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CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

INPA Fuel Switch Project
PDD Version Number 02
01/11/2007 DD/MM/YYYY

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

The INPA Fuel Switch Project (hereafter, the "Project") developed by INPA - Indústria de Embalagens Santana S/A (hereafter referred to as the "Project Developer") is a fuel switch project in Pirapetinga city, Minas Gerais state, Brazil, hereafter referred to as the "Host Country".

INPA, the project developer, is a Brazilian pulp and paper manufacturing company with years of experience in the manufacturing of a diverse range of paper products for both domestic and export markets.

The pulp and paper manufacturing process is very energy demanding. The project developer need for steam is high, around 30 tons of steam per hour, and to reach this amount of steam the company uses four low-pressure boilers, with maximum output capacity of 15 (x3) and 6 tons per hour, all of them burning fuel oil to produce steam. These four boilers will be shut down and stored on-site to be used as backup. If at any moment the old boilers have any other use, it will be accounted properly.

The purpose of this project activity is to switch the fuel consumed to produce steam in the project developer's site by a neutral carbon fuel. In order to achieve this goal, the project developer is installing two boilers with maximum output capability of 22 tons of steam per hour each, able to consume renewable biomass, a fuel with zero carbon emission factor. The company will use biomass briquettes to produce steam.

With the modification resulting from the implementation of the Project activity, the project developer's plant will be able to supply all of its demand for steam with renewable energy sources.

A significant environmental benefit of the project is that the air quality of the surrounding areas will be significantly increased, reducing the amount of pollutants dumped in the atmosphere by the burning of the fuel oil. Moreover, the project is helping the Host Country fulfil its goals of promoting sustainable development. Specifically, the project:

- Establishes a precedent for the industry by acting as a clean technology project and encouraging the development of a modern, clean and more efficient steam generation system.
- Contributes to regional integration and cooperation with other sectors: i.e. promotes positive interaction between a pulp and paper industry located in the southeast region with forestry industries from other regions of Brazil;
- Reduces GHG emissions by displacing fuel oil plants that would have otherwise continued to operate;
- Increases employment opportunities in two ways:
    1. By creating temporary jobs in the area where the project is located during the implementation work of the new facility;

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2. By strengthening the biomass market (transportation, loading and management of the biomass) in Brazil.

A.3. Project participants:

Table 1 - Project participants

Name of party involved (*) ((host) indicates a host party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	INPA - Indústria de Embalagens Santana S/A	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Group Plc	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time requesting registration, the approval by the Party(ies) involved is required.

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

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

A.4.1.1. Host Party(ies):

Brazil. (the "Host Country")

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

Southeast region, Minas Gerais state.

A.4.1.3. City/Town/Community etc:

Pirapetinga city

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

The project is located at the INPA main industrial complex located in the municipality of Pirapetinga, Minas Gerais State (Rua Inpa, 186, Centro, CEP: 36730-000). INPA is building another production unit in Uberaba city (Minas Gerais state) that will not be part of this project. See below the map of Minas Gerais State.

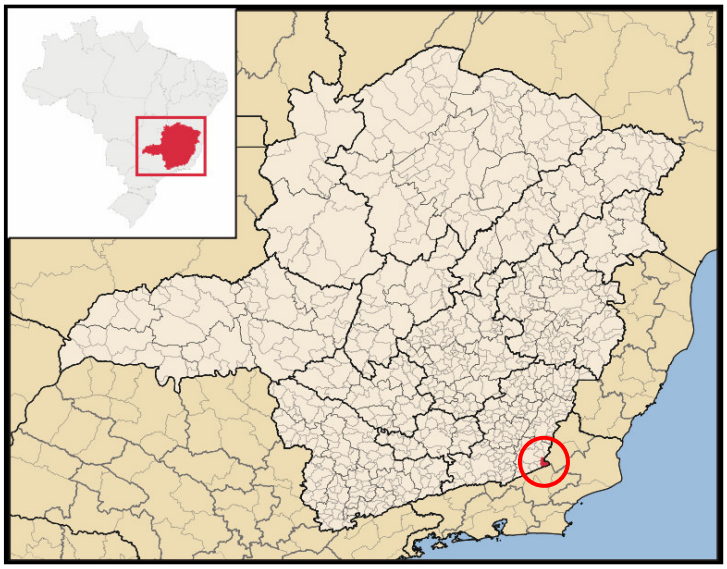

Figure: Physical location of Pirapetinga City (red), in Minas Gerais state, Southeast Brazil[1].

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

The category for the project activity according to the UNFCCC's published simplified procedures for small-scale activities is Type 1C (AMS-I.C.) – Thermal energy for the user with or without electricity. The project conforms to the project category since the nominal installed capacity of the Project is below the 45 MW_{th} threshold.

According to Annex A of the Kyoto Protocol, this project fits in Sectoral Scope 01 (Energy industries (renewable - / non-renewable sources)[2].

Section B.6.1 shows further information regarding thermal power of this project and Annex 3 shows the technical description of the equipment involved in this project activity.

