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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

Santa Fé Small Hydro Plant

Version 01. PDD completed on 27/03/2007.

A.2. Description of the project activity:

The project activity aims to generate clean energy from a run-of-river Small Hydro Plant (SHP) located at *Espírito Santo* state (Southeast of Brazil); an area with a high voltage fluctuation and high transmission losses for the imported energy.

The project activity is carried out by *Energest*[1] - an enterprise that possess investments on electrical power sector and under control of EDP – *Energias de Portugal,* one of the biggest European operators on electrical sector – through generation, commercialization and distribution activities.

The power plant has a yearly energy of 16,614 MWaverage and a current power density[2] of 30.5 W/m^2. As a result of the project activity, an amount of 38,098 tCO2e/year will be displaced from the baseline scenario and, as stated by the CDM Executive Board[3], the GHG emissions from the reservoir are neglected. Besides this significant displacement, it contributes to increase the share of small hydro power generation in the rising thermal power generation scenario in Brazil.

The project activity consists of two dams in two tributaries that form the main river *Itapemirim*, known as *Norte Braço Esquerdo* River and *Norte Braço Direito* River. The first dam, named *Santa Fé Derivação*, situated in *Braço Norte Esquerdo* River, consists in a spill way over the gutter of the river, and the second dam, named *Santa Fé Geração,* consists in a spill way by gravity walls.

Since 1984 there have been several governmental programs to promote the construction of small hydro power plants. The main goal of these programs was to decrease the oil consumption, promote local technology and promote rural development. However the last 20 years, several others programs to promote small hydro power generation were issued[4], small hydro power generation has not substantially increased and in opposition, thermal power generation has been used instead of supplying isolated and rural areas or peak loads for the grid. It is important to mention that the integrated operational management of hydropower system provided for additional optimization and gains in energy production and flood control.

Apart from the well-known positive benefits of the construction (job creation, technology well known), the benefits from the operation of the power plant (income taxes for the municipality) and environmental programs *Energest* is highly engaged on environmental education programs and promotes a wide assistance to the local stakeholders on sustainable development plans), the power plant will decrease the GHGs emissions that would otherwise been emitted under the

[1] *Escelsa was unbundled into two main companies: Energest and Celsa on 13th June 2005.*
[2] *The current reservoir area is 0.95 km*^{2}*.*
[3] *From the EB 23 meeting held at 22 – 24 February 2006. (THRESHOLDS AND CRITERIA FOR THE ELEGIBILITY OF HYDROELECTRIC POWER PLANTS WITH RESERVOIRS AS CDM PROJECT ACTIVITIES).*

[4] *The National program on hydro power plants PNCE (2000) and finally the Proinfa program (2006).*

baseline scenario, while contributing to the local economic development through environmental activities and direct tax income based on the generation activities.

Thus, one of the most important impacts of the registration of the project activity as a CDM project it would be likely the promotion of several small hydro power schemes within the project boundary area, for a region which is highly dependent on energy imports and thermal generation.

A.3. Project participants:

Name of the Party involved	Private and/or public entity (ies) project participants	Kindly indicate if the Party involved whishes to be considered as project participant
Brazil (Host Country)	*Instituto Energias do Brasil* Private entity	No
Brazil (Host Country)	*ENERGEST S.A.* Private entity	No

The owner of the *Santa Fé* SHP Project is *Escelsa/Energest*. The contact for the CDM project activity is *Ecológica Assessoria Ltda.* All contact details are included in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

Espírito Santo State. Southeast Brazil.

A.4.1.3. City/Town/Community etc:

Alegre Municipality.

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

The hydro power plant of *Santa Fé* is located on the *Itapemirm* River in the municipalities of *Itapemirim* to *Alegre*, state of *Espírito Santo*. The physical coordinates are 20° 42' S and 41° 31' W (more detail available in annex 5).

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

The project activity is a grid-connected electricity generation from a renewable energy source (run-of-river small hydropower plant).

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

In agreement with the definition of the Brazilian Electricity Regulatory Agency (ANEEL), small Hydropower Plants in Brazil should have installed capacity larger than 1 MW and less than 30 MW, and should have a reservoir area less than 3 km2. According to Eletrobrás (1999), run-of-river projects are defined as: "a project where the rivers dry season flow rate is the same or higher than the minimum require for the turbines" as it is the case of SHP *Santa Fé*.

The *Santa Fé* Small Hydro Plant *(*SHP *Santa Fé)* employs water from the *Itapemirim* River to generate energy, with a small reservoir of 0.95 km^2 and net head of 62.10 meters. The power station has two Francis hydraulic turbines, with horizontal shaft of Double Rotor and a 14,950 kW of nominal power each, currently processing a nominal water flow in the turbine of 27.6 m^3/s. The power station has two generator units able to supply the existing demand with an average power of 16,614 MW, processing an average water flow of 55.20 m^3/s. The power station is located downstream of the tributaries confluence, specifically in the *Itapemirim* River.

The energy generated will be transported through a transmission line (69 kV and 138kV) that connects the power plant to the substation of *Alegre*. The generator will have an operation/installed capacity of 29 MW. It is estimated that the hydraulic turbine will have an overall yield of 92.8%.

Santa Fé **Small Hydro Power**	
Installed capacity	29 MW
Number of gensets	2
Nominal discharge per turbine	27.6 m^3/s
Inundated area	0.95 km^2
Lenght of derivation pipe	17,000 m
Lenght of generation pipe	10,800 m
Voltage	69/138kV

Table 1. Technical description of the Santa Fé small hydro power.

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

Year	**Annual estimation of emission reductions in tonnes of CO_2equ**
2009	19,039
2010	38,079
2011	38,079
2012	38,079
2013	38,079
2014	38,079
2015	38,079
2016	19,039
Total estimated reductions (tCO_2 equ.)	266,554
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 equ.)	38,079

A.4.5. Public funding of the project activity:

No public financing for the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

The approved consolidated baseline methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 6 (valid from 19 May 06 onwards).The project activity relates to the sectoral scope number 1 "Renewable electricity generation for a grid". The project uses the version 2 of the "Tool for the demonstration and assessment of Additionality".

The project activity has currently a power density of 30.5 W/m^2 and as stated by the CDM Executive Board[5] can use the approved ACM0002 baseline methodology and the project emissions from the reservoir may be neglected.

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

The project activity is grid-connected electricity generation from renewable energy sources with a power density of 30.5 W/m^2 and as stated by the CDM EB[6], the consolidated baseline methodology ACM0002 for grid-connected electricity generation from renewable sources is therefore applicable to the project activity and the project emissions from the reservoir may be neglected.

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

The Brazilian energy market is currently transforming into a wholesale electricity market with a layered dispatch model in order to promote competition. The dispatch model is managed by the ONS, the National Operator System based on the most economic dispatch order at any given time.

In addition, the transmissions lines between geo-electric areas will definitely regulate the dispatch order by allocating first the energy within the geo-electric area where the energy was generated (the least costly option[7]) and then allocating the exceeding energy across others geo-electric areas or sub-markets; Northeast, North, South and Southeast/Central West. These electricity sub-markets must all be considered when defining grid operation and energy dispatch model on the grid operation margin.

For the purpose of determining the build margin (BM) and operating margin's (OM) emission factor, a (regional) electricity system project is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints.

The project boundary defined for the project activity comprises the South/Southeast-Central West sub-system that represents the set of generators that are connected physically to the electricity system where the CDM project activity is connected to and could be dispatched without significant transmission constraints.

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[5] *From the EB 24 meeting held at10 – 1 May 2006, Annex 7 – Revision to approved consolidated methodology ACM0002.*

[6] *From the EB 23 meeting held at 22 – 24 February 2006. (THRESHOLDS AND CRITERIA FOR THE ELEGIBILITY OF HYDROELECTRIC POWER PLANTS WITH RESERVOIRS AS CDM PROJECT ACTIVITIES)*

[7] *The ONS must establish a least-cost planning to determine the mix of loads that would comprise a hypothetical least-cost resource portfolio designed to serve the expected load at the project boundary.*

The table below provides the sources and gases included in the project boundary emitted by the project activity.

	Gas	Source	Included ?	Justification / Explanation
Baseline	CO_2	Emissions from the grid	Yes	The South/ South-East/ Central-East subsystem includes some thermal power plants that emit CO_2.
	CH_4	-	No	Not applicable
	N_20	-	No	Not applicable
Project Activity	CO_2	-	No	The power density of the project is higher than 10W/m2, therefore the project emissions are zero.
	CH_4	-	No	Not applicable
	N_20	-	No	Not applicable

Table 3. Gases included in the project boundary.

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

The baseline scenario is the consumption of electricity from the regional grid which includes non-renewable sources of energy.

For the project activity, regional grid definition is being applied as suggested by the ACM0002 consolidated methodology. The grid boundary definition comprises the South/South East/Central-West sub-system. Electricity transfers from external sub-systems (North and Northeast sub-systems) are considered electricity imports when the energy transfer occurs from the connected electricity system to the project electricity system and electricity transfers to connected electricity systems are defined as electricity exports.

The project activity will physically deliver energy within the project boundary that comprises the South/South East/Central West sub-system. The baseline scenario presents a set of uncertainties related on how the CDM project will influence the operation and development of the interconnected electrical system over time. For this reason, it must be understood how the project will impact upon operations of the electrical grid and its impact upon capacity addictions.

The Brazilian electrical grid is currently based on a mix of energy power sources where the low cost and must run resources are working at the baseload and are represented by large hydro power plants. The baseload capacity is of 83.92 %[8] of the total installed power. The energy mix is balanced by intermediate operation mode power plants working with a typical capacity factor around 30% (combined cycle based on Natural gas, Nuclear and at some extend coal) representing the 8.7% of the total installed capacity. Finally, the power plants based on combustion turbines are working at the peak load and dispatched depending upon the forecasted demand. These power plants have low capacity factors and high operation marginal cost (Diesel Oil, Fuel Oil and black liquor and others).

In order to balance the type of energy generation and decrease the risk associated to the weather uncertainties, the Ministry of Mines and Energy (MME)[1] foresees for the period (2006-2023) an

[8] *Brazilian installed capacity. Ministry of Mines and Energy (MME) at its Decennial expansion plan 2006-2015. MME 2006.*

increasing share of thermal power plants on the energy matrix based on combined cycle (+297%), coal generation (+300%), Nuclear power generation (+150%) and a decrease on the share of large hydro power plants (-15%). The values are based on a scenario with a difference of 5% between the energy demand and the energy offer. Under a scenario[9] with increasing energy demand, the CDM project activity will affect likely impact on the size of the planned capacity additions or timing (deferral) of similar dispatch mode power plants. One way the CDM project would impact the future near-term capacity additions is based on the operating mode.

The timing of a project can also influence the appropriate weights to use for a combined margin calculation. The lead time for new electric capacity additions are relevant to the weighting of OM and BM on the way on what point in time the OM[10] value would switch to BM.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

This chapter is constructed based on the document: “Annex 1 – Tool for the demonstration and assessment of additionality” as defined from the Sixteenth Meeting of the Executive Board.

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

Not applicable, since the project activity will not require crediting period prior to CDM registration.

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

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

Definition of possible/potential alternatives to the project activity:

1.-Do not implement any project activity. (Continuation of the current situation, where no project activity or alternatives are undertaken).

The project developer (*Energest-ENBR*) had either the possibility to invest on projects with a more attractive return (i.e. energy distribution activities) or to invest on the distribution company at the time of project implementation. At the time of the SHP internal proposal, the project developer was more interested on the distribution business due to the increasing opportunities on the energy market for the distribution companies. Even with some investments done in the generation area, the core business of the company still in the distribution and not on the generation, the project activities on the generation side could compete on resources with similar projects on the distribution side.

2. - Implementation of the project without CDM assistance.

In the year 2003, *Energest* was considered, by the Brazilian energy regulatory market, as a public service company where the generation activities from the facility were considered as a public service. For such type of activities, the ANEEL (National electricity agency) defined that any new generation unit from *Energest* will be granted not by the generated energy but a previously defined WACC (Weighted Average Cost of Capital).The calculation of the WACC established by the ANEEL for such generation actives is calculated based on the O&M cost of

[9] *The MME forecasts a yearly increase on the energy demand between 4% and 6% (Low and high consumption scenario).*
[10] *OM is here understood as operation margins and BM the build margins.*

the all generation activities, depreciation of the generation assets and remuneration based on the fixed assets.

In 2001, ANEEL established the resolution nº 482, on November, 12, which said that *Escelsa* holds the exploration of the hydro potential of the *Santa Fé* Small Hydro Power Plant and determined the starting date of the commercial operation on September, 29 in 2004.

The standard average cost for such power plants in Brazil, based on similar power characteristics and outside of the governmental subsidies of Proinfa is around of U$D 1.2 Million/MW installed[11], where the project activity has a total value of U$D 1.66 Million/MW installed.

Basically for the case of the *PCH Santa Fé,* the financial return established by the Brazilian regulation is based on the energy generation, through the return on the investment capital (rentability) defined by the MWh generated, the return on the O&M cost plus sectorial taxes (wheeling fees, connexion cost, etc). Furthermore the energy generated by the power plant will go for a public bid with a maximal price based on the nominal value (VN).

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

The alternatives identified are all in compliance with all applicable legal and regulatory requirements.

Step 2. Investment analysis.

The CDM project generates financial or economic benefits other than CDM related income, and then the benchmark analysis (Option III) is applied.

Sub-step 2b – Option III. Apply benchmark analysis.

