this sector is willing to invest in cogeneration projects. Moreover, the majority of the similar projects, which are currently being implemented, are carried out as CDM project activities. So far, Econergy Brasil has reported at least 26 CDM bagasse cogeneration projects in Brazil.

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

This project activity type is not considered as a widely spread activity in Brazil for only a small portion of the existing sugar mills in the country actually produce electricity for sale purposes. Also, most of the existing similar activities are being developed as CDM project activities.

Step 5. Impact of CDM registration

The impact of registration of this CDM project activity will contribute to overcome all the barriers described in this Tool: technological, institutional and political, economic and investment and cultural barriers by bringing more solidity to the investment itself and, therefore, fostering and supporting the project owners' decision to the breakthrough on their business model. In this way, the project activity is already engaged in a deal to sell its expected CERs.

Moreover, the CDM project registration must influence other similar projects to move toward the use of CER sales as economic benefits, therefore there would also be a benefit by having all of those followers working strictly on the sustainable environmental management, as this is requested by any project intending to registry.

In addition to the benefits and incentives mentioned in the text of the Tool for demonstration and assessment of additionality, published by the CDM-EB, will be experienced by the project activities such as: the project will achieve the aim of anthropogenic GHG reductions; financial benefit of the revenue obtained by selling CERs will bring more robustness to the project's financial situation; and its likely to attract new players and new technology (there are companies currently developing new type of boilers – extra-efficient – and the purchase of such equipment is to be fostered due to CER sales revenue) and reducing the investor's risk.

B.4. Description of how the definition of the <u>project boundary</u> related to the <u>baseline methodology</u> selected is applied to the <u>project activity</u>:

The definition of the project boundary related to the baseline methodology is applied to the project activity in the following way:

Baseline energy grid: for SEBCP, the South-Southeast and Midwest subsystem of the Brazilian grid is considered as a boundary, since it is the system to which CESE is connected and therefore receives all the bagasse-based produced electricity.



Bagasse cogeneration plant: the bagasse cogeneration plant considered as boundary comprises the whole site where the cogeneration facility is located.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

1. Date of completing the final draft of this baseline section

02/12/2005.

2. Name of person/entity determining the baseline

ECONERGY BRASIL (Contact: Mr. Marcelo Junqueira. Email: junqueira@econergy.com.br, phone +55 (11) 3219-0068 ext. 25), which is participant in this project, is responsible for the technical services related to GHG emission reductions, and is therefore, in behalf of CESE, the developer of this document, and all its contents.

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:

07/04/2003.

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

25y-0m.¹²

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:

7/04/2003.

C.2.1.2. Length of the first crediting period:

7y-0m

¹² Specialists from the Brazilian National Agency of Electric Power (ANEEL - Agência Nacional de Energia Elétrica) suggest using 25 years of lifetime for steam turbines, combustion turbines, combined cycle turbines and nuclear power plants, according to Bosi, 2000, p. 29.

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

NA

C.2.2.2. Length:

NA

SECTION D. Application of a monitoring methodology and plan**D.1. Name and reference of approved monitoring methodology applied to the project activity:**

Approved monitoring methodology AM0015: “Bagasse-based cogeneration connected to an electricity grid”

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

The monitoring methodology was designed to be applied to the Vale do Rosario CDM Project, however, due to the great project similarity, the same methodology was chosen in order to monitor the emissions reduction of this project activity.

The applicability of the methodology is described in the paragraph B1.1 of this document.

**D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario.**

There is no project emission to be considered in this project activity.

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

NA



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. EG _y	Electricity supplied to the grid by the Project.	Readings of the energy metering connected to the grid and Receipt of Sales.	MWh	M	Monthly	100%	Electronic and paper	Double check by receipt of sales. Will be archived according to internal procedures, until 2 years after the end of the crediting period.
2. EF _y	CO ₂ emission factor of the Grid.	Calculated	tCO ₂ e/MWh	C	At the validation and yearly after registration	0%	Electronic and paper	Will be archived according to internal procedures, until 2 years after the end of the crediting period.
3. EF _{OM,y}	CO ₂ Operating Margin emission factor of the grid.	Factor calculated from ONS, the Brazilian electricity system manager.	tCO ₂ e/MWh	C	At the validation and yearly after registration	0%	Electronic and paper	Will be archived according to internal procedures, until 2 years after the end of the crediting period.



4. $EF_{BM,y}$	CO ₂ Build Margin emission factor of the grid.	Factor calculated from ONS, the Brazilian electricity system manager.	tCO ₂ e/MWh	C	At the validation and yearly after registration	0%	Electronic and paper	Will be archived according to internal procedures, until 2 years after the end of the crediting period.
10. λ_y	Fraction of time during which low-cost/ must-run sources are on the margin.	Factor calculated from ONS, the Brazilian electricity system manager.	index	C	At the validation and yearly after registration	0%	Electronic and paper	Will be archived according to internal procedures, until 2 years after the end of the crediting period.

