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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity

Project title: Koblitz - Piratini Energia S. A - Biomass Power Plant – Small Scale CDM Project (hereafter referred to simply as "Piratini SSC-CDM Project").

PDD version number: 6 (2005.10.27)

Date: October 27, 2005

A.2. Description of the project activity

The primary objective of the Piratini 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].

The project consists in the generation of electricity with a thermoelectric power plant using wood residues from nine wood processing companies in the city of Piratini, in the State of Rio Grande do Sul, Brazil.

The electricity is generated with a high-pressure boiler (operating conditions: pressure, 42 kgf/cm^2, steam temperature, *440 °C*, steam production *50,000 kg/h*) and a multiple stage condensing steam turbine (output pressure $0.083\ kgf/cm^2$) coupled with a $10\ MW_{el}$ power generator.

For the expected electric energy output (around *65,500 MWh* - assuming 75.0% capacity factor - minus 7,500 MWh own consumption, resulting in roughly *58,000 MWh* for commercialization) a Power Purchase Agreement (PPA) with the local power utility (*CEEE* – "*Companhia Estadual de Energia Elétrica do Estado do Rio Grande do Sul*") is already signed with validity through 2015.

In January 2002 the entire power plant was completed, and the Piratini Project sold its first MWh to the local power utility CEEE. The Piratini Project buys wood residues from sawmills on the region, which guarantee the supply to the city of Piratini.

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.*"

The power plant when fully operational consumes around 160,000 tonnes of wood residues per year, which are fully provided by sawmills of the region. The sawmills process roughly 220,000 tonnes of wood per year. They buy wood from a sustainable pinewood forest of 17,000 hectares, which is reforested in the rate of 500 hectares per year.

As before the implementation of the project the sawmill had no other option available to safely eliminate the wood waste generated in the production process, these were stored in several sawdust and wood residues stockpiles, which represented a major environmental and safety problem. A second component of the project is thus related to the substantial reductions in methane emissions from the wood waste, which used to be left to decay.

The Piratini Project reduces emissions of greenhouse gases (total of 1,212,773 tonnes of CO_2e in the first crediting period) by selling sustainable renewable electricity to the grid and by avoiding methane emissions from biomass decay.

This indigenous and cleaner source of electricity also has an important contribution to environmental sustainability by reducing carbon dioxide emissions that occurs 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 generates (and emits) in the absence of the project.

Better income distribution is derived from this project due to job creation, employees' salaries and package of benefits such as social security and life insurance, and credits of emission reductions. Additionally, lower expenditure is achieved due to the fact that money will no longer be spent in the same amount to "import" electricity from other regions in the country through the grid. This money stays in the region and is used for providing the population better services which improves the availability of basic needs. This surplus of capital can be translated in investments in education and health that directly benefits the local population and indirectly in a more equitable income distribution.

To stress that the project assists the country in achieving sustainable development the Proinfa Program must be mentioned. Law number 10,438, enacted in April 2002, created the "Program of Incentives to Alternative Energy Sources" (Proinfa from the Portuguese *Programa de Incentivo as Fontes Alternativas de Energia Elétrica*). Among others, one of this initiative's goals is to increase the renewable energy sources share in the Brazilian electricity market, thus contributing to a greater environmental sustainability. In order to achieve such goals, the Brazilian government has designated the federal state-owned power utility (*Centrais Elétricas Brasileiras S.A.* – "Eletrobras") to act as the primary off-taker of electric energy generated by Alternative Energy facilities in Brazil, by entering into long-term power purchase agreements ("PPAs") with Alternative Energy producers, at a guaranteed price of at least 80% of the average energy supply tariff charged to ultimate consumers in Brazil. The Piratini Project began construction in 2001 prior to Proinfa's legislation being in effect. Furthermore it was eligible in 2002 and it did not apply, mainly due to uncertainties of the program. As such it does not have access to the financial advantages of the program. For that reason the project can be seen as an example of private sector entrepreneurship following the electricity crisis of 2001.

A.3. Project participants

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

Party involved	Private and/or public entities project participants	Project participant?
Brazil (host)	Private entity: *Piratini Energia S.A.*	No

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

Credit owner and project operator, the special purpose company *Piratini Energia S.A.*, is author and the responsible for all activities related to the project management, registration, monitoring, measurement and reporting.

A.4. Technical description of the project activity

Biomass power conversion technologies for electricity production can be broadly categorized into direct combustion technologies, gasification technologies, and pyrolysis. Direct combustion technologies, as applied in the Piratini facility are the most widely known option for simultaneous power generation and heat production from biomass. It involves the oxidation of biomass with excess air in a process that yields hot flue gases that are used to produce steam in boilers. The steam is used to produce electricity in a Rankine cycle Steam Turbine. The Rankine cycle is a heat engine with a steam power cycle. The working fluid is water. Typically, electricity is only produced in a "condensing" steam cycle, while electricity and steam are co-generated in an "extracting" steam cycle.

The technology and equipment used in the project were developed and manufactured locally and has been successfully applied to similar projects in Brazil and around the world.

The project will use wood-processing residues from sustainable renewable sources as a fuel to power the thermal facility through a high-pressure boiler and a multiple stage condensing steam coupled with a power generator. The expected electric energy output is of around *65,500 MWh* per year (assuming 75.0% capacity factor, minus *7,500 MWh* own consumption, resulting in roughly *58,000 MWh* for commercialization).

Specification of the main equipments follows:

- Acqua tubular boiler, manufactured in 2001 by *Equipalcool Sistemas Ltda*., model 50-V-2-S, serial number 050/00. Operating conditions, pressure, *42 kgf/cm^2*; steam temperature, *440 ± 10 °C*; steam production *50,000 kg/h* (maximum *55,000 kg/h*); feed water at 45 kgf/cm^2 and *110 ± 10 °C*; fuel, wood residues.
- Multiple stage condensing steam turbine with 3 points of extraction, manufactured in 1973 by *Westinghouse*, retrofitted in 2001 by *Engeturb Turbinas a Vapor Ltda.* Operating conditions, steam input pressure, 42 *kgf/cm^2* and *440 °C*; exhaust condensate at *0.083 kgf/cm^2* and *46 °C.*
- The turbo-generator manufactured in 1973 by *Westinghouse*, retrofitted in 2001 by *Engeturb Turbinas a Vapor Ltda.,* installed power *10,000 kW_{el}* (*12,500 kVA*), *3,600 rpm*, *60 Hz*, *13.8 kV*.

A.4.1. Location of the project activity

A.4.1.1. Host Party(ies)

Brazil.

A.4.1.2. Region/State/Province etc.

State of Rio Grande do Sul.

A.4.1.3. City/Town/Community etc

Piratini.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity

The project is located in the city of Piratini, state of Rio Grande do Sul, South region of Brazil (Figure 1).

Piratini is a city with 20,316 inhabitants, 3,516 km² of territorial extension a GDP per capita of BRL 5,075[2] (IBGE, 2004).

Piratini geographical coordinates are: latitude 31º 26' 53" South, longitude 53º 06' 15" West.

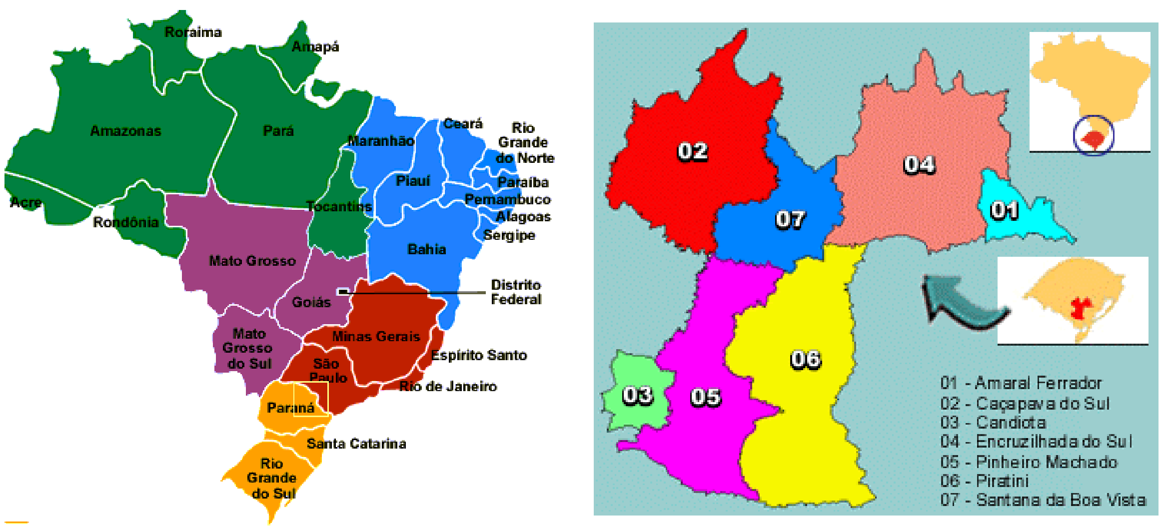


Figure 1 - Political division of Brazil showing the State of Rio Grande do Sul and the Piratini municipality (source: www.citybrazil.com.br)

A.4.2. Type and category(ies) and technology of project activity

[2] Around USD 1,894 in December 2004.

Component 1, power-generation: type I, renewable energy projects; category I.D – renewable electricity generation for a grid

Component 2, methane-emissions-avoidance: type III, other project activities; category III.E – avoidance of methane production from biomass decay through controlled combustion

Both project components are eligible under the simplified procedures for small-scale CDM project activities.

For component 1, the power plant has 10 MW of nominal installed capacity (below the eligibility limit of 15 MW).

The turbo-generator came from a fuel oil thermo power plant which was switched off by another company (*Centrais Elétricas do Norte do Brasil S/A - Eletronorte*) in Manaus, Amazonas. As the thermo plant used to operate with fuel oil no emission increase was caused.

Above and beyond, it must be clearly understood that the shut down of the thermo power plant was not caused by the conception of the project activity. Also the project activity bought a turbo-generator with specified technical specifications but, of course, with no influence to specify from where it should come from. Then, no net change of anthropogenic emissions of greenhouse gases which occurs outside the project boundary and which is measurable and reasonably attributable to the CDM project activity exists. Hence, there is no leakage due to the project activity.