Renewable biomass will be used to generate steam in this project activity. The project developer intends to use only briquettes from renewable wood residues as biomass source. However, the boilers being bought are able to burn other kinds of biomass too. There is a remote possibility that, due to any kind of difficulty, these briquettes are replaced by other kind of biomass. Below are listed the main types of briquettes that can be used as well as other possible kinds of biomass.

- Briquettes from *Pinus* and *Eucaliptus* bark;
- Briquettes from wood other than *Pinus* and *Eucaliptus*;
- Wood chips;
- Wood;
- Charcoal;
- Sawdust;
- Coconut and Coffee bark;
- Rice and Wheat straw;

[1] http://pt.wikipedia.org/wiki/Pirapetinga

[2] http://cdm.unfccc.int/DOE/scopes.html#1

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- Sugar cane bagasse.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Table - Estimated emissions reductions from the project

Years	Annual estimation of emission reductions over the chosen crediting period*
2008	25166
2009	60398
2010	60398
2011	60398
2012	60398
2013	60398
2014	60398
2015	35232
Total estimated reductions (tonnes of CO_2)	422788
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2)	60398

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

The project will not receive any public funding from Parties included in Annex I of the UNFCCC.

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

Debundling is the fragmentation of a large project activity into smaller parts. As the project developer do not act as a participant in another CDM project, it's clearly demonstrated that the present project activity is not a debundling of a larger CDM project.

SECTION B. Application of a baseline and monitoring methodology

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

The project uses approved methodology AMS-I.C., Thermal energy for the user with or without electricity, Version 12, valid from 10 Aug 07 onwards.

B.2 Justification of the choice of the project category:

The project qualifies as a small-scale project activity (SSC) as the thermal generation capacity of the project is lower than the type I threshold of 45 MW_{th}, as specified by the manufacturer. Section B.6.1 shows further information regarding thermal power of this project and Annex 3 shows the technical description of the equipment involved in this project activity.

The project activity consists of an installation of two new biomass boilers that will replace 4 fuel oil boilers. Therefore, an indirect fuel switch will take place, from a high carbon intensive fossil fuel to a renewable fuel for thermal energy generation, thus falling under the type I SSC project category.

As the thermal generation capacity is specified by the manufacturer, according to the methodology it shall be less than 45 MW_{th}. The two boilers that will be installed are capable of producing 22 tonnes of steam per hour each. The production of steam is in the form of low-pressure steam, resulting in a capacity of less than 20 MW_{th} each. Additional technical information from the boilers can be found in Annex 3. Therefore, this project activity is applicable to the chosen methodology because in comprises the installation of less than 45$MW_{th.}$

The two new boilers installed as a result of this project activity was not considered an addition of renewable energy units because there will not be an increase in energy production. This project activity can not be considered as a retrofit or modification of the old boilers because it involves the installation of new boilers. Therefore, the conditions and assumptions for these two cases as described in the methodology will not be applied for this project.

The Project therefore fulfils the eligibility requirements for the AMS-I.C. methodology.

B.3. Description of the project boundary:

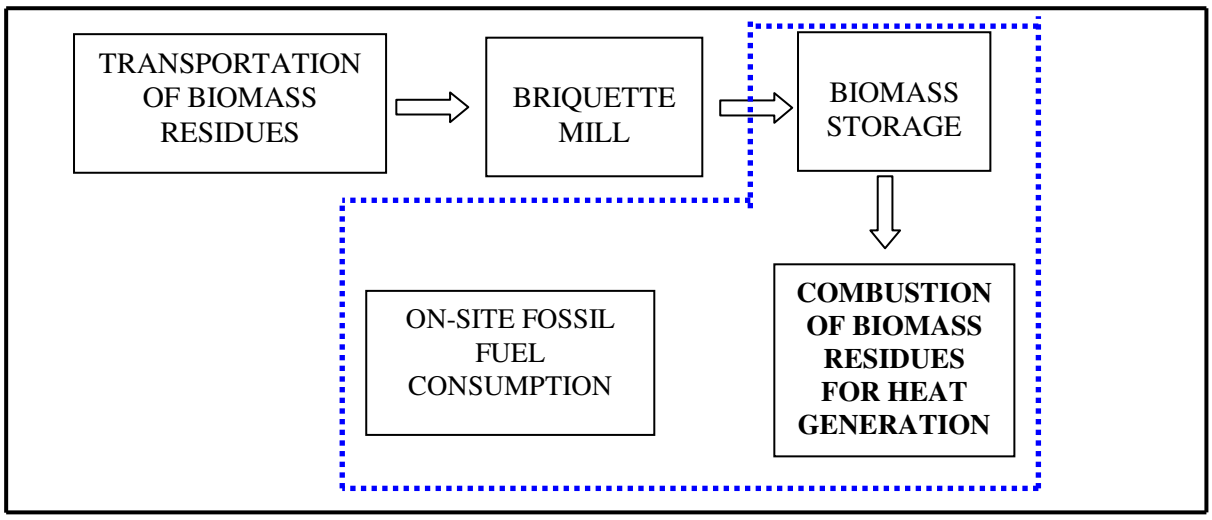
According to the AMS-I.C. methodology used for this project activity, the project boundary is the physical, geographical site of the renewable energy generation. For this project activity, this includes emissions reductions associated with the steam generation.