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

$EF_{OM, simple_adjusted, y} = (1 - \lambda_y) \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y \frac{\sum_{i,k} F_{i,k,y} \cdot COEF_{i,k}}{\sum_k GEN_{k,y}} \quad (\text{tCO}_2\text{e/GWh})$	<p>$F_{i,j(or\ m),y}$ Is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y</p> <p>j, m Refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports⁴ from the grid</p> <p>$COEF_{i,j(or\ m),y}$ Is the CO₂ emission coefficient of fuel i (tCO₂ / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j (or m) and the percent oxidation of the fuel in year(s) y, a</p> <p>$GEN_{j(or\ m),y}$ Is the electricity (MWh) delivered to the grid by source j (or m)</p>
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$EF_{BM} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_m GEN_{m,y}} \text{ (tCO}_2\text{e/GWh)}$ $EF_{electricity} = \frac{EF_{OM} + EF_{BM}}{2} \text{ (tCO}_2\text{e/GWh)}$ $BE_{electricity,y} = EF_{electricity} \cdot EG_y$	<p>$BE_{electricity,y}$ Are the baseline emissions due to displacement of electricity during the year y in tons of CO₂</p> <p>EG_y Is the net quantity of electricity generated in the bagasse-based cogeneration plant due to the project activity during the year y in MWh, and</p> <p>$EF_{electricity,y}$ Is the CO₂ baseline emission factor for the electricity.</p>
--	---

D.2.3. Treatment of leakage in the monitoring plan**D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity**

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)

NA

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**D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.)**

$$ER_y = BE_{\text{thermal}, y} + BE_{\text{electricity}, y} - PE_y - L_y$$

$$BE_{\text{thermal}, y} = 0$$

$$PE_y = 0$$

$$L_y = 0$$

$$BE_{\text{electricity}, y} = EF_{\text{electricity}} \cdot EG_y$$

ER_y: are the emissions reductions of the project activity during the year y in tons of CO₂

BE_{electricity,y}: Are the baseline emissions due to displacement of electricity during the year y in tons of CO₂

BE_{thermal,y}: Are the baseline emissions due to displacement of thermal energy during the year y in tons of CO₂

PE_y: Are the project emissions during the year y in tons of CO₂.

L_y: Are the leakage emissions during the year y in tons of CO₂.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

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	These data will be directly used for calculation of emission reductions. Sales record and other records are used to ensure the consistency.
2	Low	Data does not need to be monitored
3	Low	Data does not need to be monitored
4	Low	Data does not need to be monitored
10	Low	Data does not need to be monitored



D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

The structure for monitoring this project activity will basically consist of registering the amount of energy sold to the grid (EG_y). There are two operations that the project operators must perform in order to ensure data consistency, despite of the fact that this will actually consist of the monitoring of one single variable.

1. The monthly readings of the calibrated meter equipment must be recorded in an electronic spreadsheet
2. Sales receipt must be archived for double checking the data. In case of inconsistency, these are the data to be used.

Moreover, according to the law, the meter equipment shall be periodically calibrated to comply with the regulations for independent power producers connected to the regional grid.

D.5 Name of person/entity determining the monitoring methodology:

ECONERGY BRASIL (for further information, please refer to Annex 1), which is participant in this project, is the responsible for the technical services related to GHG emission reductions, and is therefore, in behalf of CESE, the developer of this document, and all its contents.

**SECTION E. Estimation of GHG emissions by sources****E.1. Estimate of GHG emissions by sources:**

This project activity does not burn any additional quantity of fossil fuel due to the project implementation, the variable PE_y , presented in the methodology, does not need to be monitored.

Thus, $PE_y = 0$

E.2. Estimated leakage:

The project company did not use to sell bagasse prior to SEBCP implementation.

Thus, $L_y = 0$

E.3. The sum of E.1 and E.2 representing the project activity emissions:

$L_y + PE_y = 0$

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

The baseline methodology considers the determination of the emissions factor for the grid to which the project activity is connected as the core data to be determined in the baseline scenario. In Brazil, there are two main grids, South-Southeast-Midwest and North-Northeast, therefore the South-Southeast-Midwest Grid is the relevant one for this project.

The method that will be chosen to calculate the Operating Margin (OM) for the electricity baseline emission factor is the option (b) *Simple Adjusted OM*, since the preferable choice (c) *Dispatch Data Analysis OM* would face the barrier of data availability in Brazil.

In order to calculate the Operating Margin, daily dispatch data from the Brazilian electricity system manager (ONS) needed to be gathered. ONS does not regularly provide such information, which implied in getting it through communicating directly with the entity.

The provided information comprised years 2002, 2003 and 2004, and is the most recent information available at this stage.

Simple Adjusted Operating Margin Emission Factor Calculation

According to the methodology, the project is to determine the Simple Adjusted OM Emission Factor



($EF_{OM, simple_adjusted, y}$) . Therefore, the following equation is to be solved:

$$EF_{OM, simple_adjusted, y} = (1 - \lambda_y) \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y \frac{\sum_{i,k} F_{i,k,y} \cdot COEF_{i,k}}{\sum_k GEN_{k,y}} \quad (\text{tCO}_2\text{e/GWh})$$

It is assumed here that all the low-cost/must-run plants produce zero net emissions.

$$\frac{\sum_{i,k} F_{i,k,y} \cdot COEF_{i,k}}{\sum_k GEN_{k,y}} = 0 \quad (\text{tCO}_2\text{e/GWh})$$

Please refer to the methodology text or the explanations on the variables mentioned above.

The ONS data as well as the spreadsheet data with the calculation of emission factors have been provided to the validator (DOE). In the spreadsheet, the dispatch data is treated as to allow calculation of the emission factor for the most three recent years with available information, which are 2002, 2003 and 2004.

The Lambda factors were calculated in accordance with methodology requests. More detailed information is provided in Annex 3. The table below presents such factors.

Year	Lambda
2002	0,5053
2003	0,5312
2004	0,5041

Electricity generation for each year needs also to be taken into account. This information is provided in the table below.