The most appropriate financial indicator for this project type (as defined at the *Tool for the demonstration and assessment of additionality, Sub-step 2b, Option III)* is the Internal Rate of Return (IRR) since it represents the more straight forward and understandable method in capital budgeting and decision context. The selected benchmark value is defined by the company internal benchmark or WACC representing the expected return on all of a company's securities.

The benchmark here used (weighted average capital cost of the company) represents a value extensively used by *Energest* to represent the minimum standard internal return, which is composed mainly by the RRR (required rate of return) plus a country risk linked to the cost of capital.

WACC is calculated by multiplying the cost of each capital component by its proportional weight and then summing:

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - Tc)$$

Where:
Re = cost of equity
Rd = cost of debt
E = market value of the firm's equity
D = market value of the firm's debt

[11] *Source:* http://www.unicamp.br/unicamp/unicamp_hoje/ju/julho2004/ju259pag4a.html

V = E + D
E/V = percentage of financing that is equity
D/V = percentage of financing that is debt
Tc = corporate tax rate

The benchmark used by Energest for the year 2007 (at the time of the decision of starting the construction activities) was of 15%.

Alternately and in addition to the company internal benchmark it could also be used as a benchmark, the project IRR from a similar financial option as the investment for the project activity found at the Brazilian financial market which are the government bond rates. The Brazilian financial market is for all accounts one of the most liquid and sophisticated among emerging markets, offering a wide range of debt instruments (fixed-rate, floating-rate and inflation linked bonds). Federal bonds come with fixed nominal rates (LTN and NTN-F) and floating-rates (LFT), as well as with principal linked to the price index (NTN-C linked to the IGP-M).

The selected benchmark for the project activity are the NTN-C, National Treasury Notes – C series bonds which yields are linked to variation of the General Price Index - *IGP-M* (estimated in 2007 of 4.1%), along with the interest defined upon purchase (9.03 % at present time[12], 8.42% in 2005). Moreover, a foreigner investor will consider an increase in the expected return due to the country risk (today estimated around 2.5% to 3%[13]). This type of treasury notes has a fixed payment every six months (in the form of interest) for a life span of 20 years, ideal for medium a long term investments.

Sub-step 2c.Calculation and comparison of financial indicators.

For the project activity the IRR is calculated, with and without the CDM related income, based on the available data for the year 2007, the investment scenario, the energy prices and the expected return on this year.

For the project activity the IRR is calculated based on the new values for the EPC for the year 2007 based on a total investment of R$ 103.953 Millions (USD 48.350 Millions). Here below the table with the IRR values with & without the CDM related income.

Unit	IRR Value
IRR for the *PCH Santa Fé* project without CDM.	11.92 %
IRR for the *PCH Santa Fé* project with CDM[14]	12.42 %
Differential (with & without CDM)	0.5 %
Company Internal Benchmark (WACC @ 2007)	15 %
Benchmark (NTC-C, National Treasury Notes @ 2007 [15])	8 % + 8.42 % = 16.42 %

Table 4. IRR variation with/without the CDM related income. (Source: Single parameters were provided by the project developer).

The project financial cash flow is defined as follows in the table below. The lead time for the project activity implementation is of three years (starting operation scheduled for 2009).

The following assumptions were taken in consideration for the analysis:

- An expected annual average of IGP-M based on 4.1% (2007).
- The expected energy output is of 145,416 MWh per year. The installed power is estimated on 29 MW and 16.614 MWmed assured.

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[12] *Source: http://www.tesouro.fazenda.gov.br/tesouro_direto/download/rentabilidade.pdf*
[13] *Source: EMBI Brazil + JP Morgan index.*
[14] *Initial USD/tCO2equ: 10 USD/tCO2equ.*
[15] *Source: http://www.tesouro.fazenda.gov.br/tesouro_direto/estatisticas/historico.asp*

- EPC (93% of the total investment).
- Generation fee granted by *ANEEL* on R$ 124.99.
- Financing tax (3.5 %), depreciation (2.5%) and tax on the invoicing (3.65%).
- Construction, O&M costs, wheeling fees (*CUST*) and grid connection fees.
- CDM consulting fees and transaction cost. The CERs issuance fee as well as the validation and the annual verification fees have not been included in the cost presented at the cash flow.

The cash flow analysis for the project activity with the CDM related income and the project activity financial assumptions are detailed on Annex 3.

Sub-step 2d. Sensitivity analysis.

There are three variables here analyzed for the sensitivity scenario to check the robustness of the conclusion given at the sub-step 2b: the energy tariff, the investment cost and the CERs revenue. The O&M cost are totally internalized and therefore likely under control.

Energy tariff (Δ + 25%):

Company Internal Benchmark (WACC in 2005)	**15 %**
Energy tariff – Base case: R$ 125 (US$ 58.14)[16]	**IRR Value**
IRR for the *PCH Santa Fé* power plant	11.92 %
Energy tariff : R$137 (US$ 63.72)	**IRR Value**
IRR for the *PCH Santa Fé* power plant	13,35%
Energy tariff: R$150 (US$ 69.77)	**IRR Value**
IRR for the *PCH Santa Fé* power plant	14,84%

Table 5. Sensitivity analysis for the variation of the energy tariff. (Source: Single parameters were provided by the project developer).

Energy generated:

The return of the investment and the generation cost will be directly affected by the amount of generated energy. The variation on the energy represents a more realistic approach than considering alone the operation cost (which may be in fact internalized by the company). There are mainly two factors affecting the generation cost; the technical O&M cost and the financial cost associated to the project, thus affecting the project cash flow:

- Environmental factors such as the hydrological expected flow which would directly affect the amount of energy generated. The ANEEL establishes the calculation parameters to calculate the average energy that the power plant will generate and therefore classified under the ANEEL registry. The calculations are based on a minimum period of 30 years, the expected time off that the power plant would be under Operation and Maintenance operations and the generator efficiency. Therefore, the expected energy is likely to be quite unchangeable from the case base.

- The financial perspective of those that commission the projects, (what rate of return is required on the capital, amortization and the length of time over which the capital has to be repaid).

[16] *USD 1 = R$ 2.15 in 2007.*

Therefore several possible scenarios are here analyzed.

Company Internal Benchmark (WACC)	**15 %**
MWaverage* (Base Case) : 16.60 *MWaverage	**IRR Value**
IRR for the *PCH Santa Fé* power plant (BASE CASE)	11.92 %
MWaverage*: 15.60 *MWaverage	**IRR Value**
IRR for the *PCH Santa Fé* power plant	11.00 %
MWaverage*: 17.60 *MWaverage	**IRR Value**
IRR for the *PCH Santa Fé* power plant	12.82 %
MWaverage*: 18.60 *MWaverage	**IRR Value**
IRR for the *PCH Santa Fé* power plant	13.70 %

Table 6. Variation on the investment cost. (Source: Single parameters were provided by the project developer).

CERs related income variation:

CERs related income variation		**IRR Value**
Base case		11.92 %
IRR value with CDM	10,00 USD/tCO2equ.	12.32 %
IRR value with CDM	11,25 USD/tCO2equ.	12.37 %
IRR value with CDM	12,50 USD/tCO2equ.	12.42 %
IRR value with CDM	15,00 USD/tCO2equ.	12.52 %
IRR value with CDM	18,75 USD/tCO2equ.	12.68 %

Table 7.Variation on the price for CERs. (Source: Single parameters were provided by the project developer).

By analyzing the comparative tables above, under any project scenario the value of the IRR is always lower than the WACC, the internal benchmark applied by the company. Therefore regardless how the market may increase the energy tariff (market performance) within a realistic price band (linked to the *IGP-M*) and how the generated energy may change, the project activity is unlikely to be the most financially attractive option as stated in the sensitivity analysis and therefore additional.

Step 3. Barrier analysis

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

The following barriers were here considered:

(a) Investment Barrier and energy market regulatory uncertainties (From 2000 to July 2005).

At the energy scenario in 1990's where the state owned facilities defined the investments on new generation units up to July 2005 where the Brazilian market was designed as a wholesale electricity market with a layered dispatch model and separation between activities (energy generation, distribution and commercialization); the Brazilian energy sector was flooded with a set of regulatory uncertainties, power shortage and macroeconomic instability that definitively paved the way for new opportunities in the energy distribution and the energy market.

The new regulations were based on the following basis:

- Total separation on the activities of generation, transmission and distribution.
- Fee for service approach for the transmission lines access and connection to the energy grid.
- The distribution companies will have to contract 100% of their expected electricity demand over a period of 3 to 5 years; the contracts will be coordinated through a "Pool"

with maximum tariff price established by the *ANEEL*. 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. These measures should reduce market volatility and allow distribution companies to better estimate market size.

- The generation utilities will be dispatched according to the least cost options available at each sub-market being managed by a regional office, comprising four operational and dispatch offices for the different geo-electric areas: Northeast, North, South and Southeast/Central.

Within the new energy sector regulation, the generation facilities were separated between independent producer and as a public concession producer. The category of independent producer was granted based exclusively on the MWh generated and the public concession producer could not be granted by MWh but just to offset the captive generation of the company.

In the year 2003 due to the increasing opportunities on the energy market for the project developer, the core business of the company was in the distribution and not on generation activities, therefore the project activities on the generation side had to compete on resources with similar projects on the distribution side. As a result between 2001 and the second semester of 2003 no new investments on generation units were undertaken. The result of the previous meant that many small and medium hydro power plants were not attractive enough for the investors, which in turn would invest on lower risk project portfolio. As stated here, the project activity had to overcome with the company internal financial barriers (internal benchmark) and the uncertainties due to the new regulation market.

(b) Prevailing Business Practice

Under a likely power shortage on the year 2000, the federal government launched in the beginning of this year the Thermoelectric Priority Plan[17] being originally planned 17,500 MW (47 thermo plants) of new thermal capacity by December of 2003, yet at the beginning of 2002 the installed power was reduced to 13,637 MW (40 thermo plants)[18].During the power shortage scenario, the Brazilian government increased drastically the share of the thermal capacity[19] and defined a set of back up thermal units in order to cover the immediate peak energy demand to ensure a low risk operation profile for each energy sub-system. One of the most important issues of the thermal plan is that the distribution company has a *take-or-pay* contract with the thermal generation company. Rationing was lifted at end-February 2002. As consequence of this, the industry reduced the waste of energy by replacing gensets and appliances by more cost-efficient substitutes. This persistent reduction in demand, coupled with the increase in installed capacity after 2001, created excess supply in the market, adversely affecting generators and some specific distribution companies at the middle of the year 2003.

Nowadays the thermal power generation has turned out strategy for the economic development in Brazil, since large reserves of natural gas have been discovered at the *Santos* basin[20]. As consequence of this, the Ministry of Mines and Energy (MME)[21] foresees for decennial period 2006-2015, an increasing share of thermal power plants on the energy matrix[22] based on

[17] *Federal Decree 3,371 of February 24th, 2000, and Ministry of Mines and Energy Directive 43 of February 25th, 2000.*

[18] *Federal Law 10,438 of April 26th, 2002, Article 29.*

[19] *Emergency Energy Program based on a total of 2,150 MW (58 small to medium thermal power plants) until by end of 2002 (using mainly diesel oil, 76,9 %, and residual fuel oil, 21.1 %).*

[20] *The MME foresees the implementation of a gas pipeline from the South to the Northeast to be finished at the end of 2006. The GASENE gas pipeline will deliver more than 20 Millions Nm^3 of natural gas per day.*

[21] *Brazilian installed capacity. Ministry of Mines and Energy (MME) at its Decennial expansion plan 2006-2015. MME 2006.*

[22] *Clearly, new additions to Brazil's electricity power sector are shifting from hydro to natural gas plants (Schaeffer et al., 2000).*

combined cycle (+297%), coal generation (+300%), Nuclear power generation (+150%) and a decrease on the share of large hydro power plants (-15%).

Under such circumstances, many large pipe networks are being concluded for the next 5 to 10 years (The *GASENE* gas pipeline (Northeast-Southeast) will deliver more than 20 Millions Nm^3 of natural gas per day at the end of 2006) and it is expected to increase the thermal power generation at the near future.

On the other hand, the *Proinfa*[23] was created in 2002 by Law 10.438 with the specific purpose of promoting the use of alternative renewable energy sources (wind, biomass and small-hydro plants) and diversifying the Brazilian energy matrix. In its first phase, the *Proinfa* foresaw the implementation of 3.300 MW of installed capacity, with operations beginning at latest in December 2008. The PPA (power purchase agreement) is secured by *Centrais Elétricas Brasileiras SA – Eletrobrás* – the utility company designated to assist the Brazilian Government in achieving the National Policy's objectives. As stated by Decree 5.025/2004[24], the *Proinfa* was designed not only to increase the participation of alternative renewable energy sources in the Brazilian energy matrix, but also to boost projects in accordance with the legal regime established by the Kyoto Protocol and the United Nations Framework Convention on Climate Change (UNFCCC), strengthening the Country's engagement in contributing to GHG emission reductions.

As stated before, the project activity is not currently under the Proinfa program. Moreover the fact that the *Proinfa* grants with an energy tariff higher than the one get by the project activity[25] shows how the small power plants need incentives and lower risk investment environment to promote clean and rural energy generation.

The previous shows that such barriers prevented the development of this type of project activity (small hydro power plants development) and alternatively promote the investment on thermal generation sources.

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

As described previously, the main alternative is the continuation of the current situation, where no project activity or alternatives are undertaken. Under such scenario the project developer would have invest the capital on the distribution facility or other investment opportunities abroad.

Step 4. Common practice analysis.