According to the "General guidance" from "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories"[3], the project boundary shall be limited to the physical project activity.

[3] http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_gnal_guid.pdf

Therefore, the physical boundary of the project activity comprises only the warehouses that shelter the old boilers, the new boilers and the respective fuel to each (fuel oil and biomass).

Source		Gas	Included?	Justification / Explanation
Baseline Scenario	Fossil fuel combustion in boiler for heat generation	CO_2	**Yes**	**Included, the main emission source.**
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of the biomass residues	CO_2	No	Excluded for simplification. This is conservative.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activity	On-site fossil fuel and/or electricity consumption	CO_2	**Yes**	**Included, the main emission source.**
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass residues	CO_2	No	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Combustion of biomass residues for heat generation	CO_2	No	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Biomass storage	CO_2	No	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.



B.4. Description of baseline and its development:

The simplified baseline scenario, for renewable energy technologies (i.e. biomass) that displace technologies using fossil fuels (i.e. fuel oil), is the fuel consumption of the technologies that would have been used in the absence of the project activity (i.e. fuel oil) times an emission coefficient for the fossil fuel displaced.

Three alternatives to the project scenario are considered:

Alternative 1: The proposed project activity without CDM. The installation of new boilers to use a renewable fuel (i.e. biomass), the changes performed in the company to a fuel switch from a fuel they have been using since the operation start of the facility and the new logistics to transport the biomass, implemented without considering CDM revenue.

Alternative 2: Continuation of the current practice. The steam will continue to be generated from a fossil fuel (fuel oil).

Alternative 3: Installation of a new boiler burning a less carbon intensive fossil fuel (i.e. natural gas). According to the Brazilian Energetic Balance[4], natural gas is one of the most used fuel in the pulp and paper sector of Brazil.

Assessment of Alternatives:

Alternative 1:

This alternative would face investment and other barriers outlined in section B.5 below, therefore is not considered viable.

Alternative 2:

[4] http://www.mme.gov.br/site/menu/select_main_menu_item.do?channelId=1432&pageId=10780 (2005 data)

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Continuation of the current situation would require no investments on the part of the project developer, and would not face any technological or other barriers. The steam/heat would continue to be generated through fuel oil, as the company has always been done since its operation begun (as discussed in section B.5 below).

Alternative 3:

This alternative would also face several barriers. The installation of new boilers burning natural gas is not a possible alternative because of constraints of the natural gas distribution lines. Given to that, this alternative is not considered as a possible baseline scenario.

Moreover, the natural gas usage in Brazil presents high supply risks. A recent example of the uncertainty about natural gas supply that demonstrates the interconnected nature of the supply was described in the article *"Lack of gas keep 5 thermoelectric plants from electricity generation"* (Newspaper *O Estado de São Paulo, "Sem gás, 5 térmicas estão paradas",* September 9th, 2006). The article in *O Estado de São Paulo* described a case where 5 thermoelectric plants were not able to generate electricity due to natural gas scarcity. The article stated that the plants were declared unavailable using an instrument from the electricity sector framework for the situation where power plants cannot operate due to lack of energy resource supply. In other words, when gas scarcity occurs, it affects all gas users, not just those with a direct connection to Bolivia or Campos Bay.

According to data from 2005, 46% of the Brazilian natural gas supply is imported from Bolivia[5], which shows that Brazil is vulnerable with respect to the Bolivian supply of natural gas. This vulnerable scenario worsened in 2005 with the presidential campaign of Mr. Evo Morales in Bolivia, which led to the election of Mr. Morales as President in December 2005 and to the re-nationalisation of the gas extraction industries in Bolivia. The related uncertainty surrounding the future supply of natural gas presented a barrier toward choosing natural gas as fuel in Brazilian industry in 2005.

Concern about rising gas prices also presented a barrier. Prices for natural gas in Brazil had not increased from 2003 to 2005[6] in order to foster natural gas use; however, it was understood in 2005 that natural gas prices were artificially low and could rise at any moment to correlate to the price of its main substitute fuels, such as fuel oil and diesel. Furthermore, the changing political situation in Bolivia in 2005 created a great deal of uncertainty about future prices for Bolivian natural gas.

As a result, supply uncertainties and price volatility for natural gas in Brazil posed an undesirable burden on project developers who considered the use of natural gas, making the option unattractive to industry.

Furthermore, Alternative 1, installation of new boilers burning biomass, faces more barriers than Alternative 2, and therefore is unlikely to implemented in the absence of the CDM (i.e. is not the baseline scenario).

[5] Informe Setorial, Área de Infra-Estrutura, May 2006 No. 1, Banco Nacional de Desenvolvimento Econômico e Social (of Brazil)

[6] http://www.ben.epe.gov.br/BEN2006/BenCapitulo07.asp, Balanço Energético Nacional (Brazilian Energy Balance 2006)

Alternative 2, continuation of the current situation, would face the least barriers, and is therefore identified as *the baseline scenario*. In the baseline, the reference boiler efficiency will be 90.7%. See section B.6.2 for details in how this value was reached.