Year	Electricity Load (MWh)
2002	275.402.896
2003	288.493.929



2004	297.879.874
------	-------------

Using therefore appropriate information for $F_{i,j,y}$ and $COEF_{i,j}$, OM emission factors for each year can be determined, as follows.

$$EF_{OM, simple_adjusted, 2002} = (1 - \lambda_{2001}) \frac{\sum_{i,j} F_{i,j,2002} \cdot COEF_{i,j}}{\sum_j GEN_{j,2002}} \therefore EF_{OM, simple_adjusted, 2002} = 0,4207 \text{ tCO}_2/\text{MWh}$$

$$EF_{OM, simple_adjusted, 2003} = (1 - \lambda_{2003}) \frac{\sum_{i,j} F_{i,j,2003} \cdot COEF_{i,j}}{\sum_j GEN_{j,2003}} \therefore EF_{OM, simple_adjusted, 2003} = 0,4397 \text{ tCO}_2/\text{MWh}$$

$$EF_{OM, simple_adjusted, 2004} = (1 - \lambda_{2004}) \frac{\sum_{i,j} F_{i,j,2004} \cdot COEF_{i,j}}{\sum_j GEN_{j,2004}} \therefore EF_{OM, simple_adjusted, 2004} = 0,4327 \text{ tCO}_2/\text{MWh}$$

Finally, to determine the baseline *ex-ante*, the mean average among the three years is calculated, finally determining the $EF_{OM, simple_adjusted}$.

$$EF_{OM, simple_adjusted\ 2002-2004} = 0,4310 \text{ tCO}_2/\text{MWh}$$

According to the methodology used, a Build Margin emission factor also needs to be determined.

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

Electricity generation in this case means 20% of total generation in the most recent year (2004), as the 5 most recent plants built generate less than such 20%. Calculating such factor one reaches:

$$EF_{BM, 2004} = 0,1045 \text{ tCO}_2/\text{MWh}$$

Finally, the electricity baseline emission factor is calculated through a weighted-average formula, considering both the OM and the BM, being the weights 50% and 50% by default. That gives:

$$EF_{electricity, 2002-2004} = 0,5 * 0,4310 + 0,5 * 0,1045 = 0,2677 \text{ tCO}_2/\text{MWh}$$



It is important to note that adequate considerations on the above weights are currently under study by the Meth Panel, and there is a possibility that such weighing changes in the methodology applied here.

The baseline emissions would be then proportional to the electricity delivered to the grid throughout the project's lifetime. Baseline emissions due to displacement of electricity are calculated by multiplying the electricity baseline emissions factor ($EF_{electricity,2002-2004}$) with the electricity generation of the project activity.

$$BE_{electricity,y} = EF_{electricity,2002-2004} \cdot EG_y$$

Therefore, for the first crediting period, the baseline emissions will be calculated as follows:

$$BE_{electricity,y} = 0,2677 \text{ tCO}_2/\text{MWh} \cdot EG_y \text{ (in tCO}_2\text{e)}$$

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

The emissions reduction of this project activity is

$$ER = BE_{electricity,y} - (L_y + PE_y) = 0,2677 \text{ tCO}_2/\text{MWh} \cdot EG_y - 0 \rightarrow ER = 0,2677 \text{ tCO}_2/\text{MWh} \cdot EG_y$$

E.6. Table providing values obtained when applying formulae above:

Santa Elisa Bagasse Cogeneration Project											
Grid-Connected Emission Reduction	Item	2002	Phase 1 07/04/2003	2004*	2005	Phase 2 2006	2007	2008	2009	6/4/2010	Total CERs
	Installed Capacity, MW	31	58	58	58	73	73	73	73	73	
	Electric energy to be sold to CPFL, MWh/year	N/A	117.466	98.758	117.400	216.000	216.000	216.000	216.000	0	
	Baseline emission factor tCO2e/MWh	-	0,2677	0,2677	0,2677	0,2677	0,2677	0,2677	0,2677	0,2677	
	Total CO2 emissions reductions, tCO2e/year	N/A	31.446	26.438	31.428	57.823	57.823	57.823	57.823	0	320.604
* Electricity produced until Nov/04. Data for 2005 and on are estimates.											

* Electricity produced until Nov/04. Data for 2005 and on are estimates.

SECTION F. Environmental impacts

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

The possible environmental impacts of SEBCP were analysed by the State Secretary of Environment (*Secretaria de Estado do Meio Ambiente*) through a report called "Preliminary Environmental Report" (RAP – *Relatório Ambiental Preliminar*) prepared by the company and sent to the state environmental agency (*Companhia de Tecnologia de Saneamento Ambiental – CETESB*). The environmental authorities have issued a preliminary working license, in order to be able to check whether the project is in



compliance with the demands from the Secretary and the environmental agency, and to later issue the definitive working license. The latest version was issued on the 11th of November 2004 and is valid for 120 days starting from this date.

There will be no transboundary impacts resulting from SEBCP. All the relevant impacts occur within Brazilian borders and have been mitigated to comply with the environmental requirements for project's implementation. Therefore SEBCP will not affect by any means any country surrounding Brazil.

F.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 impacts from SEBCP are not considered significant.

The secretary of environment and CETESB already analysed the most relevant impacts from the project activity through the RAP, and issuance of the environmental licenses is conditioned to the compliance with the technical demands for the installation of the project.