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

There are others similar activities than the project activity observed within the same region/state and operating under similar market conditions and similar technical characteristics (here understood as the regional grid, similar age power plants, rated power, power density and hydro power technology).

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23 *Moreover, the Executive Board also specified that Type E- national and sectorial policies "may not be taken into account in developing a baseline scenario" when such national and sectorial policies have been implemented after the adoption of the CDM M&P in decision 17/CP17 (November 11, 2001). Accordingly, the projects undertaken under the Proinfa program are not considered in the baseline scenario since the program is considered additional.*

24 *Article 5 of Decre*e 5.025, *from March 30, 2004.*

25 *In the year 2005, the PPA based on the Proinfa program was of R$ 132/MWh and R$ 127 /MWh for the project activity.*

Regarding similar activities identified at the project activity region/state under similar technical characteristics (installed power, economic environment, regulations and power density, similar technology) and taking place under similar market characteristics (independent energy producer) the projects identified under such scenario, are the following:

- *UHE Suíça* large hydro power plant.
- *Rio Bonito* small hydro power plant.
- *PCH Aparecida* small hydro power plant.
- *São Domingos* small hydro power plant.
- *PCH Mangaraviti* small hydro power plant.
- *UHE Salto Rio verdinho* large hydro power plant.
- *PCH Rio preto* mini power plant scheme.

1.-UHE Suíça large hydro power plant.

The power plant is placed at the *Espírito Santo* state; currently operating and accessing to the same power grid as the project activity, within the same project boundary. The power plant has an installed power of 30.06 MW and started operation in the year 1965.

The power plant may improve both the efficiency and increase the installed power of the power plants, up to date there are no economic means to improve the efficiency of the power generators, the reason for this is that halting the power plant will lead to higher economic losses than improve the generator efficiency. Under the current energy regulatory market, the power plant is considered as an autonomous power producer, the MWh of energy generated will be sold in the energy pool with a maximum price for the generated energy which is defined by the *ANEEL*. The nominal value considered by the *ANEEL* for former public concessions, the case of *UHE Suíça*, calculates the energy tariff based on the generation cost minus the depreciation cost that *ANEEL* considered as already abated for old utilities.

As consequence of this, the investment on resizing and/or power upgrading project on the *UHE Suíça* is not at all attractive.

2.-Rio Bonito small hydro power plant.

The power plant is placed at the *Espírito Santo* state; currently operating and accessing to the same power grid as the project activity, within the same project boundary. The power plant has an installed power of 16.8 MW and started operation in the year 1959. Several technical actions may be taken to upgrade and improve the efficiency of the power plant, such as replace generation units, increase the Kaplan turbines efficiency (blades, automatic pitch control) and to increase the efficiency on the electrical installations (transformers, transmission lines, etc).

Again, the Brazilian energy regulations considered the power plant operating under a public concession regime, so the energy generation is granted by a nominal value lower than for new generation utilities. Under such investment and operation scenario, the same as the project activity, there are no economic means to improve the efficiency of the power plant so the project is not economically feasible.

3. - PCH Aparecida small hydro power plant.

The power plant is also placed at the *Espírito Santo* state and has an installed power of 480 KW; the small hydro scheme started operations on the year 1919 and was deactivated in 1993 since the operation of the power plant had no economical sense.

Conservatively speaking its estimated that only in Brazil there are around 1,500 small hydro units (SHP) in unknown situation or deactivated, mainly off-grid and placed on rural areas. Since the 70's the Brazilian government promoted large hydro power plants in order to optimise the investment cost, leaving aside small hydro power schemes mainly located in remote areas , far from the consumption centres where the investment on transmission capacity and O&M cost where too high[26].

The improvements that may be undertaken at the power plant consider the replacement of the electro-technical and hydro-mechanical equipments and the installation of control protection and auxiliary equipment, where the technology is well known and may be manufacture in Brazil. The IRR of the power plant is of 13.93%, however the higher IRR value than the project activity IRR, the power plant is deactivated since it does not present attractiveness for investors and it is more attractive to invest on new generation facilities.

4. - São Domingos small hydro power plant.

The power plant has a rated power of 48 MW or 35.04 MWaverage. It would have a plant efficiency of 73% and will generate a total energy of 306.905 GWh/year. With a total investment cost is of R$ 90 Millions (U$D 42.25 Millions), the IRR of the project is of 9.6%. The project developer did not consider attractive enough to invest in the power plant besides the high plant efficiency.

5. - PCH Mangaraviti small hydro power plant.

Between the year 2002 and 2003 the project developer analyzed the power plant *PCH Mangaraviti.* The hydro power scheme has a rated power of 3 MW with a potential energy generation of 10,655 GWh/year. With a total investment cost is of R$ 4.3 Millions (U$D 2.02 Millions), the IRR of the project is of 13.41%. Under such investment scenario, the project developer did not consider the power plant attractive enough to invest.

6. - UHE Salto Rio Verdinho large hydro power plant.

Several feasibility studies were carried out for the large hydro power plant of *Rio Verdinho.* With an installed power of 93 MW or 61 MWaverage the total estimated investment was of R$ 90 Millions (U$D 42.25 Millions), the IRR was about 11.23%, clearly below of the internal company benchmark here used (weighted average capital cost of the company) in the year 2002 (14.72%). As a benchmark the company considered the investment as not attractive enough to implement the project activity.

7. - PCH Rio Preto mini power plant scheme.

The mini hydro power plant of 770 KW would take advantage of the *Rio preto* river natural characteristics to implement a small scheme hydro power plant with very low environmental impact. The small power plant was analyzed in the year 2004 and further feasibility studies carried out. The total investment value was defined on R$ 2.2 Millions (U$D 1 Million) and the

[26] *Large hydro 88% of the installed power vs. 1% of the installed power for small hydro schemes. Source: decennial expansion plan, Ministry of Mines and Energy.*

IRR was about 11.26%. Again the project developer did not consider the investment attractive enough to implement the small power plant.

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

The main reason of similar project activities for do not implement a hydro power plant is the low investment attractive of those projects. The *Santa Fé* Hydro Power plant aims to achieve the financial barrier by CERs incomes and considering the demand due to energy deficit of around 85-90% at the project area.

Step 5. Impact of CDM registration

As explained previously in the Step 2, the project activity does not represent an attractive asset to invest and may be understood as not in the business-as-usual scenario in a country where large hydro power plant and thermal fossil fuel projects are preferable.

Despite the fact that the small hydro power generation is a clean source of energy with low environmental impacts and the fact that the project activity reduces the transmission losses of energy from distant states, the registration of the proposed project activity will have a stronger impact on the feasibility of similar projects (type, technology and market) as those ones defined in the *Sub-step 4b*.

As shown at the *Sub-step 4b*, similar project developers may use the CDM related income to overcome the risk associated to the low project activity IRR, thus more important when reducing the high up front cost of the project activity and therefore the necessary capital cost.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

<u>Baseline</u>

For the baseline determination, project participants shall only account CO2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity. Therefore, the **annual baseline emissions (BE_y)** use the Combined Margin (CM) approach to calculate the baseline scenario emissions. The annual baseline emissions (BE_y) is the result of the annual net electricity generated from the Project (EG_y) times the yearly baseline emission factor (EF_y).

$$BE_y = EG_y * EF_y \quad \textbf{Equation 1}$$

EG_y *(MWh/year)* = The generation of the project activity.

EF_y*(tCO_2MWh)*= Weighted average emissions per electricity unit within the electrical system.

From ACM0002 baseline methodology establishes the baseline emission factor (EF_y) is based on the combined margin (*CM*) approach, consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors according to the following three steps:

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

Dispatch data analysis should be the first methodological choice. Where this option is not selected project participants shall justify why and may use the simple OM, the simple adjusted OM or the average emission rate method taking into account the provisions outlined hereafter.

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

$$EF_{OM,\ Simple\ Adjusted,\ y} = (1-\lambda_y)\cdot\frac{\sum_{i,j} F_{i,j,y}\cdot COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y\cdot\frac{\sum_{i,k} F_{i,k,y}\cdot COEF_{i.k}}{\sum_k GEN_{k,y}} \quad \textbf{Equation 2}$$

Where:

- λ_y is the share of hours in year *y,* for which low-cost/must-run sources are on the margin.
- $\sum_{i,j} F_{i,j,y}$ is the amount of fuel *i* (mass or volume unit) consumed by relevant power sources *j*
- $COEF_{i,j}$ is the CO_2e coefficient of fuel *i* (tCO_2e/mass or volume unit of the fuel), taking into account the carbon dioxide equivalent emission potential of the fuels used by relevant power sources *j* (analogous for sources *k*) and the percent oxidation of the fuel in year(s); and
- $\sum_j GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j* (analogous for sources *k*).

For the project activity, the low operating cost and must run resources typically include large hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. Therefore the emission factor for low-cost/must-run resources can reasonably be: $EF\ OM_{,y} = 0$.

The non-low-cost/must run sources for the project activity are thermal power plants burning coal, fuel oil, natural gas and diesel oil.

The most recent numbers for the interconnected S-SE-CO system were obtained from the Brazilian national dispatch center (ONS) in the form of daily consolidated reports. The load duration curves and energy demand for the project boundary of the project activity are given in Annex III.

In order to calculate the Operating Margin (OM) emission factor, the project boundary has to be modelled with electricity imports from other geo-electric systems to describe, as close as possible, the baseline situation. The ideal approach is to determine the impact of electricity imports on the "merit order" operation margin. This approach is true when dispatch merit of the external grid power sources are clearly known based on reliable data[27], if not the average emission rate of the exporting grid will be used otherwise.

For the project activity, the electricity imports from the North sub-system are based on hydro power generation operating at the system baseload. The previous means that the implementation of the project activity will not have any displacement effect on the energy provided by this low-cost/ must-run source that will anyway operate at the baseload.

On the other hand, the imports from the Northeast subsystem are composed by a mix of generation (thermal combined cycle, thermal combustion turbine and hydro power) with a dispatch model based on bilateral contracts and/or energy bids.

The methodology for the emissions factor calculation is based on the *Simple Adjusted OM*. In order to define plot the Load Duration Curve, data were sourced from the ONS for the years 2003, 2004 and 2005. In order to separate low-cost/must-run power sources and other power sources, the ANEEL[28] (National electricity agency) database was consulted (see annex 3 for more information).

- **STEP 2.** Calculate the Build Margin emission factor ($EFBM_{,y}$) as the generation-weighted average emission factor ($tCO2/MWh$) of a sample of power plants *m*.

For the purpose of determining the Build Margin (BM) emission factor, the spatial extent is limited to the project boundary since recent or likely future additions to the transmission capacity are not meaningful regarding the amount of imported electricity vs. generated energy at the project electricity system.

The sample group *m* consists of either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Power plant capacity additions registered as CDM project activities should be excluded from the sample group *m*.

$$EF\_BM_y = \frac{\sum_{i,m} F_{i,m,y}.COEF_{i,m}}{\sum_m GEN_{m,y}}$$ ***Equation 3***

- **STEP 3.** The **baseline emission factor (EF_y)** is a weighted average of the EF_OM_y (operating margin carbon emissions factor) and the EF_BM_y (build margin carbon emissions factor).

$$EF_y = (\omega_{BM} * EF\_BM_y) + (\omega_{OM} * EF\_OM_y)$$ ***Equation 4***

Where:

$\omega_{OM} = \omega_{BM} = 0.5$ *as defined at the baseline methodology ACM0002.*

[27] *The grid operator (ONS) must provide enough data to identify such marginal plant(s).*

[28] *Available in:* www.aneel.gov.br

The baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y in MWh), as follows:

$BE_y = EG_y * EF_y$	***Equation 5***

Leakage

The leakage and the emissions from the project activity are equal to zero. The main emissions giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation. No sources of leakage were identified for the project activity.

Project Emissions

The EB 23 report at its Annex 5, page 1, establishes the threshold and criteria for the eligibility of hydropower plants with reservoirs as CDM project activity.. According to methodology ACM0002, the project emissions (PEy) from the reservoir may be neglected if the power density is greater than 10W/m2. The installed capacity for the *Santa Fé* power plant is of 29 MW where the flooded area is equal to 0.95 km2. The previous figures give a current power density of 30.5 W/m2 and therefore the project emissions can be neglected

Emission Reductions

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction ER_y by the project activity during a given year y will be calculated *ex-ante* and will be provided by the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

$ER_y = BE_y - PE_y - Ly$	***Equation 6***

For the project activity, $PE_y = Ly = 0$.

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

Data / Parameter:	**EF**
Data unit:	tCO_2equ/MWh
Description:	CO_2 emission factor for the grid
Source of data used:	Data obtained from ONS (National Operator System) and calculated according to methodology ACM0002 (version 06). The emissions factors of Revised IPCC Guidelines for National Greenhouse Gas inventories were used.
Value applied:	0.262
Justification of the choice of data or description of measurement methods and procedures actually applied :	The baseline emission factor (EF_y) is calculated as the weighted average of the combination of operating margin (*OM*) and build margin (*BM*) factors. It will be calculated *ex-ante.*

Data / Parameter:	**EF_OM_y**
Data unit:	tCO_2equ/MWh
Description:	CO_2 Operating Margin emission factor for South East/ Central West and South system
Source of data used:	Data obtained from ONS (National Operator System) and calculated according to methodology ACM0002 (version 06). The emissions factors and oxidation factor were obtained from Revised IPCC Guidelines for National Greenhouse Gas Inventories. The net calorific value (energy content) obtained from the country specific values.
Value applied:	0.413 (Average of the years 2003, 2004 and 2005)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002. It will be calculated *ex-ante*.