The following table provides the key information and data used to determine the baseline scenario:

Information	Unit / Type	Data Source
Historical consumption of fuel	ton	Project developer monitoring
Natural gas distribution net of Minas Gerais State	maps	Gasmig (Minas Gerais gas company) website[7]
Trends in steam generation from Brazilian pulp and paper plants	text	Brazilian Energetic Balance
Proposals from manufacturers of boilers and suppliers of biomass	text	Project developer

The fuel oil boilers will be kept as backup. In annex 3 is stated the technical description of the four fuel oil boilers. As can be seen, the oldest boiler is from 1997 (10 years old). As this kind of boiler has an estimated lifetime of about 30 years (information from common boilers engineering practices in Brazil), we expect that the boilers would not have to be replaced in at least more 20 years.

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 small-scale CDM project activity:

The event that marks the starting date of the project activity is the communication with the Carbon Advisory Company (i.e. EcoSecurities). As the decision of switching the fuel consumed in the boilers was only possible with carbon credits revenues, EcoSecurities provided the means to fulfill the fuel switching goal. Although the construction of the project activity is estimated to begin in February 2008, as the conversation with this company started in March 2007 and the first agreement to sign a contract (thus the decision to move forward with the project) was in 09 May 2007, this is considered the "real action" date and the actual starting date of the project as a conservative approach. Therefore, this project is in compliance with paragraph 13 of Decision 17/CP.7.

The project activity consists of reducing carbon dioxide emissions by switching from fuel oil to biomass to generate steam/heat in boilers.

The project activity could not be carried out without carbon credit revenue as it implies high investment costs and high operational costs. It is demonstrated in this section that the proposed project activity is additional as per options provided under attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Three alternatives are evaluated in order to demonstrate the baseline scenario, as shown in section B.4 above. However, Alternative 3 (installation of natural gas boilers) is not a viable alternative, because there is no pipeline to distribute natural gas in this city and to build this pipeline would involve much more risks, capital and work to this project activity, what makes this alternative non-realistic.

In order to demonstrate that the proposed project activity is additional to the baseline scenario chosen, a Barrier Analysis is performed below.

[7] http://www.gasmig.com.br/redegasmig/tracadorede.asp

Table: Scenarios considered in barrier analysis.

Scenarios	Description
Alternative 1	Proposed project activity without CDM
Alternative 2	Continuation of current practice

Investment Barrier

- *Alternative 1*: the investment to perform the necessary modifications is risky, compared to other types of investment found in the host country, as it will not result in any financial gains for the company. It would be very difficult for the company to invest this sum of money in these new installations without any incentive, such as CDM revenue. As can be seen below, the Net Present Value (NPV) without carbon credits revenues is negative. Even in the best case, with an increase of 3% in total spent with fuel oil, the NPV would still be negative. This is an investment that the company would not perform without any guarantees, and the carbon credits revenues offered some security to them. Please refer to Annex 3 for additional information regarding the Financial Analysis. Therefore, *investment poses a major barrier for this alternative*.
- *Alternative 2*: there is no investment needed for this alternative. The continuation of current practice would require no investments or changes in the steam/heat production patterns. Moreover, the fuel oil boilers are new and have a long lifetime. Therefore, there are no *investment barriers for this alternative*.

Table: Sensitivity analysis of project activity without CDM (Alternative 1).

Sensitivity Analysis - Without Carbon (R$)				
Data	**%**	**Source**	**NPV 10yr**	**Necessary variation To NPV = Zero**
Discount Rate (Selic Tax)	-4 pp	calculated	**(4,782,666)**	**-72,3%**
Total spent with biomass	-3%	calculated	**(1,606,419)**	**-4,1%**
Total spent with fuel oil	3%	calculated	**(1,540,756)**	**4,1%**
Investment	-10%	calculated	**(5,011,232)**	**-72,6%**

Note: Please refer to Annex 3 for a more detailed discussion of the variation of these parameters.

Table: Comparison of NPV.

Carbon Credits Impact on CDM (R$)	
Data	**NPV 10yr**
NPV without carbon	**(5,811,232)**
NPV with carbon	**2,435,500**

Note: Please refer to Annex 3 for more detailed information regarding the financial analysis.

Technological Barrier

- *Alternative 1*: The use of biomass briquettes to produce energy in Brazil is not well known. For example, according to ANEEL (Brazilian Electricity Agency, responsible for registering all the thermoelectric plants) data base, up to the date this PDD was finished, there was no thermal plant registered there using briquettes as fuel. There was some few plants using biomass residues as fuel, but usually residues generated on site by the industrial process (E.g.: sugarcane bagasse, rice husk, or wood residues).

  The onsite generation of residue can give considerable security on supply of fuel. If most of the biomass used as fuel is self supplied, it depends only on you to generate the energy that you need.

One of the barriers for this project scenario is that 100% of biomass fuel consumed will be supplied by third parties, generating big uncertainty about supply security. Two other factors that reinforce the problems of security supply are the fact that the briquette and biomass suppliers are usually small companies, with no supply guarantee. Most of small companies in Brazil have poor management capacity, are quite informal, and close the door before 3 years of operation. According to SEBRAE (National Brazilian centre to support micro and small business) statistics[8], 35 % of small companies close the doors with 1 year of operation, and this number increase to 56% after 3 years, and the mains reasons are :lack of business experience, short planning period, no access to capital (for investments and first operational costs)[9].