SECTION G. Stakeholders' comments

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

Invitations for comments by local stakeholders are required by the Brazilian Designated National Authority as part of the procedures for analyzing CDM projects and issuing letters of approval. CESE invited several organizations and institutions to comment the CDM project being developed. Letters¹³ were sent to the following recipients:

- Diretoria do Meio Ambiente do Município de Sertãozinho / *Environmental Management Body of Sertãozinho*
- Prefeitura Municipal de Sertãozinho / *Municipal Administration of Sertãozinho*
- Câmara Municipal de Sertãozinho / *Municipal Legislation Chamber of Sertãozinho*
- Lions Club de Sertãozinho / *Lions Club of Sertãozinho*
- Rotary Club de Sertãozinho / *Rotary Club of Sertãozinho*
- Promotoria de Justiça de Sertãozinho / *Attorney of Sertãozinho*
- Fórum Brasileiro de ONGs / *Brazilian NGO Forum*
- Secretaria do Meio Ambiente do Estado de São Paulo / *Environmental Secretary of the State of São Paulo*

These letters have already been sent, and CESE got four comments on the initiative.

¹³ The copy of these invitations, as well as the answers, are available in hold of Project participants.



Previously to that action, the stakeholders' consultation process carried out by CESE for SEBCP comprised announcements in newspapers calling for public comments on the project initiative, complying with Brazilian legislation.

G.2. Summary of the comments received:

CESE received comments from four different stakeholders. They are mentioned below, along with the summary of the comments received:

Secretaria da Indústria, Comércio, Agricultura, Abastecimento e Emprego de Sertãozinho (Sertãozinho's secretary of industry, trade, agriculture, supply and employment): the secretary emphasized the need for initiatives like SEBCP to happen as a way to show replicability.

Secretaria do Meio Ambiente do Estado de São Paulo (State of São Paulo Environment Secretary): The secretary mentioned they liked the project and the most important fact was that it was using an already approved methodology.

Rotary International, municipality of Sertãozinho: Rotary applauded the initiative as it is producing renewable energy, fighting climate change.

Câmara Municipal de Sertãozinho (Sertãozinho's municipality chamber): comments were towards energy generation with very low environmental impacts.

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

Considering the comments were very positive, Santa Elisa thanked them and proceeded operation as planned.

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

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Annex 2**INFORMATION REGARDING PUBLIC FUNDING**

There is no Annex I public funding involved in SEBCP project activity.

Annex 3**BASELINE INFORMATION**

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)¹⁴:

“... 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

¹⁴ Bosi, M. *An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study*. International Energy Agency. Paris, 2000.



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. (<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.

Approved methodologies AM0015 and ACM0002 ask project proponents to account for “all generating sources serving the system”. In that way, when applying one of these methodologies, 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 2002, 2003 and 2004.

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 (http://www.aneel.gov.br/arquivos/PDF/Resumo_Gr%C3%A1ficos_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. Such capacity in fact is constituted by plants with 30 MW installed capacity or above, connected to the system through 138 kV power lines, or at higher voltages. Therefore, even though the emission factor calculation is carried out without considering all generating sources serving the system, about 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% 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.

In an attempt to include all generating sources, project developers considered the option to research for available, but non-official data, to supply the existing gap. The solution found was the International Energy Agency database built when carrying out the study “Road-Testing Baselines For Greenhouse Gas Mitigation Projects in the Electric Power Sector”, published in October 2002. Merging ONS data with the IEA data in a spreadsheet, project proponents have been able to consider all generating sources connected to the relevant grids in order to determine the emission factor. The emission factor calculated was found more conservative when considering ONS data only, as the table below shows the build margin in both cases.

IEA/ONS Merged Data Build Margin (tCO ₂ /MWh)	ONS Data Build Margin (tCO ₂ /MWh)
0,205	0,1045

Therefore, considering all the rationale explained, project developers decided for the database considering ONS information only, as it was capable of properly addressing the issue of determining the emission factor and doing it in the most conservative way.

The fossil fueled plants efficiencies were also taken from the IEA paper. This was done considering the lack of more detailed information on such efficiencies from public, reliable and credible sources.



From the mentioned reference:

The fossil fuel conversion efficiency (%) for the thermal power plants was calculated based on the installed capacity of each plant and the electricity actually produced. For most of the fossil fuel power plants under construction, a constant value of 30% was used as an estimate for their fossil fuel conversion efficiencies. This assumption was based on data available in the literature and based on the observation of the actual situation of those kinds of plants currently in operation in Brazil. The only 2 natural gas plants in combined cycle (totaling 648 MW) were assumed to have a higher efficiency rate, i.e. 45%.

Therefore only data for plants under construction in 2002 (with operation start in 2002, 2003 and 2004) was estimated. All others efficiencies were calculated. To the best of our knowledge there was no retrofit/modernization of the older fossil-fuelled power plants in the analyzed period (2002 to 2004). For that reason project participants find the application of such numbers to be not only reasonable but the best available option.

The aggregated hourly dispatch data got from ONS was used to determine the lambda factor for each of the years with data available (2002, 2003 and 2004). The Low-cost/Must-run generation was determined as the total generation minus fossil-fuelled thermal plants generation, this one determined through daily dispatch data provided by ONS. All this information has been provided to the validators, and extensively discussed with them, in order to make all points crystal clear.

On the following pages, a summary of the analysis is provided. First, the table with the 130 plants dispatched by the ONS are provided. Then, a table with the summarized conclusions of the analysis, with the emission factor calculation displayed. Finally, the load duration curves for the S-SE-MW system are presented.