From AMS I.D: "*If the unit added has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires [non-] renewable biomass and fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW … Biomass combined heat and power (co-generation) systems that supply electricity to a grid are included in this category. To qualify under this category, the sum of all forms of energy output shall not exceed 45 $MW_{thermal}$. E.g., for a biomass based co-generating system the rating for the primary boiler shall not exceed 45 $MW_{thermal}$*".

Although the project activity and <u>is not a heat and power system</u>, for the sake of conservativeness the calculation of the thermal capacity of the boiler follows:

- Output steam: 42 kgf/cm^2, 450 ^oC (maximum), specific enthalpy = 3,329.6 *kJ/kg*
- Input water: 45 kgf/cm^2, 100 ^oC (minimum), specific enthalpy = 422.3 *kJ/kg*
- Maximal steam production: 55,000 *kg/h*
- Maximal thermal capacity = [55,000 × (3,329.6 – 422.3)] ÷ 3,600
- Maximal thermal capacity = 44.4 $MW_{thermal}$ (smaller than 45 $MW_{thermal}$)

For component 2, the emissions directly related to the activity related to project activity, i.e., from the combustion of the biomass are of around 9,000 tCO_2e annually (below the eligibility limit of 15,000 tCO_2e annually). The calculation of the emissions directly related to the project is detailed below.

To calculate the emissions that are attributable to the project one needs the total amount of biomass annually used by the thermo plant (about 160,000 tonnes of wood residues) and the energy content of the biomass ($7.5 \cdot 10^{-3}$ *TJ/t*, determined through regular calorimetric tests with wood residues form the region).

The numbers shall be applied to the following formula:

$$PE_y = Q_{biomass} \times E_{biomass} \times (CH_4bio\_comb \times CH_4\_GWP + N_2Obio\_comb \times N_2O\_GWP) \div 10^6$$

Where:

- PE_y is the project activity emissions (kilotonnes of CO_2 equivalent),
- $Q_{biomass}$ is the quantity of biomass treated under the project activity (tonnes),
- $E_{biomass}$ is the energy content of biomass (*TJ/tonne*),
- CH_4bio_comb is the CH_4 emission factor for biomass and waste (which includes dung and agricultural, municipal and industrial wastes) combustion (*kg* of CH_4/TJ, default value is 300),
- CH_4_GWP is the GWP for CH4 (tonnes of CO_2 equivalent/tonne of CH_4, default value is 21),
- N_2Obio_comb is the N_2O emission factor for biomass and waste (which includes dung and agricultural, municipal and industrial wastes) combustion (*kg/TJ*, default value is 4),
- N_2O_GWP is the GWP for N_2O (tonnes of CO_2 equivalent/tonne of N_2O, default value 310),
- $PE_y = 160{,}000 \times 7.5 \cdot 10^{-3} \times (300 \times 21 + 4 \times 310)/10^6$ and,
- $PE_y = 9{,}050\ tCO_2e$ (less than 15,000 tCO_2e).

A.4.3. Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity

The project, a greenhouse (GHG) gas-free power generation project activity, results in GHG emissions reductions as the result of the displacement of generation from fossil-fuel thermal plants that has otherwise been delivered to the South-Southeast-Midwest interconnected grid.

The project activity also avoids the methane emissions given that the biomass used for electricity generation would otherwise be left in the stockpiles generating methane.

Kartha et al. (2002) stated that, "*the crux of the baseline challenge for electricity projects clearly resides in determining the 'avoided generation', or what would have happened without the CDM or other GHG-mitigation project. The fundamental question is whether the avoided generation is on the "build margin" (i.e. replacing a facility that would have otherwise been built) and/or the "operating margin" (i.e. affecting the operation of current and/or future power plants).*"

For the Piratini Project the baseline emission factor is calculated as a combined margin, consisting of the operating margin and the build margin. For the purpose of determining the build margin and the operating margin emission factors, a project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. Similarly a connected electricity system is defined as one that is connected by transmission lines to the project and in which the power plants can be dispatched without significant transmission constraints.

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

Years	Annual estimation of emission reductions in tonnes of CO_{2e}
Year 1_2002	93,169
Year 2_2003	110,463
Year 3_2004	158,788
Year 4_2005	212,588
Year 5_2006	212,588
Year 6_2007	212,588
Year 7_2008	212,588
Total estimated reductions (tonnes of CO_{2e})	1,212,773
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_{2e})	173,253

Table 2 – Estimated emission reductions of the Piratini SSC-CDM Project over the first 7-year crediting period

A.4.4. Public funding of the project activity

No public funding is or will be required for the development of the project activity.

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

The project consists of one single power plant with an installed capacity of 10 MW_{el} and is not component of other 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

Component 1, power-generation: AMS type I, renewable energy projects; category I.D – renewable electricity generation for a grid.

Component 2, methane-emissions-avoidance: AMS type III, other project activities; category III.E – avoidance of methane production from biomass decay through controlled combustion.

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

Component 1, power-generation: scope 1, energy industries (renewable-/non-renewable sources).

Component 2, methane-emissions-avoidance: scope 13, waste handling and disposal.

B.3. Description of how the anthropogenic GHG emissions 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[3]”, 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 Project. The additionality tool provides a general step-wise framework for demonstrating and assessing additionality. These steps, numbered from 0 to 5, include:

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

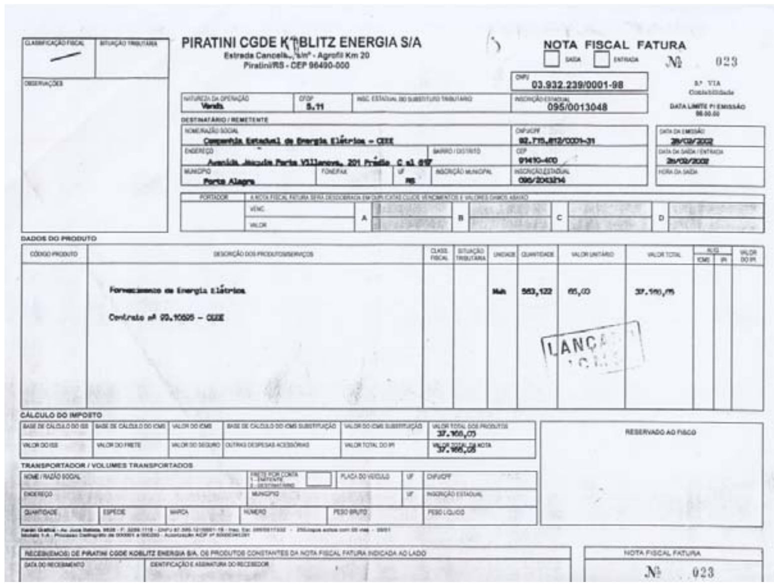
The application of the additionality tool to the Project follows.

Step 0. Preliminary screening based on the project start date:

a) Project Start date

[3] *Tool for the demonstration and assessment of additionality.* UNFCCC, CDM Executive Board 16th Meeting Report, 22 October 2004, Annex 1.

The starting date of this project activity partially occurred in January 2002 (Figure 2) when the power plant started the test/commissioning phase, and in June 2002 the project activity was commercially operational.


PIRATINI CGDE KOBLITZ ENERGIA S/A
Estrada Cancela, s/nº - Agrofil Km 20
Piratini/RS - CEP 96490-000

NOTA FISCAL FATURA
Nº 023

CNPJ 03.932.239/0001-98
Inscrição Estadual 095/0013048
Natureza da Operação: Venda
CFOP: 5.11

DESTINATÁRIO / REMETENTE
Nome/Razão Social: Companhia Estadual de Energia Elétrica – CEEE
Endereço: Avenida Joaquim Porto Villanova, 201 Prédio C sl 617
Município: Porto Alegre
UF: RS

DADOS DO PRODUTO

Descrição dos produtos/serviços	Unidade	Quantidade	Valor unitário	Valor total
Fornecimento de Energia Elétrica Contrato nº 03.10505 – CEEE	MWh	583,122	65,00	37.950,05

CÁLCULO DO IMPOSTO
Valor total dos produtos: 37.900,05
Valor total da nota: 37.900,05

RESERVADO AO FISCO

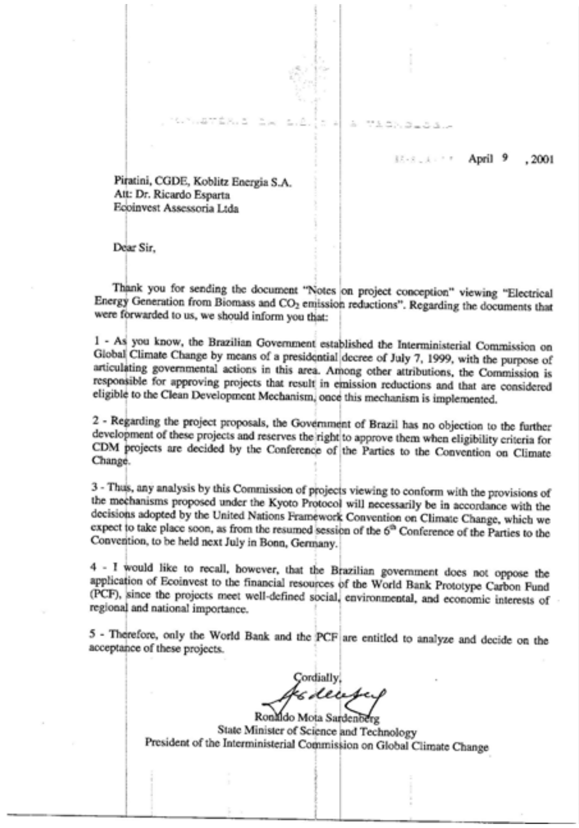
NOTA FISCAL FATURA Nº 023

Figure 2 – First electricity supply

b) Evidence demonstrates that CDM incentives were seriously considered in the development of project

Koblitz Ltda. (Koblitz) developed the Piratini SSC-CDM Project. Koblitz is a 100% Brazilian EPC contractor operating since 1975 in the area of energy systems, with solid know-how in industrial generation and cogeneration. Koblitz features a portfolio of over 200 projects, including many power plants using renewable energy sources.