Data / Parameter:	**EF_BM_y**
Data unit:	tCO_2equ/MWh
Description:	CO_2 Build Margin emission factor for South East/ Central West and South system
Source of data used:	Data obtained from ONS (National Operator System), SIESE and ANEEL. It calculated according to methodology ACM0002 (version 06). The emissions factors and oxidation factor were obtained from Revised IPCC Guidelines for National Greenhouse Gas inventories. The net calorific value (energy content) were obtained from the country specific values.
Value applied:	0.11
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002. EF_BMy was calculated *ex-ante* for a sample group *m* consists of the five power plants that have been built most recently and actually on operation

Data / Parameter:	**$F_{i,y}$**
Data unit:	Mass or volume
Description:	Fuel quantity
Source of data used:	Obtained from SIESE 2002, 2003, 2004. (National Energy statistics).
Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002

Data / Parameter:	$COEF_i$
Data unit:	tCO_2 /mass
Description:	CO_2 emission coefficient of each fuel type i
Source of data used:	Revised IPCC Guidelines for National Greenhouse gas Inventories 1996
Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002

Data / Parameter:	$GEN_{j/k/n,y}$
Data unit:	MWh/y
Description:	Electricity generation of each power source / plant j, k or n
Source of data used:	Obtained from CCEE (Monthly Energy Generation).
Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002

Data / Parameter:	Plant name
Data unit:	Text
Description:	Identification of power source / plant for the OM
Source of data used:	Obtained from ONS (National Operator System)
Value applied:	Please refer to table 11 and 12 provided in annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002

Data / Parameter:	Plant name
Data unit:	Text
Description:	Identification of power source/ plant for the BM
Source of data used:	Obtained from ONS (National Operator System)
Value applied:	Please see table 9 provided in B.6.3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002. Comprise the five most recently built plants, which comprise the larger annual generation compared to the recently built 20%.

Data / Parameter:	λ_y

Data unit:	Dimensionless Number
Description:	Fraction of time during which low-cost/ must-run sources are on the margin
Source of data used:	Calculated according to data provided by ONS
Value applied:	λ_{2003}= 0.530, λ_{2004}=0.504, λ_{2005}=0. 513
Justification of the choice of data or description of measurement methods and procedures actually applied :	Factor accounting for number of hours per year during which low-cost/must-run sources are on the margin. $$\lambda_y = \frac{hours\ per\ year\ for\ which\ low-cost \backslash mus-run\ sources\ are\ on\ margin}{8760\ hours\ per\ year}$$

Data / Parameter:	**$GEN_{j,k,ll,y\ imports}$**
Data unit:	MWh
Description:	Amount of electricity imported
Source of data used:	Obtained from ONS (National Operator System)
Value applied:	Variable.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Mandatory under methodology ACM0002.

B.6.3 Ex-ante calculation of emission reductions:

The operating margin for the project boundary is calculated *ex- ante* using the full generation-weighted average for the most recent 3 years. The amount of fuel consumption for thermal generation for the project boundary is available for 2003, 2004 and 2005 (last year availability of the data). The average *EF_OMy* for the project activity is 0.413 (kg CO_2equ/kWh). At the table 10 below the values are given.

Data Vintage	EF_Omy (kg CO_2equ/kWh)
2003	0.41
2004	0.38
2005	0.45

Table 8. Values of EF_OMy

The build margin approach aims to make a "best guess" on the type of power generation facility that would have otherwise been built, in the absence of the GHG mitigation project.

As noted by *Kartha et al.*,[29] even in well-planned electricity systems, it is not easy to determine the timing and type of new electricity capacity additions. For the project activity the most recent data based on historical capacity additions are provided through the NOS.

[29] *Martina Bosi: Road-Testing Baselines for Greenhouse Gas Mitigation Projects in the Electric Power Sector (OECD and IEA Information Paper COM/ENV/EPOC/IEA/SLT(2002)6). Outubro de 2002. Disponível em: http://www.oecd.org/dataoecd/45/54/2766208.pdf*

The values for energy generation are defined through the wholesale electricity market operator (CCEE) and where data are not available, default values for the Brazilian grid system are defined[30].

The build margin is estimated *ex-ante,* based on the five most recently built plants, which comprise the larger annual generation compared to the recently built 20%, thus they represent the capacity additions to the system. The list of the power plants is given below (Table 9):

Power Plant	Installed Capacity (MW)	Annual Generated Energy (MWh)	Fuel	Operation
Santa Clara	120.168	609,696	Jordão River	31/07/2005
Barra Grande	465.5	3,334,056	Pelotas River	nov/05
Aimorés	330	1,506,720	Doce River	30/07/2005 22/12/2005(L.O)
Ourinhos	44	207,612	Paranapanema River	12/7/2005
TermoRio	793.05	5,210	Natural Gas	mar/06

Table 9. Power plants on the Build Margin. Data Source: NOS (Brazilian grid operator entity) and ANEEL.

Using equation 4, EF_BM_y for the selected plants is 0.11.

Finally, the baseline emission factor *EFy* is calculated as the weighted average of the Operating Margin emission factor (*EF_OMy*) and the Build Margin emission factor *(EF_BMy):*

$$\boldsymbol{EF_y} = (\omega_{BM} * EF\_BM_y) + (\omega_{OM} * EF\_OM_y) = 0.262$$

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

Year	Estimation of project activity emissions	Estimation of baseline emissions (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of overall emission reductions (tonnes of CO2 e)
2009	0	19,039	0	19,039
2010	0	38,079	0	38,079
2011	0	38,079	0	38,079
2012	0	38,079	0	38,079
2013	0	38,079	0	38,079
2014	0	38,079	0	38,079
2015	0	38,079	0	38,079
2016	0	19,039	0	19,039
Total (tonnes of CO2e)	-	266,554	-	266,554

[30] *OECD and IEA Information Paper, Bossi et al (2002).*

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Electricity Generation delivered to grid
Source of data to be used:	Measured by project developer and monitored by the ONS.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	145,416 MWh
Description of measurement methods and procedures to be applied:	It will be recorded hourly and archived in electronic and paper format.
QA/QC procedures to be applied:	Data will be monitored and registered by the project developer. Sales invoices will ensure consistency for the collected data.

B.7.2 Description of the monitoring plan:

The operational structure will be based on a continuous monitoring of the *Net energy generation* delivered to the grid. The further collection, data analysis and records' handling will be managed by the power plant operation staff and the records will be kept on electronic format. The project developer will be responsible for developing the forms, registration formats for data collection and further classification.

The technical team will supervise the project activity based on monitoring spreadsheets, checking those parameters that are necessary in order to calculate the necessary data contained on the consolidated monitoring methodology ACM0002; "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources - Version 6". Furthermore the quality assessment procedures or/and any further technical auditory will be carried out at the project premises by the verification company.

The maintenance structure will be based on the internal O&M (Operation and Maintenance) staff to guarantee the perfect operation of the electricity meters. The maintenance structure will also ensure that the monitoring equipment is perfectly equilibrated based on the *ANEEL*, *INMETRO*[31], or the equipment manufacturer standards.

The project developer is the only responsible for the operation, direct monitoring and data registration. Also the project developer will ensure enough human and material resources for the accomplishment of the activities within the monitoring plan.

[31] *Brazilian institute for metrology and calibration*

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

The baseline study for the project activity and monitoring methodology were completed on 23/03/2007 by *Ecológica Assessoria*, which is not a project participant. Below, the name of person and entity determining the baseline:

Name of person/Organization	Project Participant
Magno Maciel Ecológica Assessoria Ltda. São Paulo, Brazil. Tel: +55 11 5083 3252 Fax: +55 11 5083 8442 e-mail: magno@ecologica.ws WWW: www.ecologica.ws	NO

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/01/2009

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

30 years – 0m.

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

The CDM project activity will use a renewable crediting period.

C.2.1. Renewable crediting period

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

01/07/2009

C.2.1.2. Length of the first crediting period:

7 years – 0 m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The National Environmental Policy (*PNMA*), instituted by the Law 6.938/81, has the purpose of preservation, improvement and recovery of the environmental quality, with the intention to assure conditions to the social-economic development and the protection to human dignity in the country. The *PNMA* requires previous environmental licenses for the assessment of environmental impacts, and/or other activities that uses environmental resources such as construction, installation and potentially polluting activities or able to cause environmental degradation. The environmental licenses was receipted by Federal Constitution of 1988 and won a constitutional character.

The process of environmental licensing starts with a previous analyses (preliminary studies) of the department of the local environment agency. Later, if the project is considered environmentally viable, the project developer prepares an Environmental Impact Assessment (*EIA*) and respective Environmental Impact Report (*RIMA*) or similar studies.

In the case of the *Santa Fé* small hydro power plant (*PCH*), the Environmental Impact Assessment and the Environmental Impact Report (*EIA/RIMA*) were elaborated as recommendations of *Secretaria de Estado para Assuntos do Meio Ambiente-SEAMA* (State Secretariat for Environmental Subjects). The study evaluates the Environmental Impacts caused and presents the Mitigating Measures and the Environmental Programs to be adopted to minimize the possible negative environmental impacts and increase the positive environmental impacts.

The realized *EIA* for *Santa Fé* small hydro power plant provides the necessary detailed technical studies to identify the environmental impacts and respective mitigating and/or compensatory measures including:

- ✓ Objectives and justifications of the Project;
- ✓ Detailed description of the project;
- ✓ Identification of the areas of influence;
- ✓ Environmental diagnosis of the areas of influence, including the physical, biotical and antropic scene;
- ✓ Identification and Evaluation of the Environmental Impacts;
- ✓ Mitigating and compensatory Measures;
- ✓ Environmental Programs and Plans;
- ✓ Concluding comment of the environmental viability of the project.

The areas of study were divided in Direct Area of Influence, which will suffer a bigger impact due to its implementation, and Indirect Area of Influence as shown in the table below.

Area of Influence		
Environment	Influence	
	Direct	Indirect
Physical-Biotical	Flooded area due to the reservoir increased with a 100 meters band; fragments of reduced water flow, increased with a 50 meters band above the margins; areas of the structures to be implemented.	Hydrographic Basin of the *Itapemirim* River in the upstream of the small hydropower plant
Antropic	Districts of *São João do Norte* and *Anutiba.*	Municipality of Alegre

By the legal definition of ANEEL, Resolution number 652, 9 of December 2003, the *Santa Fé* Plant fits as a small hydro power plant with an installed capacity bigger than 1 MW and up to 30 MW; with a reservoir area less or equal 3 km². The small hydropower plants are projects characterized by the low potential of negative environmental impact and for being considered a clean and sustainable energy source, mainly when compared to other energy sources in expansion on Brazilian energy scenario, such as thermoelectrical, dependent of fossil fuel and GHG senders, and big dams in Amazon region, that provokes a risk for the integrity of one of the most important Brazilian biomes and traditional and aboriginals communities.

The elaboration of an Environmental Control Plan before the project implementation, with a specification of plans and projects to recoup the degraded area, effluent treatment, displacement of solid waste, and others allow the mitigation and prevention of great part of negative environmental impacts.

The realized studies had evidenced that great part of the negative impacts occurs during the phase of the project implementation (76,5%) and 92% of these impacts are temporary. The main permanent negative impacts in the physical and biotical environment are the alterations of the water regimen and the barrier to the species of fishes. For this reason, the *Santa Fé* small hydro power plant will reduce the water flow between the dams and the Power House to the minimum necessary for a great work of the *PCH* and maintenance of the environment, beyond implement the mechanisms that guarantee the reproduction and, consequently, the preservation of the fish population that live in the upstream or downstream of the dam, beyond a monitoring plan of the species of fishes and quality of water.

No longer in a social view, the impacts are the family and infrastructure relocation. However, the use and occupation of the soil in the project area are from small country properties, not related to commerce and services. This way, the project developer is already developing a program of social communication with the preventive nature with the project developer and local communities participation and a relocation program, dispossession and indemnity of families, that will have to guarantee, at least, the reestablishment of the existing conditions of life previously to the relocation program seeking the improvement of the standard of living of affected families.

A social-economic survey of the population, located inside the project area, reveled that the implementation of the *Santa Fé* Small Hydro Power Plant brings a great expectation of development to the local communities, mainly due to the perspective of improvements in the infrastructure and urbanization of the community, as improvements in the access ways (roads and highways), installation of public telephones and hospitals, beyond the expectation for the generation of new jobs.

Important to put in evidence that the *Santa Fé* Small Hydro power Plant does not compromise the ways of subsistence of the local population whose economy is based on the coffee production.

On the other hand, 71,5% of the positive impacts are of permanent character related to anthropogenic environment with the increase of the municipal collection and the properties prices, increase of electric energy, of the tourist activities and reorganization of the access ways.

The environment licensing processes in Brazil, as well as other environment norms, are very tough, following the best international practices, and demanding the entrepreneurs to follow the rules and adequacies to implement its activities in a sustainable way, and always aiming the continuous improvement. The documents about the Environment Impacts Assessment (*EIA\RIMA*) was approved by the License Agency and presented to the community and stakeholders through public audiences, defines by article 10 of the Resolution 237\97.

To implement the project activity, all the options to prevent significant impacts in the environment had been analyzed, in the case of not being possible the prevention of the impacts, viable measures of compensation had been adopted, resulting in an environmentally sustainable profit.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Considering that the project adopts enough measures to prevent, to mitigate or to compensate the environment impacts, these are not considered significant by the stakeholders or the host party. Up to now, the *Santa Fé* Small Hydro Power Plant fulfills the effective environmental legislation and the conditions of the Previous License forwarded by the SEAMA/IEMA.