ONS Dispatched Plants



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Subsystem*	Fuel source**	Power plant	Operation start [A, 4, 5]	Installed capacity [MW] [1]	Fossil fuel conversion efficiency (%) [2]	Carbon emission factor (kg CO ₂ /kWh) [3]	Fraction carbon avoided [4]	Emission factor (tCO ₂ /MWh) [5]
1	S-SE-CD	H	Jacui	121.5	0.3	0.0	99.9%	0.000
2	S-SE-CD	H	Guaporé	120.0	1	0.0	0.0%	0.000
3	S-SE-CD	G	Três Lagoas	306.0	0.3	15.3	99.5%	0.670
4	S-SE-CD	H	Furni (MG)	190.0	1	0.0	0.0%	0.000
5	S-SE-CD	H	Itaipu I	156.1	1	0.0	0.0%	0.000
6	S-SE-CD	G	Araucária	484.5	0.3	15.3	99.5%	0.670
7	S-SE-CD	G	Caldeas	160.0	0.3	15.3	99.5%	0.670
8	S-SE-CD	H	Pirajó	81.0	1	0.0	0.0%	0.000
9	S-SE-CD	G	Novo Pratinha	384.9	0.3	15.3	99.5%	0.670
10	S-SE-CD	O	PCT COITE	5.0	0.3	20.7	99.0%	0.902
11	S-SE-CD	H	Rosai	55.0	1	0.0	0.0%	0.000
12	S-SE-CD	G	Itaipu	220.0	0.3	15.3	99.5%	0.670
13	S-SE-CD	H	Carla Brás	465.9	1	0.0	0.0%	0.000
14	S-SE-CD	H	São Carlos	60.0	1	0.0	0.0%	0.000
15	S-SE-CD	H	Machadinho	1,140.0	1	0.0	0.0%	0.000
16	S-SE-CD	G	Juiz de Fora	87.0	0.28	15.3	99.5%	0.718
17	S-SE-CD	G	Macedo Machado	922.6	0.24	15.3	99.5%	0.837
18	S-SE-CD	H	Lajeado (ANEL res. 40/2001)	902.5	1	0.0	0.0%	0.000
19	S-SE-CD	G	Eliseu Boff	275.0	0.24	15.3	99.5%	0.837
20	S-SE-CD	H	Ponte Estrela	112.0	1	0.0	0.0%	0.000
21	S-SE-CD	G	Cuiabá (Mário Costa)	329.2	0.3	15.3	99.5%	0.670
22	S-SE-CD	G	W. Arizona	194.0	0.25	15.3	99.5%	0.804
23	S-SE-CD	G	Uruçatã	638.9	0.45	15.3	99.5%	0.447
24	S-SE-CD	H	S. Cavas	1,240.0	1	0.0	0.0%	0.000
25	S-SE-CD	H	Canasvieiras	82.5	1	0.0	0.0%	0.000
26	S-SE-CD	H	Canasvieiras II	72.0	1	0.0	0.0%	0.000
27	S-SE-CD	H	Itaipu	210.0	1	0.0	0.0%	0.000
28	S-SE-CD	H	Ponte Primavera	1,540.0	1	0.0	0.0%	0.000
29	S-SE-CD	O	Cuiabá (Mário Costa)	520.2	0.27	20.7	99.5%	0.878
30	S-SE-CD	H	Sobradinho	1,600.0	1	0.0	0.0%	0.000
31	S-SE-CD	H	POH EMAP	28.0	1	0.0	0.0%	0.000
32	S-SE-CD	H	POH GEE	28.0	1	0.0	0.0%	0.000
33	S-SE-CD	H	POH ENERSUL	43.0	1	0.0	0.0%	0.000
34	S-SE-CD	H	POH CEB	15.0	1	0.0	0.0%	0.000
35	S-SE-CD	H	POH EXCELISA	43.0	1	0.0	0.0%	0.000
36	S-SE-CD	H	POH CELESC	50.0	1	0.0	0.0%	0.000
37	S-SE-CD	H	POH CEMAT	145.0	1	0.0	0.0%	0.000
38	S-SE-CD	H	POH CELG	15.0	1	0.0	0.0%	0.000
39	S-SE-CD	H	POH CERN	55.0	1	0.0	0.0%	0.000
40	S-SE-CD	H	POH COPEL	70.0	1	0.0	0.0%	0.000
41	S-SE-CD	H	POH CEMISA	24.0	1	0.0	0.0%	0.000
42	S-SE-CD	H	POH OPFL	25.0	1	0.0	0.0%	0.000
43	S-SE-CD	H	S. Mesa	1,275.0	1	0.0	0.0%	0.000
44	S-SE-CD	H	POH E PAULO	28.0	1	0.0	0.0%	0.000
45	S-SE-CD	H	Galimim Anomim	140.0	1	0.0	0.0%	0.000
46	S-SE-CD	H	Cumbá	375.0	1	0.0	0.0%	0.000
47	S-SE-CD	H	Miranda	400.0	1	0.0	0.0%	0.000
48	S-SE-CD	H	Novo Friburgo	510.0	1	0.0	0.0%	0.000
49	S-SE-CD	H	Segredo (Gov. N. Brás)	1,260.0	1	0.0	0.0%	0.000
50	S-SE-CD	H	Taquaricupã	554.0	1	0.0	0.0%	0.000
51	S-SE-CD	H	Mariano	210.0	1	0.0	0.0%	0.000
52	S-SE-CD	H	D. Francisco	125.0	1	0.0	0.0%	0.000
53	S-SE-CD	H	Itaipu	1,450.0	1	0.0	0.0%	0.000
54	S-SE-CD	H	Rasão	930.2	1	0.0	0.0%	0.000
55	S-SE-CD	N	Angra	1,874.0	1	0.0	0.0%	0.000
56	S-SE-CD	H	T. Imilim	807.5	1	0.0	0.0%	0.000
57	S-SE-CD	H	Itaipu 50 Hz	6,300.0	1	0.0	0.0%	0.000
58	S-SE-CD	H	Itaipu 50 Hz	5,375.0	1	0.0	0.0%	0.000
59	S-SE-CD	H	Embarcação	1,150.0	1	0.0	0.0%	0.000
60	S-SE-CD	H	Novo Amandiba	937.4	1	0.0	0.0%	0.000