Another important fact on this briquettes and biomass supply activity is the small number of suppliers that also increase the risk of continuous supply. Even if statistics demonstrate that there are a lot of unused biomass residues in the country, the difficulties to access it and the small number of suppliers are a risk for continuous supply. Specially, to increase the security of biomass supply, the Project developer may need to look for suppliers from sites far way from project activity, increasing the costs, and making the logistics more complex.

Given diversity of biomass residues used to produce briquettes, or used directly in the boiler, there is an heterogeneity of fuel supplied, leading to adjustments of boiler to operational sets that decrease the efficiency but increase the flexibility, or the opposite (efficient process, but with small flexibility). Thus, the lack of standards for biomass fuels (no standard for humidity, ashes, calorific values, volatiles, sulphur, nitrogen, etc.) generates great uncertainty for the operation of the boiler.

The preference of using biomass briquettes was due to the small volume of this fuel when compared to biomass residues, because it implies in lower risks and costs of transportation (although, if necessary, biomass may also be used). But when biomass briquettes enter the company site, it must be processed (shredded) before the biomass can be burnt in the boiler. Therefore, a whole new process must be created to the logistics of this processing. The project developer is not accustomed with the handling and storage of biomass and briquettes. Moreover, suppliers of briquettes are not well established in Brazil. As said, briquette usage is not spread out over Brazil, so there is a risk of supply associated with this fuel. If the supplier is not well chosen, the project developer can run out of fuel to burn in the boilers. Summarizing, *technology poses a barrier for this alternative.*

- *Alternative 2*: there is no different technology needed for this alternative. The continuation of current practice would require no new technology or changes in the steam/heat production patterns. Therefore, there are no *technological barriers for this alternative*.

No other barriers could be identified for either scenarios.

Table: Summary of barrier analysis.

Barriers	1 – Proposed project activity without CDM	2 – Continuation of previous activities
Investment barrier	**Yes**	No
Technological barrier	**Yes**	No

[8] http://fammelo.sites.uol.com.br/mortalidade/MORTALIDADE.htm

[9] http://www.upf.br/cepeac/download/rev_n14_2000_art5.pdf

Other barriers	No	No

Since the project activity is subject to barriers while the current steam production system is not, **the baseline is confirmed as the continuation of current steam production practices with fuel oil and, therefore, the Project is additional.**

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The steam used in the productive process in the project developer's facility (a pulp and paper industry) is currently being produced through burning of fuel oil, an extremely carbon intensive fossil fuel. The technology used in this project activity aims to generate the steam/heat needed for the operation of this pulp and paper factory using biomass as fuel. Therefore, the fuel oil boilers will be switched by biomass boilers to produce renewable energy. The baseline is defined as the combustion of fuel oil by four boilers to produce steam for the project developer facility production line. This project activity involves only fuel switch in the steam generation. The pattern of electricity supply to the company will remain the same, with no emission reductions being requested for electricity. The calculations of emission reductions resulting of fuel oil displacement is shown in section B.6.3.

The Methodology AMS-I.C. is applicable to the proposed project activity, as it is applicable to renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Electrical and/or mechanical energy are not included in this project activity.

According to the technical description of the new biomass boilers, sent by Aalborg Industries in their proposal to INPA - Indústria de Embalagens Santana S/A, each boiler has a capability to produce 14,271,400 kcal/kg of steam, resulting in approximately 16 MW_{th}. The two boilers, together, have a capacity of around 32 MW_{th}, therefore lower than the 45MW_{th} threshold.

Project emissions:

Conforming to the guidelines and rules for small-scale project activities, the emissions related to production, transport and distribution of the fuel used in the power plants in the baseline are not included in the project boundary, as these do not occur at the physical and geographical site of the project.

Moreover, the fuel oil used in the baseline was also transported by trucks to the project activity site. Therefore, as a small scale approach, both these parameters will not be accounted for.

The use of the old fuel oil boilers as backup will be monitored.

Baseline emissions:

As this project activity comprises a renewable energy technology that displaces a technology using fossil fuel, the simplified baseline is the fuel consumption of the technology that would have been used in the absence of the project activity (i.e. boiler burning fuel oil) times an emission coefficient for the fossil fuel displaced (i.e. emission coefficient for fuel oil). The latest IPCC default values for emission coefficients are used (i.e. IPCC 2006).

$BE_y = (HG_y * EF_{CO2} / \eta_{th})$

Where:

BE_y	Baseline emissions in the year *y* (t CO_2e);
HG_y	Net quantity of steam/heat supplied by the project activity during the year *y* (TJ)
EF_{CO2}	CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant (i.e. fuel oil) (tCO_2 / TJ)
η_{th}	Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity

The amount of energy (steam) needed in the baseline is 24.45 MW. This is equivalent to 2.45 tones of fuel oil per hour. The efficiencies of the boilers used in the baseline are from inspection made by the manufacturer.

Leakage emissions:

Neither is the new energy generating equipment transferred from another activity nor is the old energy generating equipment transferred to another activity.

The four old boilers will be shut down and stored on-site. However, if at any moment the old boilers have any other use, it will be accounted for during verification. The use of these boilers will be supervised.