Since 2000, Koblitz has formed several partnerships in order to invest in renewable energy projects throughout Brazil. In partnership with the *Brennand Group*, Koblitz developed the following renewable energy projects: Arapucel (small-hydro), Uruguaiana (rice husk fueled thermal power plant) and the *BK Energia Itacoatiara Project*. In another partnership with *C.G.D.e*, the Brazilian energy branch of the Portuguese bank *Caixa Geral de Depósitos*, one of the projects developed is the Piratini Project. In the second half of 2000, Koblitz requested from the Brazilian government, through Ecoinvest, a position regarding its participation in the Clean Development Mechanism. In April 2001, the project received a non-objection letter from the Brazilian government (Figure 3) and in the beginning of 2002, Piratini, through Ecoinvest, negotiated 1,600 tCO_2e verified emission reductions with the Canadian government. The Piratini project, which is currently fully controlled by Koblitz, is the first project registered (V-AAA-001) in the Canadian GHG Reductions Registry (http://reductions.vcr-mvr.ca/rer_masterprojects_e.cfm). Although enormous uncertainties were presented at the time, such as the entry into force of the Protocol, size of the market/price of the CERs, no nominated executive board, lack of approved baseline/monitoring methodologies and so on, the project owners took the risk and seriously considered the incentive from the CDM in the decision to proceed with the activity.



April 9 , 2001

Piratini, CGDE, Koblitz Energia S.A.
Att: Dr. Ricardo Esparta
Ecoinvest Assessoria Ltda

Dear Sir,

Thank you for sending the document "Notes on project conception" viewing "Electrical Energy Generation from Biomass and CO_2 emission reductions". Regarding the documents that were forwarded to us, we should inform you that:

1 - As you know, the Brazilian Government established the Interministerial Commission on Global Climate Change by means of a presidential decree of July 7, 1999, with the purpose of articulating governmental actions in this area. Among other attributions, the Commission is responsible for approving projects that result in emission reductions and that are considered eligible to the Clean Development Mechanism, once this mechanism is implemented.

2 - Regarding the project proposals, the Government of Brazil has no objection to the further development of these projects and reserves the right to approve them when eligibility criteria for CDM projects are decided by the Conference of the Parties to the Convention on Climate Change.

3 - Thus, any analysis by this Commission of projects viewing to conform with the provisions of the mechanisms proposed under the Kyoto Protocol will necessarily be in accordance with the decisions adopted by the United Nations Framework Convention on Climate Change, which we expect to take place soon, as from the resumed session of the 6th Conference of the Parties to the Convention, to be held next July in Bonn, Germany.

4 - I would like to recall, however, that the Brazilian government does not oppose the application of Ecoinvest to the financial resources of the World Bank Prototype Carbon Fund (PCF), since the projects meet well-defined social, environmental, and economic interests of regional and national importance.

5 - Therefore, only the World Bank and the PCF are entitled to analyze and decide on the acceptance of these projects.

Cordially,

Ronaldo Mota Sardenberg
State Minister of Science and Technology
President of the Interministerial Commission on Global Climate Change

Figure 3 - Piratini – Government non-objection letter

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

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

The identified realistic alternative to the project activity are:

- Continuation of the present scenario, with the supply of electricity from the S-SE-CO Brazilian interconnected grid and the final disposition of the wood residues in licensed disposal facilities. Regarding the final disposition of wood processing industries (sawmills), the following is based on official documents[4] and private communications with the Rio Grande do Sul Environmental Agency[5]. Sawmills in the regions have in principle the following alternatives to manage wood residues: a) final disposition in municipal landfills, b) final disposition in industrial landfills; c) Final disposition in licensed specific disposal facilities; d) incineration; and e) open field burning. From the 5 alternatives the only alternative (c)[6] would be available in the region[7].

[4] *Inventário Nacional de Resíduos Sólidos Industriais – Etapa Rio Grande do Sul* (FEPAM, 2002), and *Relatório sobre a Geração de Resíduos Sólidos Industriais no Estado do Rio Grande do Sul* (FEPAM, 2003).

[5] *Fundação Estadual de Proteção Ambiental Henrique Luis Roessler*, FEPAM (URL: http://www.fepam.rs.gov.br/).

[6] The environmental body of the state of Rio Grande do Sul released in April 1, 1998, decree number 38,356, allows the disposition of some specific solid residues, for example, wood-processing industry residues, in licensed disposal facilities under the observance of special requirements, which includes preparing and monitoring the soil to avoid contamination.

[7] Consema Federal Resolution 073/2004 prohibits the disposition in municipal landfills (option a). Rio Grande do Sul State Decree 38.356/1998 banned open field burning (alternative e). Alternatives "b" and "d" are not economically feasible due to

- The implementation of the project without incentives from the CDM.

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

The project activity and the alternative scenarios are in compliance with all applicable regulations.

→ ***Proceed to step 2 (investment analysis) or <u>step 3 (barrier analysis)</u>***

Step 2. Investment analysis

Not applicable.

Step 3. Barrier Analysis:

To substantiate 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 of 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 freedom of choice of the electricity services supplier, initiated itself in 1998 for great consumers, and should culminate with a 100% free market in 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.

Until the end of 2000, after five years of privatization, the process results were still modest (Figure 4). Despite high expectations, investments in new generation did not follow the increase in consumption.

either the cost of treatment (incineration) or transportation (the closest industrial landfill is located in Pelotas, around 120 km away, 100 km of paved roads plus 20 km of unpaved roads).

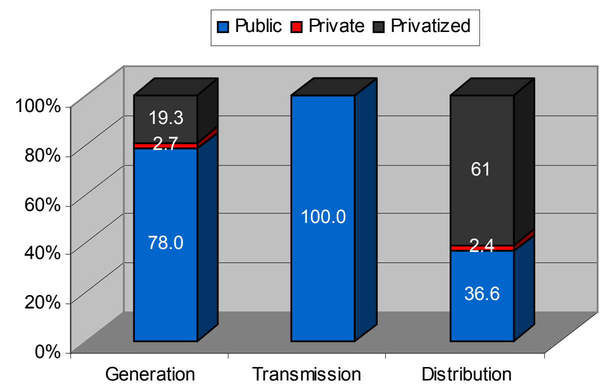


Figure 4 - Participation of private capital in the Brazilian electricity market in December 2000 (Source: BNDES, 2000).

The decoupling of GDP (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 broadening of the 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 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 5.

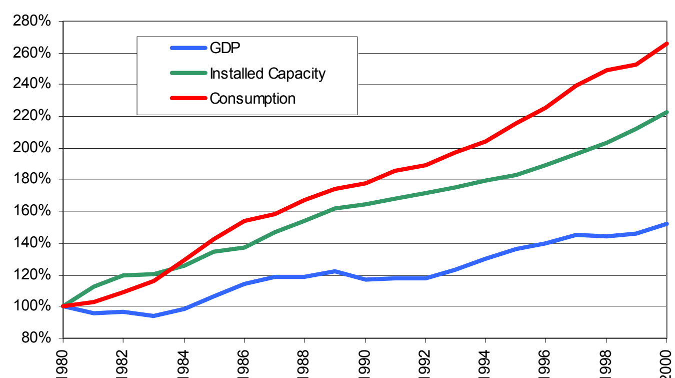


Figure 5 - Cumulated variation of GDP, electricity supply (installed capacity) and demand (consumption) (Sources: Eletrobrás, *http://www.eletrobras.gov.br*; IBGE, http://www.ibge.gov.br/).

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). Although the results of the program were remarkable, the efficiency achievement was not big enough to cover the mentioned gap between the need of new generation capacity and consumption growth.

The remaining alternative, to increase the capacity factor of the old plants, was actually the most widely used, as can be seen in Figure 6. 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 the water accumulated in the reservoirs.

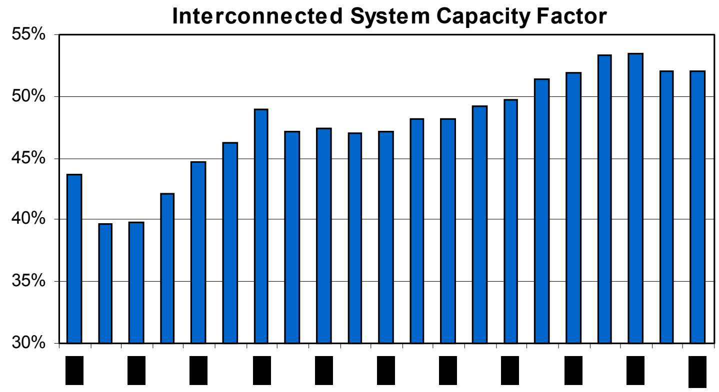


Figure 6 - Evolution of the rate of generated energy to installed capacity (Source: Eletrobrás, http://www.eletrobras.gov.br/).

Figure 7 shows what 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 the historical average rain. 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 still no long-term solution for the problems that finally caused shortage and rationing in 2001.

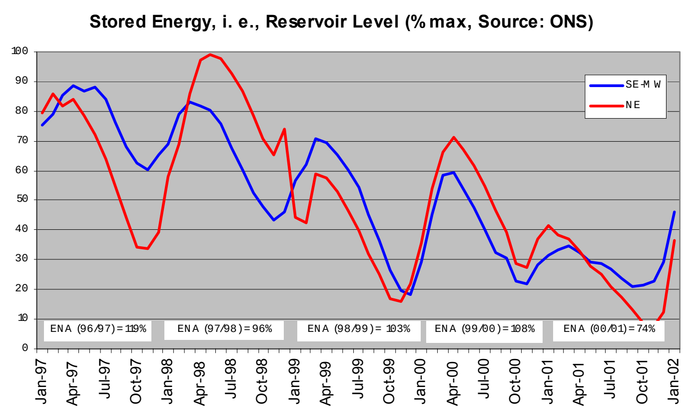


Figure 7 - Evolution of the water stored capacity for the Southeast/Midwest (SE-MW) and Northeast (NE) interconnected subsystems and intensity of precipitation in the rainy season (ENA) in the southeast region compared to the historic average (Source: ONS, http://www.ons.org.br/)

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 new installed capacity until December of 2003. During 2001 and the beginning of 2002 the plan was rearranged to 40 plants and 13,637 MW to be installed until December 2004 (Federal Law 10,438 of April 26th, 2002, Article 29). As of today, December 2004, 20 plants totalizing around 9,700 MW are 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 the end of 2002 (using mainly diesel oil, 76,9 %, and residual fuel oil, 21.1 %), totalizing 2,150 MW power capacity (CGE-CBEE, 2002).