61	S-SE-CD	H	Gov. Bento Muniz - CDM	1,076.0	1	0.0	0.0%	0.000
62	S-SE-CD	H	S. Santiago	1,420.0	1	0.0	0.0%	0.000
63	S-SE-CD	H	Bucurati	2,250.0	1	0.0	0.0%	0.000
64	S-SE-CD	O	Itaipu	131.0	0.3	20.7	99.0%	0.902
65	S-SE-CD	H	Itaipu	1,564.2	1	0.0	0.0%	0.000
66	S-SE-CD	H	A. Vendeia (Luz E. Moraes)	1,564.2	1	0.0	0.0%	0.000
67	S-SE-CD	H	S. Simão	1,710.0	1	0.0	0.0%	0.000
68	S-SE-CD	H	Capivara	840.0	1	0.0	0.0%	0.000
69	S-SE-CD	H	S. Osório	1,070.0	1	0.0	0.0%	0.000
70	S-SE-CD	H	Marechal	1,440.0	1	0.0	0.0%	0.000
71	S-SE-CD	H	Promissão	254.0	1	0.0	0.0%	0.000
72	S-SE-CD	G	Prata, Medici	446.0	0.26	26.0	98.0%	1.294
73	S-SE-CD	H	Volta Grande	360.0	1	0.0	0.0%	0.000
74	S-SE-CD	H	Porto Colômbia	320.0	1	0.0	0.0%	0.000
75	S-SE-CD	H	Passo Fundo	220.0	1	0.0	0.0%	0.000
76	S-SE-CD	H	Passo Real	150.0	1	0.0	0.0%	0.000
77	S-SE-CD	H	Iba Solteira	3,444.0	1	0.0	0.0%	0.000
78	S-SE-CD	H	Marcanduba	131.0	1	0.0	0.0%	0.000
79	S-SE-CD	H	Gov. Pinheiro de Souza - GPS	250.0	1	0.0	0.0%	0.000
80	S-SE-CD	H	Chavantes	414.0	1	0.0	0.0%	0.000
81	S-SE-CD	H	Jacutinga	454.0	1	0.0	0.0%	0.000
82	S-SE-CD	H	S. Carlos	70.0	1	0.0	0.0%	0.000
83	S-SE-CD	H	Estreito (Luz Carlos Barros)	1,050.0	1	0.0	0.0%	0.000
84	S-SE-CD	H	Itaipu	131.5	1	0.0	0.0%	0.000
85	S-SE-CD	H	Jacui	1,551.2	1	0.0	0.0%	0.000
86	S-SE-CD	O	Alajarte	66.0	0.26	20.7	99.0%	1.040
87	S-SE-CD	G	Campos (Roberto Silveira)	30.0	0.24	15.3	99.5%	0.837
88	S-SE-CD	G	Santa Cruz (RU)	790.0	0.31	15.3	99.5%	0.648
89	S-SE-CD	H	Parabuna	85.0	1	0.0	0.0%	0.000
90	S-SE-CD	H	Limoeiro (Amando Sales de Oliveira)	32.0	1	0.0	0.0%	0.000
91	S-SE-CD	H	Caconga	60.4	1	0.0	0.0%	0.000
92	S-SE-CD	C	J. Lacerda C	363.0	0.25	26.0	98.0%	1.345
93	S-SE-CD	C	J. Lacerda B	262.0	0.21	26.0	98.0%	1.602
94	S-SE-CD	C	J. Lacerda A	226.0	0.18	26.0	98.0%	1.800
95	S-SE-CD	H	Barragem de Itaipu (Luz)	143.1	1	0.0	0.0%	0.000
96	S-SE-CD	H	Furni (RU)	216.0	1	0.0	0.0%	0.000
97	S-SE-CD	C	Fátima	25.0	0.3	26.0	98.0%	1.211
98	S-SE-CD	H	Furni	1,216.0	1	0.0	0.0%	0.000
99	S-SE-CD	H	Barragem	140.8	1	0.0	0.0%	0.000
100	S-SE-CD	C	Chaparrão	72.0	0.23	26.0	98.0%	1.462
101	S-SE-CD	H	Jacutinga (Amando A. Lacerda)	97.7	1	0.0	0.0%	0.000
102	S-SE-CD	H	Jacui	180.0	1	0.0	0.0%	0.000
103	S-SE-CD	H	Pereira Passos	99.1	1	0.0	0.0%	0.000
104	S-SE-CD	H	Tres Marias	390.0	1	0.0	0.0%	0.000
105	S-SE-CD	H	Eucledes da Cunha	108.8	1	0.0	0.0%	0.000
106	S-SE-CD	H	Caratinga	46.0	1	0.0	0.0%	0.000
107	S-SE-CD	H	Santa Branca	56.1	1	0.0	0.0%	0.000
108	S-SE-CD	H	Cachoeira Dourada	658.0	1	0.0	0.0%	0.000
109	S-SE-CD	H	Salto Grande (Luz N. Garcia)	710.0	1	0.0	0.0%	0.000
110	S-SE-CD	H	Salto Grande (MG)	102.0	1	0.0	0.0%	0.000
111	S-SE-CD	H	Mascarenhas de Moraes (Pernambuco)	478.0	1	0.0	0.0%	0.000
112	S-SE-CD	H	Itaipu	52.0	0.3	26.0	98.0%	1.294
113	S-SE-CD	C	S. Jerônimo	29.0	0.26	26.0	98.0%	1.294
114	S-SE-CD	O	Caribá	90.2	0.3	20.7	99.0%	0.902
115	S-SE-CD	O	Pratinha	472.0	0.3	20.7	99.0%	0.902
116	S-SE-CD	H	Canasvieiras	42.5	1	0.0	0.0%	0.000
117	S-SE-CD	H	Nilo Peçanha	378.4	1	0.0	0.0%	0.000
118	S-SE-CD	H	Fontes Novas	130.3	1	0.0	0.0%	0.000
119	S-SE-CD	H	Henry Borden Sub.	420.0	1	0.0	0.0%	0.000
120	S-SE-CD	H	Henry Borden Ext.	469.0	1	0.0	0.0%	0.000
121	S-SE-CD	H	L. Pombos	188.7	1	0.0	0.0%	0.000
122	S-SE-CD	H	Jacui	11.8	1	0.0	0.0%	0.000
Total (MW) =				64,476.6				