SECTION E. Stakeholders' comments

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

According to the Resolution number 1 of the Brazilian Inter-Ministerial commission on Climate Change[32], invitations for comments by local stakeholders are required by the Brazilian Designated National Authority (DNA) as part of the procedures for analyzing CDM projects and issuing letters of approval.

The DNA required project participants to communicate with the public through letters, to be sent inviting for comments to:

- The Brazilian national NGO's forum.

- The local attorneys' and prosecutors' agency.

- The municipality's chamber (mayor and assembly men).

- State's and municipal's environmental authorities.

- Local communities' associations.

The social organization of *Alegre* Municipality shows a consolidation of local organization phase, communitarian and social cooperation, as well as the emergency of a net of worried entities about environmental issues. There is not social organization or environmental entity formed in the area of direct influence of the project (Districts of *São João do Norte* and *Anutiba*). As defined by DNA, the involved actors in the process had been identified and after the responsible for the project development sent information letters to the main institutions listed in the table below, describing the main aspects of implementation and operation of the proposed project. The project participant will keep open for comments during 30 (thirty) days.

[32] *Issued on December 2nd of the 2003, decree from July 7th 1999.*

Name of the Institution	Type of Entity	Address	Phone / Fax	*Contact Point*	E-mail
Alegre City Hall	Public	Parque Getúlio Vargas, 01 - Centro CEP 29500-000 Alegre - ES	(28) 3552-2327	*Carlos Renato Vianna*	-
City Council of Alegre	Public	Avenida Jerônimo Monteiro 38, 2º piso - Centro CEP: 29240-000 – Alegre-ES	(28) 3552-1147	-	-
Sustainable Development Secretariat of Alegre	Public	Avenida Jerônimo Monteiro, 34 - Edifício Raul Moulin - Sala 208 CEP 29500-000 - Alegre-ES	(28) 3552-1857	-	-
Environmental Monitoring	Public	Avenida Dr. Olívio Correia Pedrosa SN – Centro CEP: 29500-000 - Alegre – ES	(28) 3552-3214	-	-
SEMTCE – Municipal Secretariat of Tourism, Culture and Sport	Public	Rua Monsenhor Pavesi, 100 CEP 29500-000 - Alegre-ES	(28) 3552-4411	-	-
EMEF George Abreu Rangel	Public	Rua João Manoel de Aquino CEP: 29500-000 – Alegre-ES		-	-
SISPMA- Public servers' Trade Union of the Municipality of Alegre	Trade Union	Rua 7 Setembro, s/n Centro CEP: 29500-000 - Alegre - ES	(28) 3552-1599	-	-
Rural Worker's Trade Union of Alegre-SIPRUA	Trade Union	Rua Dr. Chacon, 234 Centro CEP: 29500-000 - - Alegre - ES	(28) 3552-3547	-	-
IDAF-Institute of Farming and Forest Defense Espírito Santo	Institute	Avenida Dr. Olívio Correia Pedrosa, 556 Centro CEP: 29500-000 - Alegre - ES	(28) 3552-1478	-	-
INCAPER-Institute Capix of Survey and technical assistance for Rural extension	Survey Institute	Avenida Dr. Olívio Correia Pedrosa, 556 an 2 Centro CEP: 29500-000 - Alegre - ES	(28) 3552-0833	-	-
Trade and Industrial Association	Association	Pc 6 Janeiro, 168 Centro CEP: 29500-000 - Alegre - ES	(28) 3552-2226	-	-

Trade and Industrial Association of Alegre	Association	Rua Dulcino Pinheiro, 26 – Centro CEP: 29500-000 – Alegre-ES	(28) 3552-2226	-	-
Friends of Caparaó Association	NGO	Avenida Jerônimo Monteiro, 113 – Centro CEP: 29500-000 – Alegre-ES	(28) 3552.1488	-	amigosdocaparao@terra.com.br
Fafia - Philosophy Sciences and Letters College of Alegre	University	Rua Pe José Bellotti, 100 Centro CEP: 29500-000 - Alegre - ES	(28) 3552-1412	-	-
Agriculture, Supplying, Culture of Species that live in the water and Fishing Secretariat of the State – SEAG	Public Secretariat	Rua Raimundo Nonato, 116 – Forte São João CEP: 29010-540 – Vitória-ES	(27) 3132-1411	*Gilmar Gusmão Dadalto*	*dadalto@seag.es.gov.br*
Science and Technology Secretariat of the State – SECT	Public Secretariat	Avenida Vitória, 2045 – Nazareth CEP: 29041-230 – Vitória-ES	(27) 3380-3549	*Cleber Bueno Guerra*	*cleberguerra@sect.es.gov.br*
Environment Secretariat of Espírito Santo – *SEAMA*	Public Secretariat	Km 0, BR 262, CEP: 29 140-500 - Cariacica – ES	(27) 3136-3438 / 3443	*Luiz Fernandes Shiettno*	presidente@iema.es.gov.br
Health Secretariat of the State	Public Secretariat	Avenida Mascarenhas de Morais, 2020 CEP: 29051-121 – Vitória-ES	(27) 3137-2383	*Anselmo Tose*	apoiogab@saude.es.gov.br
Industries Federacy of the State of Espírito Santo – FINDES	Federacy	Avenida Dante Micheline, 2057 – 11º andar, Edifício Praia Formosa – Mata da Praia CEP: 29065-051 – Vitória-ES	(27) 3225-0841	*Roosevelt da Silva Fernandes*	roosevelt@ebrnet.com.br
Agricultural Federacy of the State of Espírito Santo – FAES	Federacy	Avenida Nossa Senhora da Penha, 1495 – 10º andar CEP: 29045-401 – Vitória-ES	(27) 3185-9200	*Júlio da Silva Rocha Júnior*	senartec@zaz.com.br julio@faes.org.br
Association of Users of Water Resources	Association	Av. Dante Micheline, 2431 – Apto. 902 – Edifício Pallazio Venezio CEP: 29066-430 – Vitória-ES	(27) 3345-0618	*Robson Sarmento*	Robson.sarmento@terra.com.br
State Institute of the Environment – IEMA	Public	km 0, BR 262 CEP: 29140-500 - Cariacica-ES	(27) 3136 3434/ 3136 3436	*Sueli Passoni Tonini*	-

Council of the State of Water Resources - *CERH*	Public	Km 0, BR 262 – Jardim América CEP: 29140-500 - Cariacica-ES	(27) 3136 3508/ 3510	*Maria de Glória Brito*	cerh@iema.es.gov.br; presidente@iema.es.gov.br
Capixaba Institute of Survey, Technical Assistance and Rural Extension – INCAPER	Institute	Rua Afonso Sarlo, 160 - Bento Ferreira CEP: 29052-010 - Vitória – ES	(27) 3325 3111	-	central@incaper.es.gov.br
Federal Centre of Technological Education of Espírito Santo – CEFETES	Survey Institute	Rua Curitiba, 1109 – Apto 702 – Itapoá CEP: 29101-420 – Vila Velha-ES	-	*José Antonio Tosta dos Reis*	tosta@cefetes.br
Federal University of Espírito Santo – UFES	University	Avenida São Paulo, 1890 – apt 104 – Praia da Costa CEP: 29101-301 – Vila Velha-ES	-	*Antônio Sergio Ferreira Mendonça*	anserfm@terra.com.br
Public Prosecution Service of the State of Espírito Santo	Public Prosecution Service	Rua Humberto Martins de Paula – Ed. Promotor Edson Machado, nº. 350 Enseada do Suá CEP: 29050-265 – Vitória-ES	(27) 3224-4500	-	-
Public Prosecution Service of Vitória	Public Prosecution Service	Rua Humberto Martins de Paula, 350 CEP: 29050-265 - Vitória – ES	(27) 3224 4500	-	-
IBAMA – Regional Office of Cachoeiro do Itapemirim	Environmental Agency	Rua Francisco Lacerda de Aguiar, 21 – Bairro Gilberto Machado – Centro CEP: 29203-300 Cachoeiro do Itapemirim-ES	(28) 3511-1440	*Eldo Scherrer Louzada*	*eldo.louzada@ibama.gov.br*
Friends Association of the Basin do Rio Itapemirim - AABRI	NGO	Rua Dom Pedro II, nº. 02 – Coronel Borges CEP: 29300-970 Cx. Postal: 277 - Cachoeiro do Itapemirim-ES	(28) 3517 3190	-	agua@dci.org.br,aabri@dci.org.br
Intermunicipal Trust of Bacia do Rio Itapemirim	Public Institution	Rua Barão de Itapemirim, 14 - 1º andar - Centro CEP: 29.300-110 - Cachoeiro Itapemirim - ES	(27) 3381.5339	*Theodorico de Assis Ferraço*	pcesar@npd.ufes.br
Committee of the Basin of Itapemirim River	Public	Praça Alvin Silveira, 1. Bairro Ilha da Cruz CEP: 29307-801 – Cachoeiro de	(28) 3526-3321	*Antônio Carlos Brandão de Alencar*	antonio@citagua.com.br

		Itapemirim-ES			
Environmental Association *Voz da Natureza*	NGO	Rua Coronel Schwab Filho, 104 - Ap. 501 CEP: 29050-780 - Vitória - ES	(27) 9989.6022	*Hudson Tercio Pinheiro*	voz_da_natureza@yahoo.com.br
Capixaba Forum of Climate Changes and Rational Use of the Water	NGO	*BR 262 km 0 S/N – Jardim América Cariacica-ES* *CEP: 29140-500*	-	-	-
Association *Amar-Caparaó*	NGO	Rua Principal, s\n, Patrimônio da Penha CEP: 29590-000 – Divino São Lourenço-ES	(28) 9976-1034 \ 5819	*Núbia Lares*	amarcaparao@terra.com.br
Brazilian Agency for the Sustainable Development – ABDS	Public Institution	Rua Cristalino Rolim de Freitas, 249 – Ibiúna/SP CEP: 18150-000	(015) 241-1696	*José Pinheiro Machado*	tapir@tapir.com.br
Brazilian Forum of NGOs	NGO	SCLN 210 Bloco C Sala102 Brasília - Distrito Federal CEP: 70856-530	(61) 3340-0741	-	forumbr@tba.com.br
ABRAMPA – Brazilian Association of the Public Prosecution Service of the Environment	Association	Rua Araguari, 1705/703 Belo Horizonte/MG CEP: 30190-111	(31) 3292-4365	*Jarbas Soares Júnior*	-
ABEMA – Brazilian Association of State Entities of Environment	Association	Rua Vital de Oliveira, 32 Recife/PE CEP: 50030-370	-	*Alexandrina Sobreira de Moura*	www.abema.org.br
ANAMMA – National Association of Municipalities and Environment	Association	Rua Hélio de Castro Maia, 279 CEP: 79050-030 - Campo Grande - MS	(067) 314-5172 / 314-5163	-	-
National Counsil of Environmental Defense - CNDA	NGO	Avenida Paulista, 475 - 1º andar – Bela Vista – São Paulo/SP CEP: 01311-000	-	-	-
Greenpeace Brazil	NGO	Rua Alvarenga, 2301 – Butantã São Paulo/SP CEP: 05509-006	-	*Marcelo Furtado, Sergio Dialetachi*	-

Beyond sending information letters about the developed CDM project, audiences with the stakeholders had been realized to discuss the environmental impacts caused by the construction of the *PCH* and spreading the news in the media. The accomplishment of public audiences with the stakeholders is an obligator procedure of the Environmental Licensing defined by article 10 of Resolution 237 \ 97. These meetings aim to discuss the impacts generated by the project and mitigating or compensatory measures with the local communities and institutions interested in the search for the public acceptance and legitimation of the project.

Ata da Reunião Prévia do Projeto de Construção da PCH Santa Fé, realizada no dia 08/12/2006, em Alegre – ES.

(TRANSCRIÇÃO)

Aos [1]08 (oito) dias do mês de dezembro de 2006 às 19h42min, no Centro de Ciências Agrárias da UFES, em Alto Universitário S/Nº, Centro, Alegre, Estado do Espírito Santo, dá-se início a Reunião Prévia sobre o Processo de Licenciamento Ambiental do [2]Projeto de Construção da PCH Santa Fé, da empresa Castelo Energética S.A., conforme [3]convite público da Senhora Maria da Glória Brito Abaurre, Diretora-Presidenta do Instituto Estadual do Meio Ambiente e Recursos Hídricos – IEMA, publicado no [4]Diário Oficial do Estado do dia 29 de novembro de 2006 e em jornais de grande circulação no Estado do dia 29 de novembro de 2006, além de mobilização feita pela Gerência de Educação Ambiental do IEMA através de convites, visitas, e-mails e outros meios, também o empreendedor fez divulgação com os seus próprios meios. A Reunião Prévia tem por [5]objetivo apresentar e divulgar às Comunidades, ONGs, entidades civis, e demais segmentos da sociedade civil sobre o empreendimento da empresa Castelo Energética S.A., explicando sobre os Estudos Ambientais realizados, com os seus possíveis impactos positivos e/ou negativos, alternativas e

[1] - Reunião Prévia – 08-12-2006.
[2] - Projeto de Construção da PCH Santa Fé.
[3] - Convite Público.
[4] - Publicação no Diário Oficial do dia 29 -11-2006.
[5] - Objetivos da reunião.