Moreover, the company was concerned with the possibility to dislocate biomass residues that was already been replacing fossil fuels in other places. The suppliers of biomass had to guarantee to the company that they had an excess of biomass and no other client of them was going to have their supply pattern changed. This situation is expected to endure and will be monitored during the entire crediting period.

According to Attachment C to Appendix B (Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories), there are three types of emission sources that are potentially significant. These possible sources of emissions are addressed below.

1- Shifts of pre-project activities: In the first moment, when briquettes will be bought from suppliers, there are guarantees from the suppliers that they are totally in accordance with national and regional legislations, resulting in no deforestation or no decrease of carbon stocks from any kind due to shifts of pre-project activities. If the type of biomass used or the suppliers are changed, INPA - Indústria de Embalagens Santana S/A will check if the new sources still in accordance with national and regional legislations in order to continue neglecting this emission source.

2- Production of Biomass: In this first moment, as there is no production of biomass exclusively for this project, this emission source was neglected.

3- Competing uses for the biomass: The surplus of the biomass being used in the project activity will be evaluated annually to demonstrate that the quantity of available biomass in the region is at least 25% larger than the amount of biomass used in this project. For this PDD purposes, this proof is given in the form of the production of briquettes from the suppliers.

INPA - Indústria de Embalagens Santana S/A was already concerned with the competing use for the biomass. Therefore, the company requested, from possible suppliers, a guarantee that their actual supply was not going to be affected. This guarantee was provided and the company moved forward with the

project. As the project developer will purchase biomass from some suppliers that already purchase their biomass from several regions of Brazil, the consumption of biomass from INPA - Indústria de Embalagens Santana S/A were divided between these several regions, which made difficult to occur a negative effect from competing uses for the biomass.

Therefore, leakage is considered zero.

Emission reductions:

According to the Methodology the greenhouse gas emission reductions achieved by the project activity during a given year "y" (ER_y) shall be estimated as follows:

$ER_y = BE_y – PE_y – LE_y$

Where:

ER_y	Emission reduction in the year y (t CO_2e);
BE_y	Baseline emissions in the year y (t CO_2e);
PE_y	Project emissions in the year y (t CO_2e);
LE_y	Leakage emissions in the year y (t CO_2e).

As Project Emissions and Leakage Emissions are Zero, the emission reduction of this project activity can be calculated as a result of the Baseline Emissions only. More details regarding the calculations of emission reductions from the project activity are shown in Section B.6.3.

The specific fuel consumption related to the present project activity is 0.22 tonnes of biomass per MWh steam. In the baseline, the specific fuel consumption was 0.10 tonnes of fuel oil per MWh steam.

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

Data / Parameter:	SBC
Data unit:	Tonnes of biomass/MWh steam
Description:	Specific biomass consumption per unit of thermal energy generated
Source of data used:	Project developer estimative
Value applied:	0.22
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value reached from the fuel oil energy consumption from the baseline using the Calorific value from briquettes.
Any comment:	

Data / Parameter:	SFC
Data unit:	Tonnes of fuel oil/MWh steam
Description:	Specific fuel oil consumption per unit of thermal energy generated
Source of data used:	Project developer estimative
Value applied:	0.10
Justification of the	Value reached from the monitoring of fuel oil energy consumption from the

choice of data or description of measurement methods and procedures actually applied :	baseline.
Any comment:	

Data / Parameter:	EF_{CO2}
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor per unit of energy of fuel oil
Source of data used:	IPCC 2006
Value applied:	77.37
Justification of the choice of data or description of measurement methods and procedures actually applied :	The methodology suggested the use of standard values from IPCC 2006 in estimatives.
Any comment:	

Data / Parameter:	η_{th}
Data unit:	-
Description:	Efficiency of the fuel oil boilers used in the baseline
Source of data used:	Manufacturer
Value applied:	90.7%
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value is a result of the measurement performed by the manufacturer of the boilers in October 2007.
Any comment:	As there are four fuel oil boilers in the baseline, the value used in this parameter is the highest value of the four.

B.6.3 Ex-ante calculation of emission reductions:

As the project activity emissions from this project activity is zero (the project will burn renewable fuel) and there is no leakage effects applied in this case as discussed in section B.6.1, the emission reduction is equal to the baseline emissions, as follows:

$$ER_y = BE_y = HG_y \times EF_{CO_2} \div \eta_{th}$$

Where:

ER_y Emission reduction in the year y (t CO_2e)
BE_y Baseline emissions in the year y (t CO_2e)
HG_y Net quantity of steam/heat supplied by the project activity during the year y (TJ)
EF_{CO2} CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline plant (i.e. fuel oil) (tCO_2 / TJ)

η_{th} Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity

Table: Values used to estimate emission reductions based on previous data from project developer.

Data	*Symbol*	*Unit*	Total
Steam Production	HGy	TJ	708
Oil Consumption	-	tonne	19,600
Estimation of biomass consumption	-	tonne	43,713
CO_2 emission factor	EF_{CO2}	tCO_2 / TJ	77.37
Efficiency	η_{th}	-	90.7%

Table: Estimation of baseline emissions.