* Subsystem: S - south, SE - CD - Southeast Midwest

** Fuel source: C, bituminous coal; D, diesel oil; G, natural gas; H, hydro; N, nuclear; O, residual fuel oil

[1] Agência Nacional de Energia Elétrica. Banco de Informações de Geração. <http://www.anel.gov.br>, data collected in november 2004.

[2] Bui, M. A., Lawrence, P., Matamoros, R., Schaeffer, A. F., Simoes, H., Winter, and J.M. Luksemburg. Plant testing exercises for GHG mitigation projects in the electric power sector. OECD/IEA Information paper, October 2002.

[3] Intergovernmental Panel on Climate Change. Revised 1996 Guidelines for National Greenhouse Gas Inventories.

[4] Operador Nacional do Sistema Elétrico. Centro Nacional de Operação do Sistema. Acompanhamento Diário da Operação do SIN (daily reports from Jan. 1, 2001 to Dec. 31, 2003).

[5] Agência Nacional de Energia Elétrica. Superintendência de Fiscalização dos Serviços de Geração. Resumo Geral dos Novos Empreendimentos de Geração. <http://www.anel.gov.br>, data collected in november 2004.



Summary table

Emission factors for the Brazilian South-Southeast-Midwest interconnected grid				
Baseline (including imports)	EF_{OM} [tCO ₂ /MWh]	Load [MWh]	LCMR [GWh]	Imports [MWh]
2002	0,8504	275.402.896	258.720	1.607.395
2003	0,9378	288.493.929	274.649	459.586
2004	0,8726	297.879.874	284.748	1.468.275
Total (2001-2003) =	861.776.699		818.118	3.535.256
$EF_{OM, simple-adjusted}$ [tCO ₂ /MWh]	$EF_{BM, 2004}$	Lambda		
0,4310	0,1045	λ_{2002}		
Alternative weights	Default weights	0,5053		
$w_{OM} = 0,75$	$w_{OM} = 0,5$	λ_{2003}		
$w_{BM} = 0,25$	$w_{BM} = 0,5$	0,5312		
EF_{CM} [tCO ₂ /MWh]	Default EF_{OM} [tCO ₂ /MWh]	λ_{2004}		
0,3494	0,2677	0,5041		