Figure 1 – Act of the Previous Meeting of the Construction Project of PCH Santa Fé*, realized in 08-12-2006.*

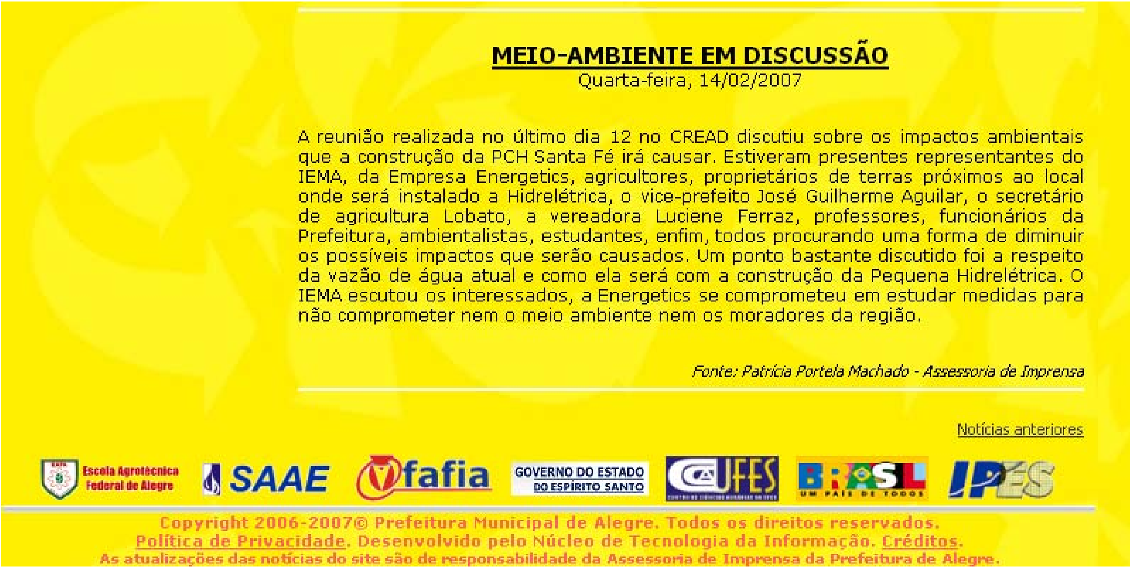
Ata da Audiência Pública do Projeto de Construção da PCH Santa Fé, realizada no dia 21/12/2006, em Alegre – ES.

(*Transcrição*)

Aos [1]21 (vinte e um) dias do mês de dezembro de 2006 às 19h50min, no Centro de Ciências Agrárias da UFES, em Alto Universitário S/Nº, Centro, Alegre, Estado do Espírito Santo, dá-se início a Audiência Pública sobre do Processo de Licenciamento Ambiental do [2]Projeto de Construção da PCH Santa Fé, da empresa CESA - Castelo Energética S.A., conforme [3]prévia convocação da Senhora Maria da Glória Brito Abaurre, Diretora-Presidenta do Instituto Estadual do Meio Ambiente e Recursos Hídricos – IEMA e Secretaria Estadual do Meio Ambiente - SEAMA, publicado no [4]Diário Oficial do Estado do dia 13 de dezembro de 2006 e em jornais de grande circulação no Estado do dia 12 de dezembro de 2006. A Audiência Pública é uma [5]exigência legal, tendo como base as Leis nºs 4.701 de 01/12/92; Decreto nº. 4.344-N de 07/10/98; Decreto nº. 4.447-N de

[1] - Audiência Pública – 21-12-2006.
[2] - Projeto de Construção da PCH Santa Fé.
[3] - Prévia convocação.
[4] - Publicação no Diário Oficial do dia 13 -12-2006.
[5] - Exigência Legal.

Figure 2 – Act of Public Audience of the Construction Project of PCH Santa Fé*, realized in 21-12-2006.*



MEIO-AMBIENTE EM DISCUSSÃO
Quarta-feira, 14/02/2007

A reunião realizada no último dia 12 no CREAD discutiu sobre os impactos ambientais que a construção da PCH Santa Fé irá causar. Estiveram presentes representantes do IEMA, da Empresa Energetics, agricultores, proprietários de terras próximos ao local onde será instalado a Hidrelétrica, o vice-prefeito José Guilherme Aguilar, o secretário de agricultura Lobato, a vereadora Luciene Ferraz, professores, funcionários da Prefeitura, ambientalistas, estudantes, enfim, todos procurando uma forma de diminuir os possíveis impactos que serão causados. Um ponto bastante discutido foi a respeito da vazão de água atual e como ela será com a construção da Pequena Hidrelétrica. O IEMA escutou os interessados, a Energetics se comprometeu em estudar medidas para não comprometer nem o meio ambiente nem os moradores da região.

Fonte: Patrícia Portela Machado - Assessoria de Imprensa

Notícias anteriores

Escola Agrotécnica Federal de Alegre SAAE fafia GOVERNO DO ESTADO DO ESPÍRITO SANTO UFES BRASIL UM PAÍS DE TODOS IPES

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Figure 3 – Notice published in the site of the Municipal City Hall of Alegre – ES in 14-02-2007.

E.2. Summary of the comments received:

No comments related to the CDM project have been received so far.

The acts of the public audiences realized are available in the site of State Institute of Environment and Water resources – IEMA in the links below, only in Portuguese version:

http://www.iema.es.gov.br/download/Atas/rp_08_12_06.pdf

http://www.iema.es.gov.br/download/Atas/ap_21_12_06_PCH.pdf

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

Not applicable.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	*ENERGEST S.A.*
Street/P.O.Box:	*Rua Bandeira Paulista, nº 530, 11º andar*
Building:	*Bandeira* Tower
City:	*São Paulo*
State/Region:	*SP*
Postfix/ZIP:	04532-001
Country:	Brazil
Telephone:	+55 11 2185 5900
FAX:	+55 11 2185 5914
URL:	www.energiasdobrasil.com.br
Title:	Engineer
Salutation:	Mr
Last Name:	Sirgado
Middle Name:	Miguel
First Name:	Pedro
Department:	Environment and Sustainability
Mobile:	+ 55 11 9966 1498 / 11 8245 0093
Direct FAX:	+ 55 11 2185 5987
Direct tel:	+ 55 11 2185 5955
Personal E-Mail:	pedro.sirgado@enbr.com.br

Organization:	*INSTITUTO ENERGIAS DO BRASIL*
Street/P.O.Box:	*Rua Bandeira Paulista, nº 530, 14º andar*
Building:	*Bandeira* Tower
City:	*São Paulo*
State/Region:	*SP*
Postfix/ZIP:	04532-001
Country:	Brazil
Telephone:	+55 11 2185 5900
FAX:	+55 11 2185 5914
URL:	www.energiasdobrasil.com.br
Title:	Engineer
Salutation:	Mr
Last Name:	Costa
Middle Name:	Martins
First Name:	Antônio
Department:	Environment and Sustainability
Personal E-Mail:	antonio.martinscosta@enbr.com.br

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There are no public financing for the project.

Annex 3

BASELINE INFORMATION

Below, the graphs representing the duration load curve and the energy demand for 2003, 2004 and 2005. Data were sourced directly from the ONS (National operator system) for the project electrical system and project boundary (South East/ Central West and South system).

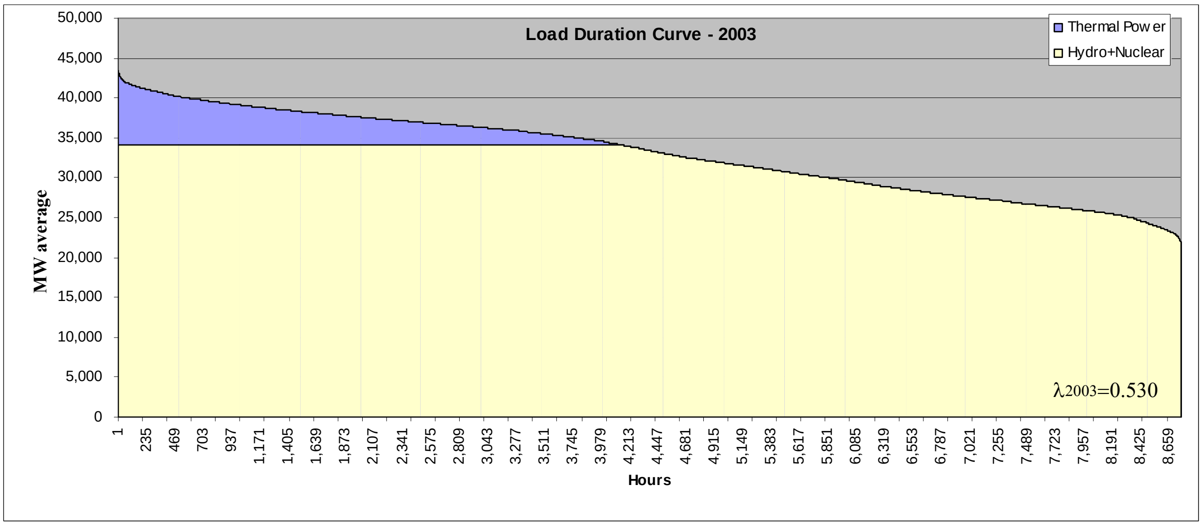


Figure 4.Load duration curve 2003 for the South – South East – Central West system

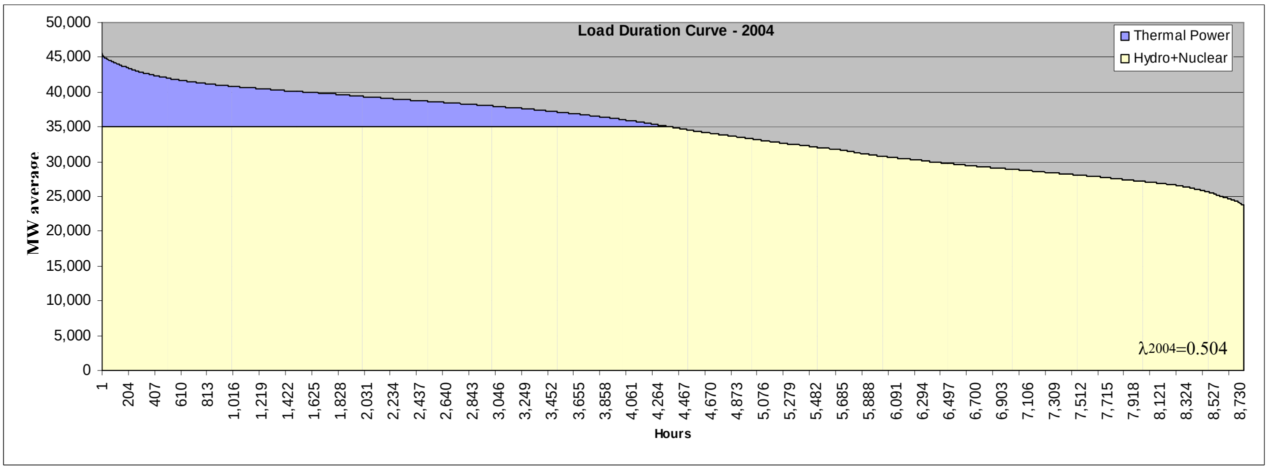


Figure 5. Load duration curve 2004 for the South – South East – Central West system

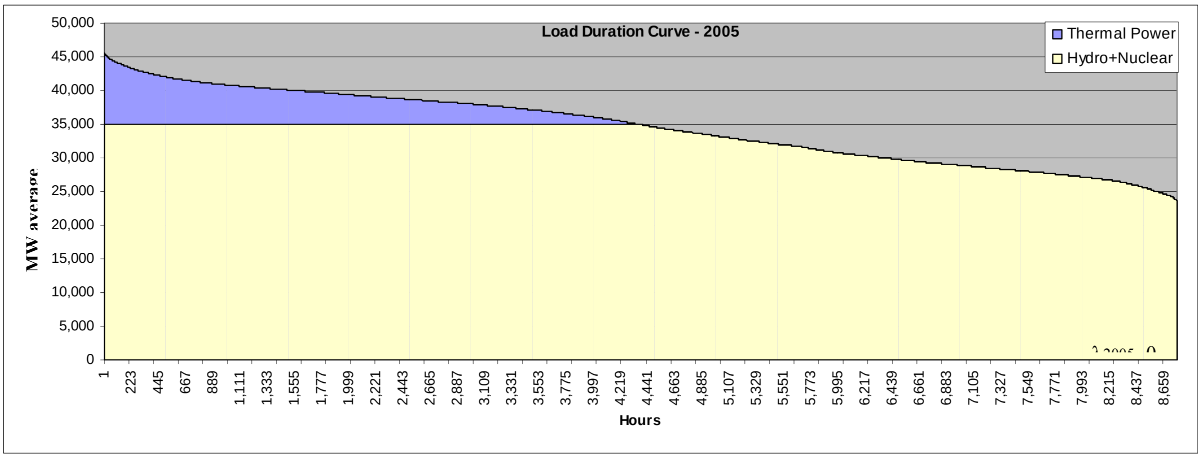


Figure 6. Load duration curve 2005 for the South – South East – Central West system

The table below represents the lead time values agreed for new capacity additions used at the baseline weighting values estimated. The assumptions are currently used in the US government's energy modelling. These are consistent with the coal and gas numbers from the OECD/IEA report, and include lead time estimates for other electric generating technologies. An assumption of three or four years would appear to be reasonable for many fossil and renewable generating technologies.