It is clear though that hydroelectricity is and will continue as the main source responsible 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 electric power sector are shifting from hydroelectricity to natural gas plants (Schaeffer *et al.,* 2000). With discoveries of vast reserves of natural gas in the Santos Basin in 2003 (Figure 8) the policy of using natural gas to generate electricity remains a possibility and it still will continue to have interest from private-sector investments in the Brazilian energy sector.

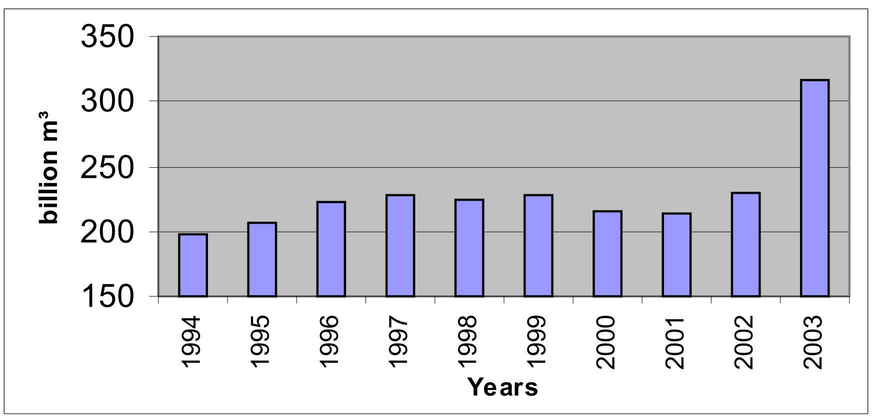


Figure 8 – Evolution of the Brazilian natural gas proved reserves (Source: Petrobras, http://www.petrobras.com.br/)

In power since January 2003, the new elected government decided to fully review the electricity market institutional framework. A new model for the electricity sector was approved by Congress 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 will 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 (*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. These measures have the potential to reduce market volatility and allow distribution companies to better estimate market size. 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 per cent. 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 one of the new model biggest aim is to reduce market risk, its ability to encourage private investment 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 bigger role to play in long-term planning should be avoided by increasing the Ministry of Mines and Energy's technical capabilities, while insulating the new institutions 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 energy sector needs to be defined within a specific sectoral framework.

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

Investment Barrier

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 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 high volatility coupled with strong devaluation, effectively precluding commercial banks from providing any long-term debt financing to local companies. The lack of a long-term debt market caused a severe negative impact on the financing of energy projects in Brazil. Real interest rates have been extraordinarily high since the Real plan stabilized inflation in 1994.

Interest rates for local currency financing are significantly higher than US Dollar rates. The National Development Bank – BNDES is the only supplier of long-term loans. Debt financing from BNDES are made primarily through commercial banks. The credit market is dominated by shorter maturities (90-days to 1-year) and long-term credit lines are available only to 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 maturity of one year or greater practically do not exist in Brazil. Experience has shown that in moments of financial stress the duration of savings instruments contracted drops 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).

The lack of local long-term financing results from the reluctance of creditors and savers to lengthen the term of their investments. It has made savers opt for the most liquid investments and to 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[8].

The SELIC Rate has been very volatile ranging from a minimum of 15% p.a. in January 2001 to a maximum of 45% p.a. in March 1999 (Figure 9).

The project was developed on a project finance basis. To finance construction, the project developer took advantage from the financing lines of BNDES. This financial support covered 80% of the project costs with a rate of TJLP (BNDES[9] Long Term Interest Rate – 10%) plus a 5% spread risk for a term of 8-year and 1-year grace period.

[8] COPOM, "Monetary Policy Committee" (from the Portuguese *"Comitê de Política Monetária").* The Central Bank of Brazil's (BCB) Monetary Policy Committee (COPOM) was created on June 20th 1996, and was assigned the responsibility of setting the stance of monetary policy and the short-term interest rate.

[9] The "*Brazilian Development Bank*" (BNDES from the Portuguese, "*Banco Nacional de Desenvolvimento Economico e Social*") was established in 1952 and is a public company associated with the Ministry of Development, Industry, and Foreign Trade. The BNDES mission is to be an agent for development in Brazil , giving priority to social inclusion, decreases inequalities, sustainability, economic growth, and the strengthening of national sovereignty and economic integration within the countries of South America.

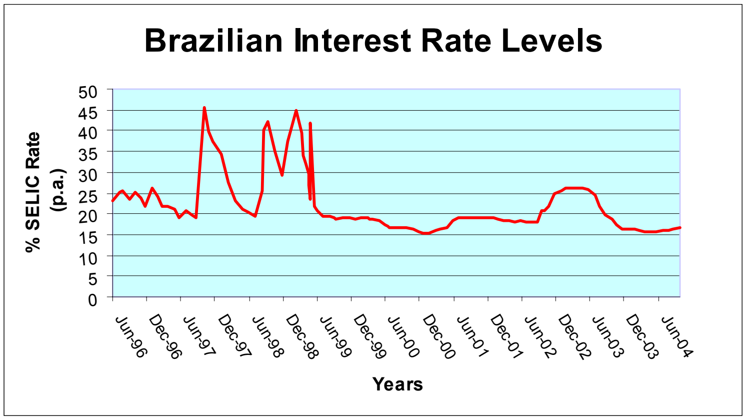


Figure 9 - SELIC rate (Source: Banco Central do Brasil)

The Project was set up with an expected financial Internal Rate of Return (IRR) lower than SELIC rate even tough it corresponds to a riskier investment compared to a Brazilian government bonds. The inclusion of the revenues from CERs makes the project's IRR increase from 11% to 42% (Table 3)[10]. Such increase in return would compensate for the additional risk an investor would enter into with this project.

Financial Sensitivity Analysis - PIRATINI

SELIC rate* (1996 - 2004)	%	Project NPV	Project NPV with CER
Maximum Level	45,00%	(R$ 3.851.305)	(R$ 372.469)
Average	22,36%	(R$ 2.407.985)	R$ 5.742.728
Minimum Level	15,25%	(R$ 1.112.111)	R$ 10.365.326
Current Discount Rate	**18,00%**	**(R$ 1.700.531)**	**R$ 8.300.587**
Project IRR		**11%**	**42%**

* The SELIC rate was created in 1996.

Table 3 – Financial sensitivity analysis

With the increase of revenues would bring the project additional benefits due to the fact that they are generated in hard currencies (US Dollar or EURO). The additional revenue allows the project investor 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 lower interest rate, thus increasing the project leverage.

The conclusion is that the CDM incentive plays a very important role in overcoming financial barriers. The Table 3 demonstrates how the CER revenues influence the project NPV and increase the project IRR.

Institutional Barrier

[10] The worksheet with detailed calculations is available upon request.

As described above, since 1995 government electricity market policies have been continuously changing in Brazil. Too many laws and regulations were created supposedly to organize and to incentive new investments in the energy sector. Obviously the result of such unstable regulatory environment was rather the contrary. During the rationing period the prices surpassed the value of BRL 600/MWh (around USD 200/MWh) and the forecasted marginal price of the new energy was at around BRL 120 to 150/MWh (around USD 45). In the middle of 2004 however, the average price was below BRL 50/MWh (less than USD 20/MWh). The volatility of the electricity price in Brazil has a correlation with the instability in government policies in the period, with 3 different regulatory environments in a 10 years period (from 1995 to 2004). In theory the new regulatory framework has the potential to reduce market risk considerably. Nevertheless the time span is still too short to evaluate the new model in relation to market risks reduction and private investment attraction[11]. In that sense, it will interesting to evaluate the results of the first auction of licenses for the construction of new power plants in order to correctly assess the success of the implementation of the new regulatory framework.

Cultural Barrier

The switch to a new electricity source, provided by sawmills, has faced mistrust from the local population. They did not understand that electricity could be supplied by biomass, nor did they trust that it would be reliable.

Other Cultural Barrier faced by the project was with some NGOs. They did not support the project activity until they understood that the project does not promote deforestation but promotes sustainable development.

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

As described above, the realistic alternatives to the project activity are either the continuation of the scenario without the project activity or the implementation of the project activity without the CDM incentives. Clearly the barriers above do not have any effect in the former. For the latter, all the barriers apply and are intensified, making the implementation of the alternative without the incentive from the CDM very unlikely.

Step 4. Common practice analysis:

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

To the best of the knowledge of the project owners, there are no power plants in Brazil using wood residues to generate electricity to be dispatched into grids, which are not requesting eligibility under the CDM.

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

Again, to the best of the knowledge of the project owners, all similar projects in the country considered the incentives from the CDM to proceed with the investment.

Step 5 – Impact of CDM Registration

The CDM has made possible to set up a power plant and export electricity to the interconnected South-Southeast-Midwest grid. CDM revenues improve the project's rate of return from 11 % to an acceptable 42%, which is necessary to initiate such pioneering projects and to guarantee their operation in

[11] The reform of the legal framework of the Brazilian electricity sector started with Provisional Measure No. 144, later converted into Law No. 10,848, of 15 March 2004 - was unveiled with the publication of Decree No. 5,163, of 30 July 2004.

the long term. Without the prospect of CERs revenues it is very unlikely that the project would have been implemented. Despite of the huge uncertainties project owners took the risk to finance the project and counted with the CERs revenues to overcome the above described cultural, institutional and financial barriers. The registration of the proposed project activity will have a strong impact not only rewarding the belief of the project owners in the Kyoto Protocol as well as it will pave the way for similar biomass projects to be implemented.

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:

According to the chosen methodology[12] the project boundary is the physical, geographical site where the treatment of biomass takes place (Figure 10).

This includes the power plant, as well as the units that provide the electricity to the South-Southeast-Midwest grid in the baseline scenario.

The Simplified modalities and procedures for small–scale clean development mechanism project activities further explain: The project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases (GHG) under the control of the project participants that are significant and reasonably attributable to the CDM project activity.

The Guidelines for Completing CDM-PDD, CDM-NMB and CDM-NMM further explains: the (Meth Panel) shall develop specific proposals for consideration by the Executive Board on how to operationalize the terms “under the control of”, “significant” and “reasonably attributable.” Pending decisions by the Executive Board on these terms, project participants are invited to explain their interpretation of such terms when completing and submitting the CDM-NMB and CDM-NMM.