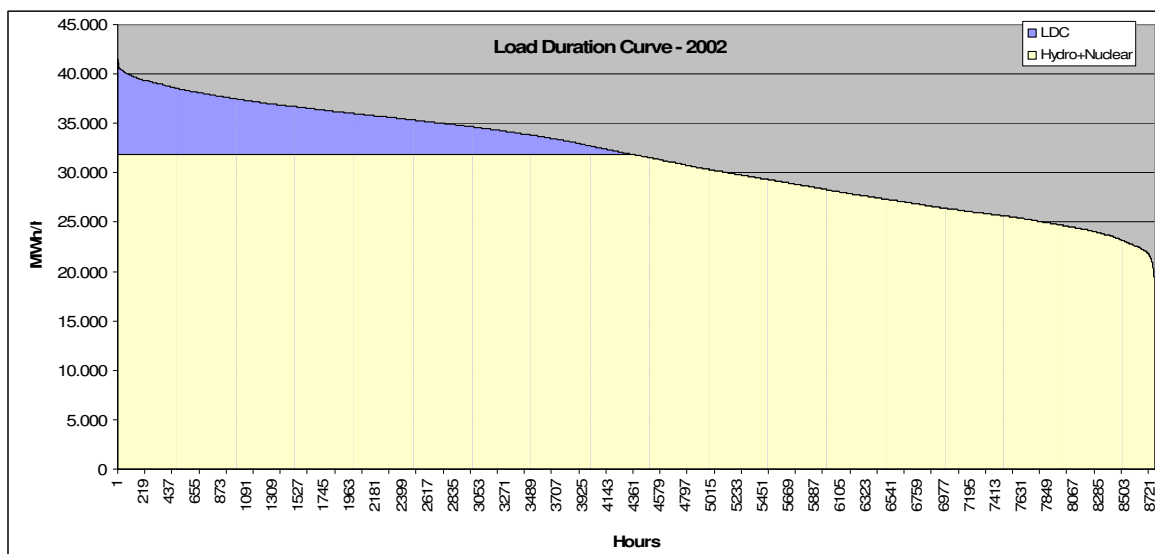


Figure 4. Load duration curve for the S-SE-MW system, 2002

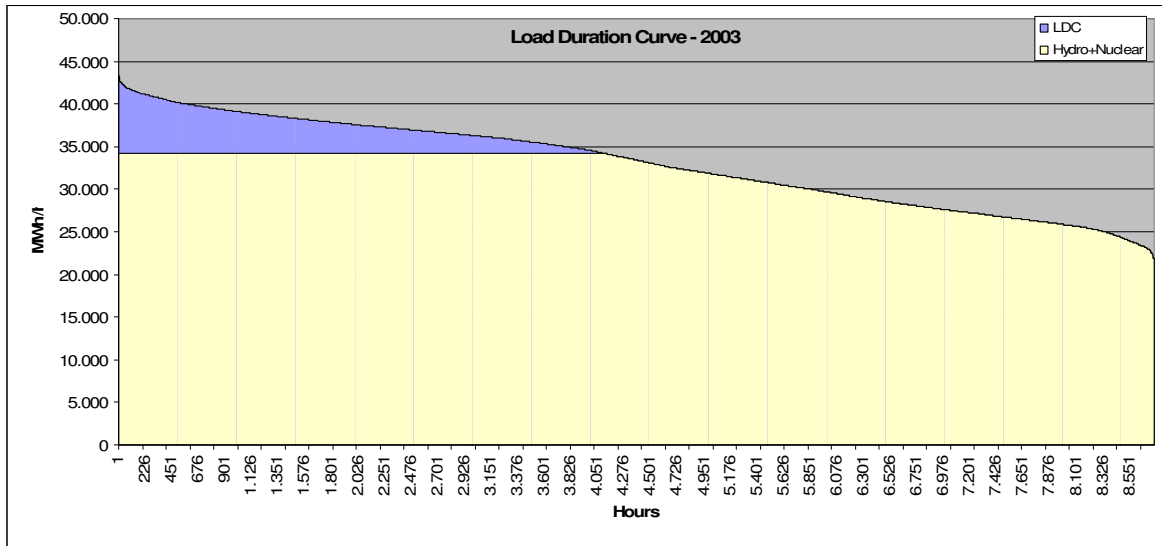


Figure 5. Load duration curve for the S-SE-MW system, 2003

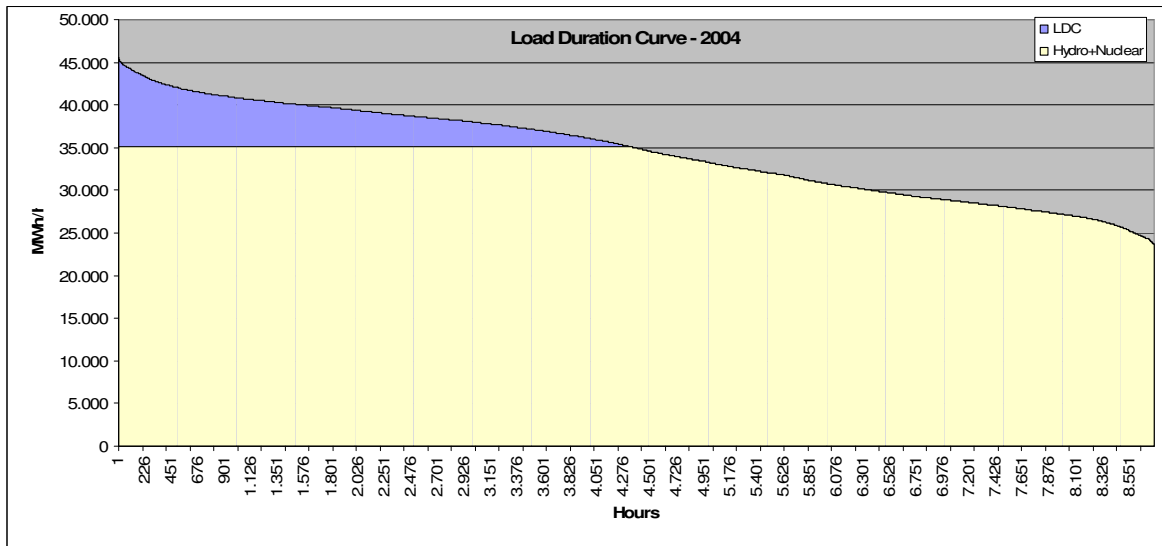


Figure 6. Load duration curve for the S-SE-MW system, 2004

**Annex 4****MONITORING PLAN**

According to the section D of this document, the unique variable that will be monitored in this project activity is the quantity of energy exported to the grid, from year 2003 up to the end of the last crediting period. Since no leakage nor any off-grid emissions change were identified in this project activity, there will be no need to monitor the variables for these cases. The monitoring will occur as follows:

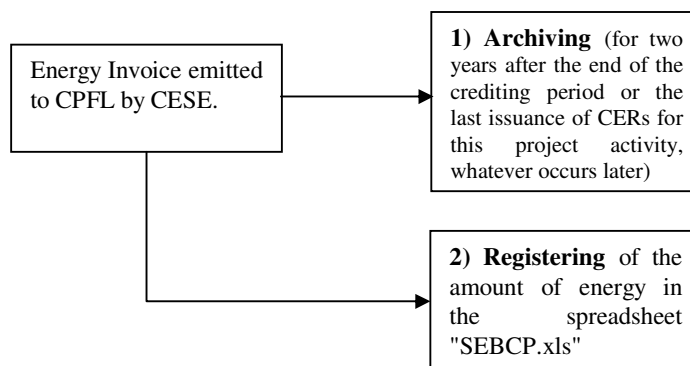


Figure 7: Monitoring procedures for SEBCP

The quantity of energy exported to the grid will be monitored through the energy invoice emitted by CPFL, the energy distributor, to CESE. The archiving will occur up to two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later. The amount of energy will be registered in the spreadsheet "SEBCP.xls", which shall be the instrument for the further Verification.