Technology	Lead time (in years)
Coal	4
Natural Gas (CC)	3
Combustion turbine	2
Nuclear	6
Wind	3
Biomass	4

Table 10-Lead time estimation for electric generating technologies.[33]

At the definition of the baseline, the set of power plants (low cost/must run resources) are analysed as well those power plants non-low cost/must run power plants. The table below shows the installed capacity for the hydro power plants within the project boundary of the project activity.

[33] *Source: OECD/IEA report: Projected Cost of Generating Electricity*

Hydro Power plant	Installed power (KW) (2006)	Municipality	2003	2004	2005
Água Vermelha	1,396,200	Indiaporã - SP/Iturama	1,396,200	1,396,200	1,396,200
Americana	30,000	Americana - SP	30,000	30,000	30,000
Antas II	16,800	Poços de Caldas - MG	16,800	16,800	16,800
Antônio Brennand	20,020	Araputanga - MT	20,020	20,020	20,020
Apucaraninha	10,000	Tamarana - PR	10,000	10,000	10,000
Areal	18,000	Areal - RJ	18,000	18,000	18,000
Assis Chateaubrind	29,500	Ribas do Rio Pardo - MS	29,500	29,500	29,500
Bariri (Alvaro de Souza Lima)	143,100	Boracéia - SP	143,100	143,100	143,100
Barra Bonita	140,760	Barra Bonita - SP	140,760	140,760	140,760
Baruíto	18,300	Campo Novo do Parecis	18,300	18,300	18,300
Benjamim Mário Baptista	9,000	Manhuaçu - MG	9,000	9,000	9,000
Bracinho	17,700	Schroeder - SC	17,700	17,700	17,700
Braço do Norte II	10,752	Guarantã do Norte - MT	10,752	10,752	10,752
Braço Norte	5,180	Guarantã do Norte - MT	5,180	5,180	5,180
Bugres	11,500	Canela - RS	11,500	11,500	11,500
Cachoeira Dourada	658,000	Cachoeira Dourada - MG	658,000	658,000	658,000
Caconde	80,400	Caconde - SP	80,400	80,400	80,400
Camargos	46,000	Itutinga - MG/Nazareno - MG	46,000	46,000	46,000
Cana Brava	465,900	Cavalcante - GO / Minaçu	465,900	465,900	465,900
Canastra	44,000	Canela - RS	44,000	44,000	44,000
Canoas I	82,500	Itambaracá - PR / Cândido Mota - SP	82,500	82,500	82,500
Canoas II	72,000	Andirá - PR / Palmital - SP	72,000	72,000	72,000
Capão Preto	5,520	São Carlos - SP	5,520	5,520	5,520
Capivara	640,000	Porecatu - PR / Taciba - SP	640,000	640,000	640,000
Casca III	12,420	Chapada dos Guimarães - MT	12,420	12,420	12,420
Cedros (Rio dos Cedros)	8,400	Rio dos Cedros - SC	8,400	8,400	8,400
Celso Ramos	5,400	Faxinal dos Guedes - SC	5,400	5,400	5,400
Chaminé	18,000	São José dos Pinhais - PR	18,000	18,000	18,000
Chavantes	414,000	Chavantes - SP / Ribeirão Claro	414,000	414,000	414,000
Coronel Domiciano	5,040	Muriaé - MG	5,040	5,040	5,040
Corumbá I	375,000	Caldas Novas - GO	375,000	375,000	375,000
Costa Rica	16,000	Costa Rica - MS	16,000	16,000	16,000
Derivação do Rio Jordão	6,500	Reserva do Iguaçu - PR	6,500	6,500	6,500
Dona Francisca	125,000	Nova Palma - RS / Agudo	125,000	125,000	125,000
Dourados	10,800	Nuporanga - SP	10,800	10,800	10,800
Eloy Chaves	19,000	Espírito Santo do Pinhal - SP	19,000	19,000	19,000
Emborcação	1,192,000	Cascalho Rico - MG/ Catalão -	1,192,000	1,192,000	1,192,000
Ervália	6,970	Guiricema - MG / Ervália - MG	6,970	6,970	6,970
Esmeril	5,040	Patrocínio Paulista - SP	5,040	5,040	5,040
Estreito -Luiz Carlos Barreto	1,050,000	Sacramento - MG/ Rifaina - SP	1,050,000	1,050,000	1,050,000
Euclides da Cunha	108,800	São José do Rio Pardo - SP	108,800	108,800	108,800
Fontes Nova	130,300	Piraí - RJ	130,300	130,300	130,300
Fruteiras	8,736	Cachoeiro de Itapemirim - ES	8,736	8,736	8,736
Funil	216,000	Itatiaia - RJ	216,000	216,000	216,000
Furnas	1,216,000	Alpinópolis - MG	1,216,000	1,216,000	1,216,000
Gafanhoto	14,000	Divinópolis - MG	14,000	14,000	14,000
Garcia	8,920	Angelina - SC	8,920	8,920	8,920
Governador Bento Munhoz da Rocha Neto (Foz do Areia)	1.676.000	Pinhão - PR	1,676,000	1,676,000	1,676,000
Governador José Richa	1.240.000	Capitão Leônidas	1,240,000	1,240,000	1240000

		Marques			
Governador Ney Aminthas de Barros Braga (Segredo)	1.260.000	*Mangueirinha - PR*	1,260,000	1,260,000	1,260,000
Governador Parigot de Souza (Capivari/Cachoeira)	260,000	*Antonina - PR*	260,000	260,000	260,000
Guaricana	36,000	*Guaratuba - PR*	36,000	36,000	36,000
Henry Borden	889,000	*Cubatão - SP*	889,000	889,000	889,000
Ibitinga	131,490	*Ibitinga - SP*	131,490	131,490	131,490
Igarapava	210,000	*Conquista - MG/ Igarapava - SP*	210,000	210,000	210,000
Ilha dos Pombos	187,169	*Além Paraíba - MG/ Carmo - RJ*	187,169	187,169	187,169
Ilha Solteira	3,444,000	*Ilha Solteira - SP/Selvíria - MS*	3,444,000	3,444,000	3,444,000
Itá	1,450,000	*Aratiba - RS / Itá - SC*	1,450,000	1,450,000	1,450,000
Itaipu (Parte Brasileira)	6.300.000	*Foz do Iguaçu - PR*	6,300,000	6,300,000	6,300,000
Itatinga	15,000	*Bertioga - SP*	15,000	15,000	15,000
Itaúba	512,400	*Pinhal Grande - RS*	512,400	512,400	512,400
Itumbiara	2,082,000	*Araporã - MG / Itumbiara*	2,082,000	2,082,000	2,082,000
Itutinga	52,000	*Itutinga - MG*	52,000	52,000	52,000
Jacuí	180,000	*Salto do Jacuí - RS*	180,000	180,000	180,000
Jaguara	424,000	*Rifaina - SP /Sacramento*	424,000	424,000	424,000
Jaguari	11,800	*Pedreira - SP*	11,800	11,800	11,800
Jaguari	27600	*Jacareí - SP*	27600	27600	27600
João Camilo Penna	21,600	*Raul Soares - MG*	21,600	21,600	21,600
Joasal	8,400	*Juiz de Fora - MG*	8,400	8,400	8,400
Júlio de Mesquita Filho	29,072	*Cruzeiro do Iguaçu - PR*	29,072	29,072	29,072
Jupiá (Engº Souza Dias)	1,551,200	*Castilho - SP/Três Lagoas - MS*	1,551,200	1,551,200	1,551,200
Jurumirim	97,700	*Cerqueira César - SP*	97,700	97,700	97,700
Limoeiro (Armando Salles de Oliveira)	32,000	*São José do Rio Pardo - SP*	32,000	32,000	32,000
Macabu	21,000	*Trajano de Morais - RJ*	21,000	21,000	21,000
Machadinho	1,140,000	*Maximiliano de Almeida - RS / Piratuba - SC*	1,140,000	1,140,000	1,140,000
Manso	210,000	*Chapada dos Guimarães*	210,000	210,000	210,000
Marechal Mascarenhas de Moraes	478,000	*Ibiraci - MG/ Sacramento*	478,000	478,000	478,000
Marimbondo	1,440,000	*Fronteira - MG / Icém - SP*	1,440,000	1,440,000	1,440,000
Martins	7,700	*Uberlândia - MG*	7,700	7,700	7,700
Mascarenhas	130,000	*Aimorés - MG*	130,000	130,000	130,000
Miranda	408,000	*Indianópolis*	408,000	408,000	408,000
Mogi-Guaçu	7,200	*Mogi Guaçu - SP*	7,200	7,200	7,200
Mourão I	8,200	*Campo Mourão - PR*	8,200	8,200	8,200
Neblina	6,468	*Ipanema - MG*	6,468	6,468	6,468
Nilo Peçanha	378,420	*Piraí - RJ*	378,420	378,420	378,420
Nova Avanhandava (Rui Barbosa)	347,400	*Buritama - SP*	347,400	347,400	347,400
Nova Ponte	510,000	*Nova Ponte - MG*	510,000	510,000	510,000
Padre Carlos (Ex- PCH Rolador)	7800	*Poços de Caldas - MG*	7800	7800	7800
Palmeiras	24,602	*Rio dos Cedros - SC*	24,602	24,602	24,602
Paraibuna	85,000	*Paraibuna - SP*	85,000	85,000	85,000
Paranapanema	29,840	*Piraju - SP*	29,840	29,840	29,840
Paranoá	29,700	*Brasília - DF*	29,700	29,700	29,700
Passo do Meio	30,000	*São Francisco de Paula*	30,000	30,000	30,000
Passo Fundo	226,000	*Entre Rios do Sul - RS*	226,000	226,000	226,000
Passo Real	158,000	*Salto do Jacuí - RS*	158,000	158,000	158,000
Pedrinho I	16,200	*Boa Ventura*	16,200	16,200	16,200
Pereira Passos	99,110	*Piraí - RJ*	99,110	99,110	99,110
Peti	9,400	*São Gonçalo*	9,400	9,400	9,400
Piabanha	9,000	*Areal - RJ*	9,000	9,000	9,000
Piau	18,012	*Santos Dumont - MG*	18,012	18,012	18,012
Pinhal	6,800	*Espírito Santo do Pinhal*	6,800	6,800	6,800
Poço Fundo	9,160	*Poço Fundo - MG*	9,160	9,160	9,160
Porto Colômbia	320,000	*Guaíra - SP / Planura -*	320,000	320,000	320,000

		MG			
Porto Estrela	112,000	Açucena - MG/ Braúnas	112,000	112,000	112,000
Porto Primavera	1,540,000	Anaurilândia - MS	1,430,000	1,540,000	1,540,000
Primavera	8,120	Poxoréo - MT	8,120	8,120	8,120
Promissão (Mário Lopes Leão)	264,000	Ubarana - SP	264,000	264,000	264,000
Rasgão	22,000	Pirapora do Bom Jesus	22,000	22,000	22,000
Rio Bonito	16,800	Santa Maria de Jetibá - ES	16,800	16,800	16,800
Rio de Pedras	9,280	Itabirito - MG	9,280	9,280	9,280
Rio do Peixe (Casa de Força I e II)	18,060	São José do Rio Pardo - SP	18,060	18,060	18,060
Rosal	55,000	Bom Jesus - RJ	55,000	55,000	55,000
Rosana	369,200	Rosana - SP	369,200	369,200	369,200
Sá Carvalho	78,000	Antônio Dias - MG	78,000	78,000	78,000
Salto (Salto Weissbach)	6,280	Blumenau - SC	6,280	6,280	6,280
Salto Grande	102,000	Braúnas - MG	102,000	102,000	102,000
Salto Grande	70,000	Cambará - PR / Salto Grande	70,000	70,000	70,000
Salto Osório	1.078.000	Quedas do Iguaçu - PR	1,078,000	1,078,000	1,078,000
Salto Santiago	1,420,000	Saudade do Iguaçu - PR	1,420,000	1,420,000	1,420,000
Santa Branca	56,050	Jacareí - SP/ Santa Branca	56050	56050	56050
Santa Cecília	34,960	Barra do Piraí - RJ	34,960	34,960	34,960
Santa Lúcia	5,000	Sapezal - MT	5,000	5,000	5,000
São Bernardo	6,820	Piranguçu - MG	6,820	6,820	6,820
São Domingos	14,336	São Domingos - GO	14,336	14,336	14,336
São Joaquim	8,050	Guará - SP	8,050	8,050	8,050
São Simão	1,710,000	Santa Vitória - MG	1,710,000	1,710,000	1,710,000
Serra da Mesa	1,275,000	Cavalcante - GO / Minaçu	1,275,000	1,275,000	1,275,000
Suíça	30060	Santa Leopoldina - ES	30060	30060	30060
Taquaruçu (Escola Politécnica)	554,000	Sandovalina - SP / Santa Inês	554,000	554,000	554,000
Três Irmãos	807,500	Pereira Barreto - SP	807,500	807,500	807,500
Três Marias	396,000	Três Marias - MG	396,000	396,000	396,000
Tronqueiras	8,500	Coroaci - MG	8,500	8,500	8,500
Vigário	90,820	Piraí - RJ	90,820	90,820	90,820
Volta Grande	380,000	Conceição das Alagoas - MG	380,000	380,000	380,000
Braço Norte III	14,160	Guarantã do Norte - MT	14,160	14,160	14,160
Funil	180,000	Lavras - MG / Perdões - MG	180,000	180,000	180,000
Itiquira (Casas de Forças I e II)	156,060	Itiquira - MT	108,400	156,060	156,060
Ivan Botelho I (Ex-Ponte)	24,400	Descoberto - MG / Guarani	24,400	24,400	24,400
Ombreiras	26,000	Araputanga - MT/ Jauru - MT	26,000	26,000	26,000
Paraíso I	21,600	Costa Rica - MS	21,600	21,600	21,600
Pesqueiro	12,440	Jaguariaíva - PR	10,960	10,960	12,440
Salto Natal	15,120	Campo Mourão - PR	14,000	15,120	15,120
Salto Voltão	8,200	Xanxerê - SC	6,760	6,760	8,200
Santa Lúcia II	7,600	Sapezal - MT	7,600	7,600	7,600
Vitorino	5,280	Itapejara d´Oeste - PR	5,280	5,280	5,280
Faxinal II	10,000	Aripuanã - MT	0	10,000	10,000
Ferradura	9,200	Redentora - RS / Erval	0	9,200	9,200
Furnas do Segredo	9,800	Jaguari - RS	0	9,800	9,800
Indiavaí	28,000	Indiavaí - MT / Jauru - MT	0	28,000	28,000
Jauru	121,500	Indiavaí - MT/Jauru - MT	0	121,500	121,500
Ourinhos	44,000	Jacarezinho - PR / Ourinhos	0	44,000	44,000
Porto Góes	24,800	Salto - SP	11000	24,800	24,800
Quebra Queixo	121,500	Ipuaçu - SC / São Domingos	0	121,500	121,500
Queimado	105,000	Cristalina - GO /Unaí -	0	105,000	105,000