The proposed project activity is a special purpose company dedicated to electricity generation from renewable wood residues. The project activity is responsible for the biomass burned in the power plant, including the biomass collected from the landfill. Obviously the “operation” of the open field stockpiles cannot be reasonably attributed to the project activity.

[12] Appendix B of the simplified modalities and procedures small-scale CDM project activities. Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. Type III.E. Avoidance of methane production from biomass decay through controlled combustion (Version 05: 25 February 2005).

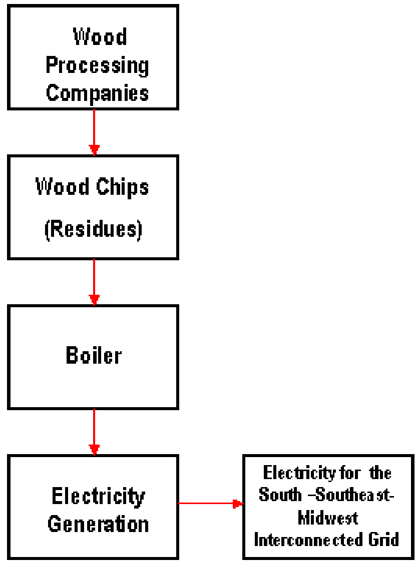


Figure 10 - Project Boundary

The following gedanken experiment corroborates the statement.

Assume that as soon as the Piratini Project operator has collected the biomass from sawmills, the owners of the sawmills use the free space to dispose non combustible municipal solid waste. If the boundary of the Piratini Project would include the geographical site of the "landfill", emissions absolutely out of the control of the project participants would be wrongly attributed to the CDM project activity.

Despite the existence of the open field stockpiles and methane generation therein, there will always be at least a virtual landfill (or a virtual open field stockpile) in the baseline scenario. The avoidance of methane emissions is due to either to the avoidance of the creation of a new landfill (residues that will not be disposed) or for collecting and burning material that would otherwise decay in an existing landfill (residues that will not be left to decay).

This is surely why the project boundary is exactly and correctly defined in the methodology **only** as the physical, geographical site where the treatment of biomass takes place.

B.5. Details of the baseline and its development

B.5.1. Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities

According to the simplified M&P for small-scale CDM, there are two options that can be applied in the selected project category.

"*The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2equ/kWh) calculated in a transparent and conservative manner:*

(a) The average of the 'approximate operating margin' and the 'build margin', where:

a. *The 'approximate operating margin' is the weighted average emissions (in kg CO2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;*
b. *The 'build margin' is the weighted average emissions (in kg CO2equ/kWh) 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.*

or

The weighted average emissions (in kg CO2equ/kWh) of the current generation mix".

Option (a) will be used (see section E.1.2.4 for a detailed description).

The Piratini Project also includes a methane avoidance component that will use the baseline listed in Type III.E, as defined in Appendix B of the simplified modalities and procedures for small-scale CDM project activities (see section E.1.1 for a detailed description).

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 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. (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 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 – 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 MW installed in Brazil by the same date (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% of the installed capacity serving Brazil is taken into account (Table 4), 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.

B.5.2. Date of completing the final draft of this baseline section *(DD/MM/YYYY)*

29/09/2005

B.5.3. Name of person/entity determining the baseline

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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

Operational since January 2002

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

25y-0m

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

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period

01/01/2002

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. Monitoring methodology and plan

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

According to Appendix B of the simplified modalities and procedures for small-scale CDM project activities for Type I.D:

"Monitoring shall consist of metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass input and its energy content shall be monitored."

Thus, the monitoring plan of the electricity generation component consists in metering the renewable electricity generated by the power plant.

In addition, the project also includes the methane avoidance component. In accordance with Appendix B of the simplified modalities and procedures for small-scale CDM project activities for Type III.E the amount of biomass combusted by the project activity in a year will be monitored. The project owners are aware that the different origins of biomass burned in the power plant lead should be differentiated as not everything would decay in anaerobic conditions and therefore would not generate methane as forecasted in the methodology. There is no guidance in the methodology on how to handle such differences. Although it is not demanded in the methodology, project owners will maintain the monitoring of the different sources of biomass. For the methane avoidance component the biomass collected from clearing roads will not be accounted. For the biomass collected from existing open air stockpiles it is clear that part of the biomass might already been decayed. In the spirit of simplified methodologies for small-scale project activities, the biomass from open field stockpiles will be here considered. Nevertheless guidance for similar operation in future project activities submissions should be defined.

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

The Monitoring Plan was based on the suggested baseline option 7. (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 it applies to meter the electricity generated by the renewable energy, in the case, biomass generation; This has already been carried out by the Piratini Project.

The other Monitoring Plan was based on the monitoring option 5. (a) of Type III, Category E of CDM small-scale project activity categories contained in Appendix B of the simplified M&P for CDM small-scale project activity and it affirms that the amount of biomass has to be monitored; This has already been carried out by the Piratini Project.

D.3. Data to be monitored

In accordance with the approved methodology the PDD lists two data to be monitored:

Electricity quantity

The project owner measures with an electronic supervisory system the amount of total electricity generation, electricity exported to the grid, and electricity consumed by the project.

There is a meter that informs the supervisory system (Figure 11), this meter is periodically calibrated. The system keeps historical data that can be accessed when necessary.

Double check is done with the receipt of sales issued by CEEE, the local electricity utility, in the case of exported electricity.

Therefore, the Piratini Project is the main responsible for generating, monitoring, measuring and reporting data regarding electricity exportation to the grid.

Fuel quantity

The project owner monitors wood residues that are burned to generate electricity. The measurement is made through the total of biomass fed into the boiler. This data is obtained through a scale used to quantify wood residues entering the site. This measurement is made manually in the field using a periodically calibrated a mechanical scale. Every day this information is electronically stored into a spreadsheet.

If any small divergence is found, both equipments are re-calibrated. The numbers that lead to the smallest electricity generation and methane avoidance will be used if the uncertainty is not considered significant (less than 1% difference). The electricity generation and methane avoidance will not be accounted for GHG emission reductions if the uncertainty is considered significant.

Figure 11 - Software for energy control.

ID number	Data type	Data variable	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)	For how long is archived data to be kept?	Comment
D.3-1	EG_y	Electricity supplied to the grid.	*MWh*	M	Monthly recording	100%	Electronic	During the credit period and two years after	Electricity supplied by the project to the grid. Energy metering connected to the grid and receipt of sales.
D.3-2	$Q_{biomass,fresh}$	Amount of wood residues consumed at the project activity, collected from the sawmills operation.	*tonnes*	M	daily	100%	Electronic and paper	During the credit period and two years after	Renewable sourced wood waste from sawmills operations
D.3-3	$Q_{biomass,old}$	Amount of wood residues consumed at the project	*tonnes*	M	daily	100%	Electronic and paper	During the credit period	Renewable sourced wood waste from sawmills operations

		activity, collected in open field stockpiles.						and two years after	
D.3-4	$Q_{biomass,roads}$	Amount of wood residues consumed at the project activity, collected from clearing the roads/forest.	*tonnes*	M	daily	100%	Electronic and paper	During the credit period and two years after	Renewable sourced wood waste from sawmills operations
D.3-5	EF_y	Emission factor of the grid	tCO_2/MWh	C	At validation of every renewable crediting period	Not applicable.	Electronic	During the credit period and two years after	Data will be archived during the credit period according to internal procedures.
D.3-6	$EF_{OM,y}$	Operating margin emission factor of the grid	tCO_2/MWh	C	At validation of every renewable crediting period	Not applicable.	Electronic	During the credit period and two years after	Data will be archived during the credit period according to internal procedures.
D.3-7	$EF_{BM,y}$	Build margin emission factor of the grid	tCO_2/MWh	C	At validation of every renewable crediting period	Not applicable	Electronic	During the credit period and two years after	Data will be archived during the credit period according to internal procedures.

Credit owner and project operator, the special purpose company Piratini Energia S. A. (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

The quality control and quality assurance measures planned for the Piratini SSC-CDM Project are outlined in the following table.

Data (table and ID number.)	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.3-1, 2, 3 and 4	low	These data will be used for calculate the emission reductions. Two meters are used to measure the electricity delivered to the grid (main meter and backup meter). Sales record is used to ensure consistency. The same applies to the biomass residues.

Others	low	Default data (for emission factors) and literature statistics (IEA, IPCC, others) are used to check the local data.

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

All variables used to calculate project and baseline emissions are directly measured or are publicly available official data (data supplied by the Brazilian National Dispatch Center and Electricity Agency). To ensure the quality of the data, in particular those that are measured, the data will be double checked against commercial data. Default data (for emission factors) and literature statistics (IEA, IPCC, others) are used to check the local data.

All necessary procedures to monitor emission reductions and any leakage effects generated by the project activity are actually part of the business-as-usual procedures of the project, therefore, no extra operational and management structures are necessary.

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

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SECTION E. Estimation of GHG emission by sources

E.1. Formulae used

E.1.1 Selected formulae as provided in appendix B

For the power generation component no formula is provided in AMS I.D.

For the methane avoidance component the formulae listed in Type III.E are:

$$CH_4\_IPCC_{decay} = (MCF * DOC * DOC_F * F * 16/12) \quad \textbf{Equation 1}$$

Where:

- $CH_4\_IPCC_{decay}$ IPCC CH_4 emission factor for decaying biomass in the region of the project activity (tonnes of CH_4/tonne of biomass or organic waste)
- MCF methane correction factor (fraction) (default is 0.4)
- DOC degradable organic carbon (fraction, see equation below or default is 0.3)
- DOC_F fraction DOC dissimilated to landfill gas (default is 0.77)
- F fraction of CH_4 in landfill gas (default is 0.5)

For DOC, the following equation may be used instead of the default:

$$DOC = 0.4\ (A) + 0.17\ (B) + 0.15\ (C) + 0.30\ (D) \quad \textbf{Equation 2}$$

Where:

- A per cent waste that is paper and textiles
- B per cent waste that is garden waste, park waste or other non-food organic putrescibles
- C per cent waste that is food waste
- D per cent waste that is wood or straw

$$BE_y = Q_{biomass} * CH_4\_IPCC_{decay} * GWP\_CH_4 \quad \textbf{Equation 3}$$

Where:

- BE_y Baseline methane emissions from biomass decay (tonnes of CO2 equivalent)
- $Q_{biomass}$ Quantity of biomass “treated” under the project activity (tonnes)
- GWP_CH_4 GWP for CH_4 (tonnes of CO_2 equivalent/tonne of CH_4)

$$Q_{biomass} = Q_{biomass,total} - Q_{biomass,old} - Q_{biomass\ roads} \quad \textbf{Equation 4}$$

$$Q_{biomass,total} = Q_{biomass,fresh} + Q_{biomass,roads} + Q_{biomass,old} \quad \textbf{Equation 5}$$

Where:

- $Q_{biomass,total}$ Total amount of wood residues consumed at the project activity (tonnes).
- $Q_{biomass,old}$ Amount of wood residues consumed at the project activity collected in open field stockpiles (tonnes).