Average baseline emissions (BE)	tCO_2/year	**60398**

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

Table – Forecasted values for each type of emissions.

Years	**Estimation of project activity emissions (tonnes of CO2 e)**	**Estimation of baseline emissions (tonnes of CO2 e)**	**Estimation of leakage (tonnes of CO2 e)**	**Estimation of overall emission reductions (tonnes of CO2 e)**
2008	**0**	25,166	**0**	25,166
2009	**0**	60,398	**0**	60,398
2010	**0**	60,398	**0**	60,398
2011	**0**	60,398	**0**	60,398
2012	**0**	60,398	**0**	60,398
2013	**0**	60,398	**0**	60,398
2014	**0**	60,398	**0**	60,398
2015	**0**	35,232	**0**	35,232
Total (tonnes of CO_2)	**0**	422,788	**0**	422,788

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

B.7.1 Data and parameters monitored:

Data / Parameter:	HG_y
Data unit:	TJ
Description:	Net quantity of steam/heat supplied by the project activity during year *y*
Source of data to be used:	Project developer monitoring
Value of data	708
Description of measurement methods and procedures to be applied:	The steam flow will be metered by certified and calibrated equipment that measures the mass steam flow (tons per hour). To transform the mass flow to energy, temperature and pressure of steam will be also measured, to calculate the steam enthalpy. Based on this, the amount of steam will be multiplied by the steam enthalpy, to reach the amount of energy generated.
QA/QC procedures to	The output of steam will be cross-checked with the input of fuel to check if the

be applied:	measured value is in an acceptable range.
Any comment:	The amount of energy will be metered indirectly. The steam flow will be multiplied by the steam enthalpy to reach the steam production in TJ. For simplification, the feed of water will be considered as constant, at 20ºC and 1 atm.

Data / Parameter:	Biomass
Data unit:	Tonnes
Description:	Amount of biomass burned in the boiler
Source of data to be used:	Monitoring by the Project Developer
Value of data	43,713
Description of measurement methods and procedures to be applied:	The biomass consumption in the boiler will be monitored. The equipment will be selected after the selection of the boiler and associated equipment. Changes in the biomass types will be also monitored.
QA/QC procedures to be applied:	Any weighing devices will be calibrated according to manufacturer's recommendations. The monitored consumption of biomass will be periodically cross checked with supplier invoices.
Any comment:	The project developer is investigating different sources of biomass to use in case of they are short of briquettes supply; there is no estimative of when of if this may happen. Changes in biomass will be monitored as required by the methodology.

Data / Parameter:	Fuel oil
Data unit:	Tonnes
Description:	Amount of fuel oil burned
Source of data to be used:	Monitoring by the Project Developer
Value of data	19,600
Description of measurement methods and procedures to be applied:	The fuel oil consumption in the boiler will be monitored by stock control.
QA/QC procedures to be applied:	Fuel oil consumption will be checked with purchase invoices on a periodic basis.
Any comment:	There is no intention to burn fuel oil in the biomass boilers. However, the old fuel oil boilers will be kept as backup and their use of fuel oil will be monitored as stated above.

B.7.2 Description of the monitoring plan:

The monitoring of the project is not fully established as neither the manufacturer of the boilers nor the supplier of the biomass have been finalised. Upon selection and installation of the boiler equipment, the fuel consumption monitoring equipment will be finalised. However, the company has already started the description of the procedure of the project activity's monitoring, together with EcoSecurities.

The company already has an ISO 9001:2000 system obtained in 2002. As a result, the site has existing systems and procedures that can be applied to the CDM monitoring requirements (managing equipment,

data and records). EcoSecurities specialized monitoring team will assist INPA - Indústria de Embalagens Santana S/A in establishing an adequate monitoring for this project activity at a point where the boiler equipment (including fuel supply system) has been selected. The possibility to include the monitoring of the project activity in the ISO 9001 certification will be considered.

All CDM data to be monitored will be collected and quality checked by the site's Department of Quality Management and Environment (*Departamento de Gestão da Qualidade e Meio Ambiente*). This will include checks for completeness of data and any cross checks to identify unusual or unexpected values. EcoSecurities will assist in the development of the monitoring system to ensure the quality of the monitoring data by adequately training the personnel involved in data and record collection and in conducting additional quality assurance of the data.

The maintenance of the equipment and the training of all personnel involved with monitoring at INPA - Indústria de Embalagens Santana S/A are according to the schedule recommended by NR-13[10] (*Norma Regulamentadora* number 13), a regulation from Work and Employment Ministry of Brazil (*Minstério do Trabalho e Emprego*). This regulation focuses specifically on boilers and states the best practices in Brazil.

Although all data are accessible by the entire company through corporate network, only the Department of Quality Management and Environment has the access to change data in order to minimize the risks of wrong data. Data in paper will be kept for intra-verifications time (generally, one year) and digital data will be kept for the entire crediting period plus two years.

The fuel oil boilers use as backup will be monitored and accounted as project emissions, whenever needed. The use of fuel oil will be monitored by stock control, cross-checking with receipts.