		MG			
Salto Corgão	27,000	*Nova Lacerda - MT*	0	27,000	27,000
Túlio Cordeiro de Mello	15,800	*Abre Campo - MG*	14,000	15,800	15,800
Aimorés	330000	*Aimorés - MG*	0	0	0
Barra Grande	465,500	*Anita Garibaldi - SC*	0	0	0
Candonga	140,000	*Rio Doce - MG/*	0	0	140,000
Ivan Botelho II (Ex-Palestina)	12480	*Guarani - MG*	0	0	12480
Ivan Botelho III (Ex-Triunfo)	24,400	*Astolfo Dutra - MG*	0	0	24,400
Monte Claro	65,000	*Bento Gonçalves - RS*	0	0	65,000
Ormeo Junqueira Botelho	22,700	*Muriaé - MG*	0	0	22,700
Ponte de Pedra	176,100	*Itiquira - MT/Sonora - MS*	0	0	0
Santa Clara	60,000	*Nanuque - MG*	0	0	60,000
Santa Clara	120,168	*Candói - PR / Pinhão - PR*	0	0	60,000
Santa Edwiges II	12,100	*Buritinópolis - GO*	0	0	0
Xavier	6,006	*Nova Friburgo - RJ*	5,280	5,280	6,006
TOTAL			**48,128,177**	**48,778,557**	**49,166,783**

Table 11. Installed capacity of the hydro power plants.

The table below shows the installed capacity for the ***thermal based power plants*** within the project boundary of the project activity.

Power plant	Installed Power (kW)	Fuel type	2003	2004	2005
Alberto - Unidade I)	657,000	Uranium	657,000	657,000	657,000
Alegrete	66,000	Fuel Oil	66,000	66,000	66,000
Angra II	1,350,000	Uranium	1,350,000	1,350,000	1,350,000
Araucária	484,500	Natural Gas	484,500	484,500	484,500
Brahma	13,080	Natural Gas	13,080	13,080	13,080
Brasília	10,000	Diesel Oil	10,000	10,000	10,000
Campos	30,000	Natural Gas	30,000	30,000	30,000
Carapina Brasympe	43,500	Diesel Oil	43,500	43,500	43,500
Carioba	36,160	Diesel Oil	36,160	36,160	36,160
Casa F-242	9,000	Natural Gas	9,000	9,000	9,000
Charqueadas	72,000	Coal	72,000	72,000	72,000
Civit Brasympe	22,510	Diesel Oil	22,510	22,510	22,510
Copesul	74,400	Residual Gas	74,400	74,400	74,400
Cuiabá	529,200	Natural Gas	529,200	529,200	529,200
Daia	44,300	Diesel Oil	44,300	44,300	44,300
Eletrobolt	379,000	Natural Gas	379,000	379,000	379,000
Energy Works Kaiser	8,592	Natural Gas	8,592	8,592	8,592
Energy Works Rhodia	11,000	Natural Gas	11,000	11,000	11,000
Eucatex	9,800	Natural Gas	9,800	9,800	9,800
Figueira	20,000	Coal	20,000	20,000	20,000
Igarapé	131,000	Heavy Oil	131,000	131,000	131,000
Ipatinga	40,000	BGC gas	40,000	40,000	40,000
Jorge Lacerda I e II	232,000	Coal	232,000	232,000	232,000
Jorge Lacerda III	262,000	Coal	262,000	262,000	262,000
Jorge Lacerda IV	363,000	Coal	363,000	363,000	363,000
Macaé Merchant	922,615	Natural Gas	922,615	922,615	922,615
Negro de Fumo	24,400	Residual Gas	24,400	24,400	24,400
Nutepa	24,000	Fuel Oil	24,000	24,000	24,000
Piratininga	472,000	Fuel Oil	472,000	472,000	472,000
Ponta de Ubu Brasympe	42,640	Diesel Oil	42,640	42,640	42,640
Presidente Médici A/B	446,000	Coal	446,000	446,000	446,000
São Jerônimo	20,000	Coal	20,000	20,000	20,000
São José do Rio Claro	5,699	Diesel Oil	5,224	5,224	5,224
Sapezal	8,130	Diesel Oil	9,836	9,836	9,836
Tubarão Brasympe	42,640	Diesel Oil	42,640	42,640	42,640
UGPU (Messer)	7,700	Natural Gas	7,700	7,700	7,700
Uruguaiana	639,900	Natural Gas	639,900	639,900	639,900
Vila Rica	9,252	Diesel Oil	4,672	7,520	9,252
Canoas	160,573	Natural Gas	160,573	160,573	160,573
Capuava	18,020	Fuel Oil	18,020	18,020	18,020

EnergyWorks Corn Products Balsa	9,199	Natural Gas	9,199	9,199	9,199
Ibirité	226,000	Natural Gas	226,000	226,000	226,000
Modular de Campo Grande	194,000	Natural Gas	194,000	194,000	194,000
Xavantes Aruanã	53,576	Diesel Oil	53,576	53,576	53,576
Barreiro	12,900	BGC gas	-	12,900	12,900
Colniza	5,564	Diesel Oil	3,336	5,564	5,564
Rhodia Paulínia	10,000	Natural Gas	-	10,000	10,000
Corn Products Mogi	30,775	Natural Gas	-	30,775	30,775
Juiz de Fora	87,048	Natural Gas	82,000	87,048	87,048
Norte Fluminense	868,925	Natural Gas	-	868,925	868,925
Nova Piratininga	386,080	Natural Gas	-	386,080	386,080
Santa Cruz	766,000	Natural Gas	600,000	766,000	766,000
Três Lagoas	306,000	Natural Gas	-	240,000	306,000
TermoRio	793,050	Natural Gas	-	-	793,050
TOTAL			**8,906,373**	**10,631,177**	**11,491,959**

Table 12. Installed capacity of the thermal power plants

Here below are the project activity financial indicators of the project activity whose have been based on the data provided by the project developer.

ENERGY CHARACTERISTICS	
Installed Capacity (MW)	29
Energy (MW Average)	16,60
Availability Factor (%)	100,00%
Energy Increase	0,00%
Energy (MWh)	145.416

ENERGY COST	
Rate for sales (Mix of energy purchasing pri	124,99

ENERGY TRANSPORT CHARGES	
Tariff for transportation (in R$)	1,18
– Rate for distribution	2,35
– Connection Fee	0,00

HYDRO POWER LIFETIME	
Hydro Power lifetime (years)	30

INVESTMENT DESCRIPTION	
Investimento na USINA (em R$ MIL)	103.953
– Administration staff	1.999
– EPC	96.956
– Others	0
– Facilities	0
– Environment + Land purchase	4.998
Fluctuation value from the initial invest	
– Unitary cost (in R$/ installed kW)	
– Value – All in cost	3.585
– EPC (Calculated)	96.956

INTEREST DURING CONSTRUCTION	
– Own Capital	0,00%
– Third Market Capital	100,00%

AMORTIZATION	
– Method	Constant
– Period (YEARS)	6
– Shortage Period (YEARS)	2

REFINANCING	
Required Percentage	0,00%

OPERATION	
First Year of operation (number of months i	12

CARBON CREDIT	
Tonnes of CO2 e. (year)	29.741
Price per tonne (Euro)	20,00
RCE receipt	0,00

LEGAL CHARGES	
ICMS	
– ICMS on electric energy (%)	0,00%
Taxes on invoiced revenues (%)	3,65%
– PIS (in %)	0,65%
– COFINS (in %)	3,00%
CPMF (in %)	0,38%
Taxes on real revenues	no
– Income tax (in %)	25,00%
– Social contribution without revenues (in %)	9,00%
Taxes on revenues - income tax presumed	8,00%
– Income tax --- 8% of revenues	15,00%
	10,00%
Taxes on revenues - Social contribution on	12,00%
– Social contribution without revenues --- 12% of	9,00%
Financial compensation = % * Energy * RCD	0
– Reference Currently Duty - RCD (in R$)	0,00
– Applied Percentual	0,00%
ANEEL inspection taxes = 0.50% of revenue	0,50%

OPERATIONAL COSTS	
O&M Costs (in R$/MWh)	5,16
Security Costs - Technic/Operational (% of r	0,00%

OUTHER EXPENSES	
Administration - SNUC	0,00%
Area renting	0,00%
Success rate	0,00%

FINANCIAL CHARGES	
Financial tax (in % per year)	3,50%
Working capital financial tax (in % per year)	0,00%
Investments taxes (in % per year)	0,00%
Exchange Tax (R$/US$)	2,22
Exchange Tax (R$/Euro)	

"ACTIONING POSITION"	
Payment of debits (in %)	95,00%
Impulse (%)	65,00%

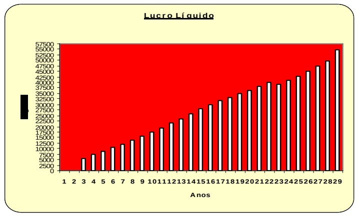
WEIGHTED AVERAGE COST OF CAPITAL (WACC)	
Weighted average cos of capital	
Expected annual Reajuste Tax (Initial Investment)	

DEPRECIATION	
Equipments	2,50%
Civil works	2,50%
Engeneering and pre-Operational	
Annual depreciation (Average)	2,50%

PAYMENT SCHEDULE	
YEAR 1	45,00%
YEAR 2	45,00%
YEAR 3	10,00%
YEAR 4	0,00%
YEAR 5	0,00%
YEAR 5	0,00%
Annual distribution of the investment	100,00%

RESULTS		
MPV (R$ x 10^3)	#######	
IRR (%)	15,44%	
ROE (%)	48,40%	ANNUAL AVERAGE
ROA (%)	27,26%	ANNUAL AVERAGE
EBITDA / Inv. (%)	NI	ANNUAL AVERAGE
MARGIN OF PROFIT	75,44%	ANNUAL AVERAGE
ROIC (%)	30,04%	ANNUAL AVERAGE

EQUIVALENT ANNUAL COST (R$/MWh)		
Description	R$/MWh	US$/MWh
Total cost with taxes and rates =	164,92	74,19
Total cost without taxes and rates =	142,50	64,10
Total cost with taxes and rates without depreciation =	153,52	69,06
O&M =	5,73	2,58
Tranport =	3,26	1,47
Outhers (Administration, Renting, Success rate, Safety) =	0,47	0,21
Taxes =	10,69	4,81
ANEEL rates =	0,34	0,15
Own Capital =	83,53	37,57
Third Market Capital =	37,75	16,98
Depreciation =	11,40	5,13
Financial Charges =	11,76	5,29



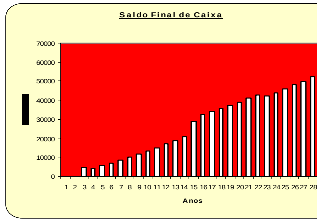


Table 13. Financial premises for the project activity.

Annex 4

MONITORING INFORMATION

The Monitoring plan is based on the approved monitoring methodology ACM0002, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources".

1. Monitoring Process

The monitoring plan provides a set of procedures for continuous monitoring of the electricity generation of the project activity that is exported to the grid and measured by means of a kWh-meter. The monitoring methodology schedules a continuous screening of the defined values and the further storage on electronic format. (Excel spreadsheet).

The monitoring of the *PCH Santa Fé* Hydro Power Plant will be based on an internal control and sampling unit that will execute the operation routines, pre-synchronization and final synchronization of the two gensets with the electrical grid. An internal mechanical device will be responsible to switch off the genset from the electrical grid. The process and data will be directly monitored at the specially built interface human-machine.

The project developer is the only responsible for the operation, direct monitoring and data registration. Also the project developer will ensure enough human and material resources for the accomplishment of the activities within the monitoring plan.

2. Emissions reduction calculation process

The main data needed to recalculate the operating margin emission factor are based on the *simple adjusted OM* from the approved baseline methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

The main data needed to recalculate the build margin emission factor are also consistent with the approved baseline methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Annex 5

DETAIL OF PHYSICAL LOCATION, INCLUDING INFORMATION ALLOWING THE UNIQUE IDENTIFICATION OF THE PROJECT ACTIVITY

Figure 7. Detail of physical location. (Source: IBGE 2005)

Figure 8. Detail of the municipality of Alegre and Itapemirim River.