- $Q_{biomass,fresh}$ Amount of wood residues consumed at the project activity collected from the sawmills operation (tonnes).
- $Q_{biomass,roads}$ Amount of wood residues consumed at the project activity collected from clearing the roads/forest (tonnes).

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

Project emissions for the electricity generation = zero (0 tCO2).

Project emissions from the methane avoidance component = 9,048 *tCO2e* annually (estimated when fully operational, see calculation in item A.4.2 but with total biomass use of 160,000 tonnes).

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 formula is needed. No leakage calculation is required.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions

Project emissions = 9,048 tCO_2e annually

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's 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

The emission reduction of the electricity generation is simply emissions in the baseline scenario (BE_y, in tCO_2e), i.e., the annual electricity supplied to the grid (EG_y, *in MWh*) times the baseline emission factor of the grid (Equation 10).

$$BE_y = EG_y \times EF_y \qquad \textbf{Equation 6}$$

As explained in item B.5.1, 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 tCO_2e/MWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad \textbf{Equation 7}$$

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 CO2e coefficient COEFi is obtained as,

$$COEF_{i,j} = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad \textbf{Equation 8}$$

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 kg CO2equ/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,

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad \textbf{Equation 9}$$

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 EFy is the average of the operating margin factor ($EF_{OM,y}$) and the build margin factor ($EF_{BM,y}$),

$$EF_y = 0.5 \cdot EF_{OM,y} + 0.5 \cdot EF_{BM,y} \qquad \textbf{Equation 10}$$

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

For the power generation component, 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 interconnected grids, South-Southeast-Midwest and North-Northeast. For the Piratini Project the relevant one is the South-Southeast-Midwest interconnected grid.

In order to calculate the emission factors, daily dispatch data from the Brazilian national dispatch center (ONS, from the "*Portuguese Operador Nacional do Sistema"*) needed to be collected. ONS does not regularly provide such information, which implied in getting it directly with the entity.

In 2005 ONS supplied raw dispatch data for the whole interconnected grid in the form of daily reports from Jan. 1, 2002 to Dec. 31, 2004 (ONS-ADO, 2004), the most recent information available at this stage.

The following data sources were relevant for the calculation of the baseline:

- For the relevant connected electricity system (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), i.e., the south-southeast-midwest interconnected system (S-SE-CO, from the Portuguese "***S****ul-****S****ud****E****ste-****C****entro-****O****este*"), data from 120 power plants, comprising 63.6 GW installed capacity and 828 TWh electricity generation over the 3-year period were considered (ONS-ADO, 2004).
- The amount of fuel consumed by relevant fossil-fuel-fired plants, are the ones collected in a research made by the International Energy Agency (Bosit *et al.*, 2002).
- The emission coefficients of each fuel are the ones indicated by the IPCC (1996).

	Subsystem*	Fuel source**	Power plant	Operation start [2, 4, 5]	Installed capacity (MW) [1]	Fossil fuel conversion efficiency (%) [2]	Carbon emission factor (tC/TJ) [3]	Fraction carbon oxidized [3]	Emission factor (tCO2/MWh)
1	S-SE-CO	H	Jauru	Sep-2003	121.5	1	0.0	0.0%	0.000
2	S-SE-CO	H	Gauporé	Sep-2003	120.0	1	0.0	0.0%	0.000
3	S-SE-CO	G	Três Lagoas	Aug-2003	306.0	0.3	15.3	99.5%	0.670
4	S-SE-CO	H	Funil (MG)	Jan-2003	180.0	1	0.0	0.0%	0.000
5	S-SE-CO	H	Itiquira I	Sep-2002	156.1	1	0.0	0.0%	0.000
6	S-SE-CO	G	Araucária	Sep-2002	484.5	0.3	15.3	99.5%	0.670
7	S-SE-CO	G	Canoas	Sep-2002	160.6	0.3	15.3	99.5%	0.670
8	S-SE-CO	H	Piraju	Sep-2002	81.0	1	0.0	0.0%	0.000
9	S-SE-CO	G	Nova Piratininga	Jun-2002	384.9	0.3	15.3	99.5%	0.670
10	S-SE-CO	O	PCT CGTEE	Jun-2002	5.0	0.3	20.7	99.0%	0.902
11	S-SE-CO	H	Rosal	Jun-2002	55.0	1	0.0	0.0%	0.000
12	S-SE-CO	G	Ibirité	May-2002	226.0	0.3	15.3	99.5%	0.670
13	S-SE-CO	H	Cana Brava	May-2002	465.9	1	0.0	0.0%	0.000
14	S-SE-CO	H	Sta. Clara	Jan-2002	60.0	1	0.0	0.0%	0.000
15	S-SE-CO	H	Machadinho	Jan-2002	1,140.0	1	0.0	0.0%	0.000
16	S-SE-CO	G	Juiz de Fora	Nov-2001	87.0	0.28	15.3	99.5%	0.718
17	S-SE-CO	G	Macaé Merchant	Nov-2001	922.6	0.24	15.3	99.5%	0.837
18	S-SE-CO	H	Lajeado (ANEEL res. 402/2001)	Nov-2001	902.5	1	0.0	0.0%	0.000
19	S-SE-CO	G	Eletrobolt	Oct-2001	379.0	0.24	15.3	99.5%	0.837
20	S-SE-CO	H	Porto Estrela	Sep-2001	112.0	1	0.0	0.0%	0.000
21	S-SE-CO	G	Cuiaba (Mario Covas)	Aug-2001	529.2	0.3	15.3	99.5%	0.670
22	S-SE-CO	G	W. Arjona	Jan-2001	194.0	0.25	15.3	99.5%	0.804
23	S-SE-CO	G	Uruguaiana	Jan-2000	639.9	0.45	15.3	99.5%	0.447
24	S-SE-CO	H	S. Caxias	Jan-1999	1,240.0	1	0.0	0.0%	0.000
25	S-SE-CO	H	Canoas I	Jan-1999	82.5	1	0.0	0.0%	0.000
26	S-SE-CO	H	Canoas II	Jan-1999	72.0	1	0.0	0.0%	0.000
27	S-SE-CO	H	Igarapava	Jan-1999	210.0	1	0.0	0.0%	0.000
28	S-SE-CO	H	Porto Primavera	Jan-1999	1,540.0	1	0.0	0.0%	0.000
29	S-SE-CO	D	Cuiaba (Mario Covas)	Oct-1998	529.2	0.27	20.2	99.0%	0.978
30	S-SE-CO	H	Sobragi	Sep-1998	60.0	1	0.0	0.0%	0.000
31	S-SE-CO	H	PCH EMAE	Jan-1998	26.0	1	0.0	0.0%	0.000
32	S-SE-CO	H	PCH CEEE	Jan-1998	25.0	1	0.0	0.0%	0.000
33	S-SE-CO	H	PCH ENERSUL	Jan-1998	43.0	1	0.0	0.0%	0.000
34	S-SE-CO	H	PCH CEB	Jan-1998	15.0	1	0.0	0.0%	0.000
35	S-SE-CO	H	PCH ESCELSA	Jan-1998	62.0	1	0.0	0.0%	0.000
36	S-SE-CO	H	PCH CELESC	Jan-1998	50.0	1	0.0	0.0%	0.000
37	S-SE-CO	H	PCH CEMAT	Jan-1998	145.0	1	0.0	0.0%	0.000
38	S-SE-CO	H	PCH CELG	Jan-1998	15.0	1	0.0	0.0%	0.000
39	S-SE-CO	H	PCH CERJ	Jan-1998	59.0	1	0.0	0.0%	0.000
40	S-SE-CO	H	PCH COPEL	Jan-1998	70.0	1	0.0	0.0%	0.000
41	S-SE-CO	H	PCH CEMIG	Jan-1998	84.0	1	0.0	0.0%	0.000
42	S-SE-CO	H	PCH CPFL	Jan-1998	55.0	1	0.0	0.0%	0.000
43	S-SE-CO	H	S. Mesa	Jan-1998	1,275.0	1	0.0	0.0%	0.000
44	S-SE-CO	H	PCH EPAULO	Jan-1998	26.0	1	0.0	0.0%	0.000
45	S-SE-CO	H	Guilmam Amorim	Jan-1997	140.0	1	0.0	0.0%	0.000
46	S-SE-CO	H	Corumbá	Jan-1997	375.0	1	0.0	0.0%	0.000
47	S-SE-CO	H	Miranda	Jan-1997	408.0	1	0.0	0.0%	0.000
48	S-SE-CO	H	Noav Ponte	Jan-1994	510.0	1	0.0	0.0%	0.000
49	S-SE-CO	H	Segredo (Gov. Ney Braga)	Jan-1992	1,260.0	1	0.0	0.0%	0.000
50	S-SE-CO	H	Taquaruçu	Jan-1989	554.0	1	0.0	0.0%	0.000
51	S-SE-CO	H	Manso	Jan-1988	210.0	1	0.0	0.0%	0.000
52	S-SE-CO	H	D. Francisca	Jan-1987	125.0	1	0.0	0.0%	0.000
53	S-SE-CO	H	Itá	Jan-1987	1,450.0	1	0.0	0.0%	0.000
54	S-SE-CO	H	Rosana	Jan-1987	369.2	1	0.0	0.0%	0.000
55	S-SE-CO	N	Angra	Jan-1985	1,874.0	1	0.0	0.0%	0.000
56	S-SE-CO	H	T. Irmãos	Jan-1985	807.5	1	0.0	0.0%	0.000
57	S-SE-CO	H	Itaipu 60 Hz	Jan-1983	6,300.0	1	0.0	0.0%	0.000
58	S-SE-CO	H	Itaipu 50 Hz	Jan-1983	5,375.0	1	0.0	0.0%	0.000
59	S-SE-CO	H	Emborcação	Jan-1982	1,192.0	1	0.0	0.0%	0.000
60	S-SE-CO	H	Nova Avanhandava	Jan-1982	347.4	1	0.0	0.0%	0.000
61	S-SE-CO	H	Gov. Bento Munhoz - GBM	Jan-1980	1,676.0	1	0.0	0.0%	0.000
62	S-SE-CO	H	S.Santiago	Jan-1980	1,420.0	1	0.0	0.0%	0.000
63	S-SE-CO	H	Itumbiara	Jan-1980	2,280.0	1	0.0	0.0%	0.000
64	S-SE-CO	O	Igarapé	Jan-1978	131.0	0.3	20.7	99.0%	0.902
65	S-SE-CO	H	Itauba	Jan-1978	512.4	1	0.0	0.0%	0.000
66	S-SE-CO	H	A. Vermelha (Jose E. Moraes)	Jan-1978	1,396.2	1	0.0	0.0%	0.000
67	S-SE-CO	H	S.Simão	Jan-1978	1,710.0	1	0.0	0.0%	0.000
68	S-SE-CO	H	Capivara	Jan-1977	640.0	1	0.0	0.0%	0.000
69	S-SE-CO	H	S.Osório	Jan-1975	1,078.0	1	0.0	0.0%	0.000
70	S-SE-CO	H	Marimbondo	Jan-1975	1,440.0	1	0.0	0.0%	0.000
71	S-SE-CO	H	Promissão	Jan-1975	264.0	1	0.0	0.0%	0.000
72	S-SE-CO	C	Pres. Medici	Jan-1974	446.0	0.26	26.0	98.0%	1.294
73	S-SE-CO	H	Volta Grande	Jan-1974	380.0	1	0.0	0.0%	0.000
74	S-SE-CO	H	Porto Colombia	Jun-1973	320.0	1	0.0	0.0%	0.000
75	S-SE-CO	H	Passo Fundo	Jan-1973	220.0	1	0.0	0.0%	0.000
76	S-SE-CO	H	Passo Real	Jan-1973	158.0	1	0.0	0.0%	0.000
77	S-SE-CO	H	Ilha Solteira	Jan-1973	3,444.0	1	0.0	0.0%	0.000
78	S-SE-CO	H	Mascarenhas	Jan-1973	131.0	1	0.0	0.0%	0.000
79	S-SE-CO	H	Gov. Parigot de Souza - GPS	Jan-1971	252.0	1	0.0	0.0%	0.000
80	S-SE-CO	H	Chavantes	Jan-1971	414.0	1	0.0	0.0%	0.000
81	S-SE-CO	H	Jaguara	Jan-1971	424.0	1	0.0	0.0%	0.000
82	S-SE-CO	H	Sá Carvalho	Apr-1970	78.0	1	0.0	0.0%	0.000
83	S-SE-CO	H	Estreito (Luiz Carlos Barreto)	Jan-1969	1,050.0	1	0.0	0.0%	0.000
84	S-SE-CO	H	Ibitinga	Jan-1969	131.5	1	0.0	0.0%	0.000
85	S-SE-CO	H	Jupiá	Jan-1969	1,551.2	1	0.0	0.0%	0.000
86	S-SE-CO	O	Alegrete	Jan-1968	66.0	0.26	20.7	99.0%	1.040
87	S-SE-CO	G	Campos (Roberto Silveira)	Jan-1968	30.0	0.24	15.3	99.5%	0.837
88	S-SE-CO	G	Santa Cruz (RJ)	Jan-1968	766.0	0.31	15.3	99.5%	0.648
89	S-SE-CO	H	Paraibuna	Jan-1968	85.0	1	0.0	0.0%	0.000
90	S-SE-CO	H	Limoeiro (Armando Salles de Olivier	Jan-1967	32.0	1	0.0	0.0%	0.000
91	S-SE-CO	H	Caconde	Jan-1966	80.4	1	0.0	0.0%	0.000
92	S-SE-CO	C	J.Lacerda C	Jan-1965	363.0	0.25	26.0	98.0%	1.345
93	S-SE-CO	C	J.Lacerda B	Jan-1965	262.0	0.21	26.0	98.0%	1.602
94	S-SE-CO	C	J.Lacerda A	Jan-1965	232.0	0.18	26.0	98.0%	1.869
95	S-SE-CO	H	Bariri (Alvaro de Souza Lima)	Jan-1965	143.1	1	0.0	0.0%	0.000
96	S-SE-CO	H	Funil (RJ)	Jan-1965	216.0	1	0.0	0.0%	0.000
97	S-SE-CO	C	Figueira	Jan-1963	20.0	0.3	26.0	98.0%	1.121
98	S-SE-CO	H	Furnas	Jan-1963	1,216.0	1	0.0	0.0%	0.000
99	S-SE-CO	H	Barra Bonita	Jan-1963	140.8	1	0.0	0.0%	0.000
100	S-SE-CO	C	Charqueadas	Jan-1962	72.0	0.23	26.0	98.0%	1.462
101	S-SE-CO	H	Jurumirim (Armando A. Laydner)	Jan-1962	97.7	1	0.0	0.0%	0.000
102	S-SE-CO	H	Jacui	Jan-1962	180.0	1	0.0	0.0%	0.000
103	S-SE-CO	H	Pereira Passos	Jan-1962	99.1	1	0.0	0.0%	0.000
104	S-SE-CO	H	Tres Marias	Jan-1962	396.0	1	0.0	0.0%	0.000
105	S-SE-CO	H	Euclides da Cunha	Jan-1960	108.8	1	0.0	0.0%	0.000
106	S-SE-CO	H	Camargos	Jan-1960	46.0	1	0.0	0.0%	0.000
107	S-SE-CO	H	Santa Branca	Jan-1960	56.1	1	0.0	0.0%	0.000
108	S-SE-CO	H	Cachoeira Dourada	Jan-1959	658.0	1	0.0	0.0%	0.000
109	S-SE-CO	H	Salto Grande (Lucas N. Garcez)	Jan-1958	70.0	1	0.0	0.0%	0.000
110	S-SE-CO	H	Salto Grande (MG)	Jan-1956	102.0	1	0.0	0.0%	0.000
111	S-SE-CO	H	Mascarenhas de Moraes (Peixoto)	Jan-1956	478.0	1	0.0	0.0%	0.000
112	S-SE-CO	H	Itutinga	Jan-1955	52.0	1	0.0	0.0%	0.000
113	S-SE-CO	C	S. Jerônimo	Jan-1954	20.0	0.26	26.0	98.0%	1.294
114	S-SE-CO	O	Carioba	Jan-1954	36.2	0.3	20.7	99.0%	0.902
115	S-SE-CO	O	Piratininga	Jan-1954	472.0	0.3	20.7	99.0%	0.902
116	S-SE-CO	H	Canastra	Jan-1953	42.5	1	0.0	0.0%	0.000
117	S-SE-CO	H	Nilo Peçanha	Jan-1953	378.4	1	0.0	0.0%	0.000
118	S-SE-CO	H	Fontes Nova	Jan-1940	130.3	1	0.0	0.0%	0.000
119	S-SE-CO	H	Henry Borden Sub.	Jan-1926	420.0	1	0.0	0.0%	0.000
120	S-SE-CO	H	Henry Borden Ext.	Jan-1926	469.0	1	0.0	0.0%	0.000
121	S-SE-CO	H	I. Pombos	Jan-1924	189.7	1	0.0	0.0%	0.000
122	S-SE-CO	H	Jaguari	Jan-1917	11.8	1	0.0	0.0%	0.000
				Total (MW) =	**64,478.6**				

* Subsystem: S - south, SE-CO - Southeast-Midw est

** 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 da Geração* (http://w w w .aneel.gov.br/, data collected in november 2004)

[2] Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A.F. Simoes, H. Winkler and J.M. Lukamba. *Road testing baselines for GHG mitigation projects in the electric power sector.* OECD/IEA information paper, October 2002.

[3] Intergovernamental 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://w w w .aneel.gov.br/, data collected in november 2004).

Table 4 – Power plants database for the Brazilian S-SE-CO interconnected grid.

The emission reductions by the project activity (ER_y, in tCO_2e) during a given year y are the product of the baseline emissions factor (EF_y, in *tCO2e/MWh*) times the electricity supplied by the project to the grid (EG_y, in *MWh*), as follows:

$$ER_{y,power-generation} = EF_y \cdot EG_y \qquad \textbf{Equation 11}$$

The numbers arising from the application of Equation 7 to Equation 10 to the above data sources[13] are presented in Table 6 (EF_y = baseline emission factor = 0.5364 *tCO2e/MWh*).

For the expected electric energy output for commercialization when the project is fully operational, 58,200 *MWh* (total generation of 65,700 *MWh*, assuming 75.0% capacity factor, minus 7,500 MWh own consumption):

$$ER_{y,power-generation} = 58{,}200 \cdot 0.5364 = 31{,}218\ tCO_2e \qquad \textbf{Equation 12}$$

For the methane avoidance component, the amount of residues used in the power plant is monitored since its operation start and are presented in Table 7. Using the estimated consumption of 156,000 tonnes of wood residues for the power plant when fully operation and Equation 1 to Equation 5, the estimated annually emission reductions are:

$$ER_{y,methane-avoidance} = BE_y - PE_y = 185{,}657 - 8{,}822 = 176{,}836\ tCO_2e \qquad \textbf{Equation 13}$$

E.2 Tables providing values obtained when applying formulae above

Year	Estimation of project activity emission reductions (tonnes of CO_{2e})	Estimation of baseline emission reductions (tonnes of CO_{2e})	Estimation of leakage (tonnes of CO_{2e})	Estimation of emission reductions (tonnes of CO_{2e})
Year 1_2002	3,812	96,981	0	**93,169**
Year 2_2003	5,190	115,653	0	**110,463**
Year 3_2004	6,859	165,648	0	**158,788**
Year 4_2005	9,048	221,636	0	**212,588**
Year 5_2006	9,048	221,636	0	**212,588**
Year 6_2007	9,048	221,636	0	**212,588**
Year 7_2008	9,048	221,636	0	**212,588**
Total (tonnes of CO_{2e})	52,054	1,264,827	-	**1,212,773**

Table 5 - Piratini SSC-CDM Project estimated emission reductions

[13] Worksheet with detailed calculations is available upon request.

Source: Operador Nacional do Sistema Elétrico, Centro Nacional de Operação do Sistema, Acompanhamento Diário da Operação do SIN, (daily reports from Jan. 1, 2002 to Dec. 31, 2004).

SSC Emission factors for the Brazilian South-Southeast-Midwest interconnected grid		
Small-scale baseline (without imports)	**OM (tCO2e/MWh)**	**Total generation (MWh)**
2002	0.9304	276,731,024
2003	0.9680	295,666,969
2004	0.9431	301,422,617
	Average OM (2002-2004, tCO2e/MWh)	Total = 873,820,610
		BM 2004 (tCO2e/MWh)
	0.9472	0.1256
	OM*0.5+BM*0.5 (tCO2e/MWh)	
	0.5364	

Table 6 - Brazilian South-Southeast-Midwest electricity system emission factors

	Years				
Emission Reductions - Methane Avoidance	**2002**	**2003**	**2004**	**From 2005 to 2022 per year***	**1st Crediting Period from 2002 to 2008**
CH4_IPCCdecay (tCH4/t biomass)	0.0616	0.0616	0.0616	0.0616	0.0616
Qbiomas, road (tonnes)	1,379	14,190	10,296	12,800	77,065
Qbiomas,old (tonnes)	0	0	0	0	0
Qbiomas fresh (tonnes)	66,039	77,593	111,001	147,200	843,433
Qbiomas total (tonnes)	67,418	91,783	121,297	160,000	920,498
Qbiomas - accounted for methane avoidance (tonnes)	66,039	77,593	111,001	147,200	843,433
Baseline Emissions (BEy, in tCO2)	85,428	100,374	143,591	190,418	1,091,065
Energy content of biomass (Ebiomass in TJ/t)	0.0075	0.0075	0.0075	0.0075	0.0075
Project emission (PE, in tCO2)	3,812	5,190	6,859	9,048	52,054
Emission Reductions from Methane Avoidance (tCO2)	**81,616**	**95,184**	**136,732**	**181,370**	**1,039,011**

*Expected

Table 7 – Piratini Project emission reductions, component 2, methane-avoidance

SECTION F. Environmental impacts

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

The proponent of any project that involves the construction, installation, expansion, and operation of 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. For the Piratini Project a report containing an assessment 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.).

The main environmental impacts identified were particulate matter emissions and wastewater management. To mitigate the former impact a multi-cyclone was. To minimize the latter impact a wastewater treatment was. Levels of emissions are permanently monitored and compared with legal standards.

The project has already received all necessary environmental, operational and construction licenses.

Piratini Energia S.A. received the authorization to operate as independent power producer issued by ANEEL[14] (resolution number 288 – 23/July/2001, available at http://www.aneel.gov.br/).

The provisional operation license (LO – Nº 0829/2002-DL) was issued in February 27, 2002 by FEPAM (*Fundação Estadual de Proteção Ambiental Henrique Luis Roessler*), the environmental agency of the state of Rio Grande do Sul. The final license was issued in December 27, 2004 (LO – Nº 8056/2004-DI, Figure 12).

The sawdust and the wood chips residues were a problem to mills and to the city of Piratini. The implementation of the biomass power plant, in 2002, solves two problems for the city. One, introducing a reliable renewable energy source and, enabling a final solution for the wood residues treatment.

[14] "Brazilian Electricity Regulatory Agency" (ANEEL from the Portuguese "*Agência Nacional de Energia Elétrica"*).

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LICENÇA DE OPERAÇÃO **LO N° 8056/2004-DL**

A Fundação Estadual de Proteção Ambiental, criada pela Lei Estadual n° 9.077 de 04/06/90 e com seus Estatutos aprovados através do Decreto n° 33.765, de 28/12/90, registrada no Ofício do Registro Oficial em 01/02/91, no uso das atribuições que lhe confere a Lei n° 6.938, de 31/08/81, que dispõe sobre a Política Nacional do Meio Ambiente, regulamentada pelo Decreto n° 99.274, de 06/06/90 e com base nos autos do processo administrativo n° 4902-05.67/04-1, expede a presente LICENÇA DE OPERAÇÃO que autoriza a:

EMPREENDIMENTO: 29320, **CODRAM:** 3510,10,
EMPREENDEDOR: PIRATINI, CGDE, KOBLITZ ENERGIA S/A,
ENDEREÇO: Estrada Cancelão – Agrofil, km 20 – 4° Subdistrito - Barrocão,
MUNICÍPIO: Piratini – RS,

a promover a operação relativa
à atividade de: GERAÇÃO DE ENERGIA ELÉTRICA A PARTIR DE BIOMASSA (RESÍDUOS DE MADEIRA ORIUNDOS DE SERRARIAS), com 6.119,75 m² de área útil, dos quais 5.852,3 m² são de área construída e 30 empregados,

localizada: na Estrada Cancelão – Agrofil, km 20 – 4° Subdistrito - Barrocão, no município de Piratini – RS.

Com as condições e restrições:
1-a capacidade instalada da usina é de 10 MW;
2-quanto à mata nativa:
2.1-deverá ser observada a legislação referente à preservação de mata nativa, e em caso de supressão de parte da mesma, deverá ser atendido o Decreto Estadual n.° 38.355, de 01/04/98, com referência à apresentação da "Licença Prévia de Exame e Avaliação da Área Florestal", emitida pelo Departamento de Florestas e Áreas Protegidas – DEFAP;
2.2-deverá ser totalmente preservada a APP (Área de Preservação Permanente) correspondente a uma faixa de preservação permanente de 30 (trinta) metros de largura *ao longo do arroio Barrocão* que limita a área, medida horizontalmente a partir da cota máxima de inundação, conforme RESOLUÇÃO CONAMA N.° 303 de 20/03/2002;
3-quanto aos efluentes líquidos:
3.1-a empresa está sendo incluída no Sistema de Automonitoramento de Atividades Poluidora – SISAUTO/DICOPI, na classe C, devendo realizar medições e análises de seus efluentes líquidos de acordo com o Art. 15 da Resolução CONSEMA 01, de 15/04/98, e encaminhar as respectivas Planilhas de Acompanhamento de Efluentes Líquidos à FEPAM, de acordo com o Art. 19 da mesma Resolução que segue em anexo; as planilhas deverão ser apresentadas até o 10° dia dos meses de **janeiro, abril, julho e outubro** (a Resolução CONSEMA 01 e as Planilhas de Acompanhamento encontram-se disponíveis na home-page da FEPAM: www.fepam.rs.gov.br, em *Legislação/Resoluções Consema*);
3.2-as Planilhas Mensais de Acompanhamento de Medições, os Laudos de Coleta de Efluentes Líquidos, cujos modelos seguem em anexo, e os Laudos de Análise deverão permanecer arquivados na empresa pelo período de 02 (dois) anos, à disposição da fiscalização da FEPAM;
3.3-a vazão máxima permitida para o lançamento dos efluentes líquidos industriais [illegible] m³/dia;
3.4 [illegible] tratado (os perfis encontram-se disponíveis na home-page da FEPAM: www.fepam.rs.gov.br, em *Licenciamento Ambiental/ Planilhas de Acompanhamento/ Planilhas de Acompanhamento-SISAUTO*). Ressaltamos que o perfil deverá cobrir um mínimo de 24 horas sucessivas;
3.5-o corpo receptor dos efluentes líquidos industriais tratados é o Arroio Barrocão;

Fundação Estadual de Proteção Ambiental Henrique Luís Roessler/RS
Rua. Carlos Chagas, 55 - Fone: *(51) 3225-1528 - FAX: (51) 3212-4151 - CEP 90030-020 - Porto Alegre - RS - Brasil

Figure 12 - Operating License (page 1 of 4)

SECTION G. Stakeholders' comments

G.1. Brief description of the process by which comments by local stakeholders have been invited and compiled

The Brazilian Designated National Authority for the CDM ("*Comissão Interministerial de Mudança Global do Clima*") demands the translation of the PDD into Portuguese, the compulsory invitation of selected local stakeholders, the validation report issued by an authorized DOE (original and translation in Portuguese), under other requirements, in order to provide the letter of approval (according to the CIMGC resolution # 1, September 11, 2003, published in December 2, 2003; available at http://www.mct.gov.br/clima/ingles/cigmc/resolu.htm).

The proponent of the project sent letters to the following stakeholders involved in and affected by the project activity in order to invite their comments while the PDD of the project is open for comments in the validation stage in the United Nations Framework Convention on Climate Change.

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

Invitation letters were sent to above mentioned agents in May 2005 (copies of the letters and post office confirmation of receipt communication are available upon request) and no comment was received. The PDD of the project was open for comments in the validation stage in the United Nations Framework Convention on Climate Change website (http://cdm.unfccc.int/), since anyone had access to the mentioned document from a legitimate source.

G.2. Summary of the comments received

Brazilian DNA for the CDM requests project activities to be open for comments prior to validation. Thus, in addition to UNFCCC global stakeholders' comments process, invitation letters were sent to above mentioned agents in May 2005 (copies of the letters and post office confirmation of receipt communication are available upon request) and no comment was received.

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

Brazilian DNA requests in addition to the UNFCCC global stakeholders' process, that the project participants invite comments from the specific agents mentioned above. The letters were sent in May 2005 (copies of the letters and post office confirmation of receipt communication are available upon request). No comment was received.

ANNEXES

Annex 1 - Contact information on participants in the project activity

Organization:	Piratini Energia S.A.
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URL:	http://www.koblitz.com.br/
Represented by:	
Title:	Director
Salutation:	Mr.
Last name:	Faro
Middle name:	Roberto
First name:	José
Department:	Financial
Personal e-mail:	jrfaro@koblitz.com.br

Annex 2 - Information regarding public funding

No public funding was and will be used in the present project.

Annex 3 - Bibliography

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Annex 4 - Cover and table of contents

Piratini Energia S. A.

Biomass Power Plant Project Activity

Piratini-RS, Brazil

Prepared by Ecoinvest Carbon

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