The leakage will be monitored according to the Attachment C to Appendix B (Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories). The monitoring of this information will vary depending on the type of biomass being used. For briquettes (the type of biomass that will be used in the first moment), it was already demonstrated on the PDD that use of this type of biomass do not lead to leakage. In case of eventual changes in the type of biomass used, the monitoring can consists of demonstrating that the new biomass consumed can attend the three requirements to not have leakage. The three requirements are described in section B.6.1

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

The baseline study and the monitoring methodology were concluded on 23/08/2007 (DD/MM/YYYY). The entity determining the baseline study and the monitoring methodology and participating in the project as the Carbon Advisor is EcoSecurities, listed in Annex 1 of this document.

Personnel responsible for the baseline and monitoring of this project:

Mr. Thiago Viana	EcoSecurities Brasil Ltda.	Project Manager	Thiago.viana@ecosecurities.com
Mr. Luis Filipe Kopp	EcoSecurities Brasil Ltda.	Monitoring Manager	Luis.kopp@ecosecurities.com

[10] http://www.mte.gov.br/legislacao/normas_regulamentadoras/nr_13.asp

CDM – Executive Board

Mr. Pablo Fernandez	EcoSecurities Brasil Ltda.	Team Leader	Pablo@ecosecurities.com
Mr. Rodrigo Braga	EcoSecurities Brasil Ltda.	Technical Reviewer	Rodrigo.Braga@ecosecurities.com

Contact: EcoSecurities Brasil Ltda., Rua Lauro Müller 116, 4303/4304, Botafogo, Rio de Janeiro, Brazil. CEP: 22290-160. Phone: +55 (21) 2546-4150

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:

09/05/2007 (DD/MM/YYYY) (date of signing an Emission Reduction Purchase Agreement)

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

More than 21 years

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

C.2.1. Renewable crediting period

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

The crediting period will start on 01/10/2008, or on the date of registration of the CDM project activity, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years

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

INPA - Indústria de Embalagens Santana S/A is in compliance with all laws and regulations applicable. All applicable licenses were obtained and all conditions were obeyed. The State Environmental Authority, i.e. Fundação Estadual do Meio Ambiente (FEAM), from Minas Gerais state, requests Environmental Impact Assessment (EIA) for all activities with a high potential to harm the environment. However, as this project does not have a high potential to harm the environment, an EIA was not requested for this project activity.

The company already has a valid Operational Licence issued by FEAM, stating that they are in compliance with environmental laws. The changes in the steam production were already communicated to FEAM and further communications will follow this one to keep this environmental authority up to date with everything related to this issue.

Therefore, given that the project activity will not induce significant impacts, no impact assessment was undertaken.

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:

No significant negative environmental impacts are expected from this project activity.

SECTION E. Stakeholders' comments

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

According to Resolution #1 dated December 2nd, 2003 from the Brazilian Inter-Ministerial Commission of Climate Change (Comissão Interministerial de Mudança Global do Clima - CIMGC), any CDM project must send a letter with a description of the project and an invitation for comments by local stakeholders. In this case, letters were sent to the following local stakeholders:

- City Hall of Pirapetinga;
- Chamber of Deputy of Pirapetinga;
- District Attorney (known in Portuguese as Ministério Público, i.e. the permanent institution essential for legal functions responsible for defending the legal order, democracy and social/individual interests);
- Environment agencies from the State and Local Authority;
- Brazilian Forum of NGOs;
- Local community association(s).

Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation.

E.2. Summary of the comments received:

To date, no formal comment has been received from stakeholders.

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:	INPA - Indústria de Embalagens Santana S/A
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URL:	www.inpa-embalagens.com.br
Represented by:	
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Salutation:	Mr.
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Project Annex 1 participant:

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Represented by:	
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Salutation:	Mrs.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funding from Annex 1 parties.

Annex 3

BASELINE INFORMATION

FINANCIAL ANALYSIS:

Investments	Unit	Source	NPV 10yr
Civil work, Equipments and Installation	R$	client	-8,000,000
Investments NPV	R$	calculated	**(8,000,000)**

Operational	Unit	Source	NPV 10yr
Total spent with fuel oil (estimated)	R$/yr	client	102,003,477
Total spent with biomass (estimated)	R$/yr	estimated	-100,435,066
Operational NPV (with perpetuity)	R$	calculated	**2,188,768**

DISCOUNT RATE:

The discount rate used in the first published version of the financial analysis was 12.5%. This rate was based on the average SELIC rate (i.e. the overnight lending rate between the Central Bank of Brazil and other banks, see www.bcb.gov.br) over the first half of 2007. This benchmark is actually much more conservative than necessary. The SELIC rate fluctuates significantly over time (as it is a very short term rate), therefore it is usual practice to take a longer term, three-year average, as that is more representative. In the case of this project, the project starting date is May 2007 (date of ERPA signature). The average SELIC rate for the 3 preceding years (i.e. May 2004 to April 2007) was 16.52%. This is the correct benchmark, which should have been applied. However, the incorrect rate of 12.5% has been kept in the analysis arbitrarily, to demonstrate beyond avoidance of all doubt that the project is additional.

SENSITIVITY ANALYSIS:

The parameters presented in section B.5 for the sensitivity analysis were chosen because of their potential variation over the project's crediting period. Following this rationale, an explanation of how the potential variation was assessed can be found below.

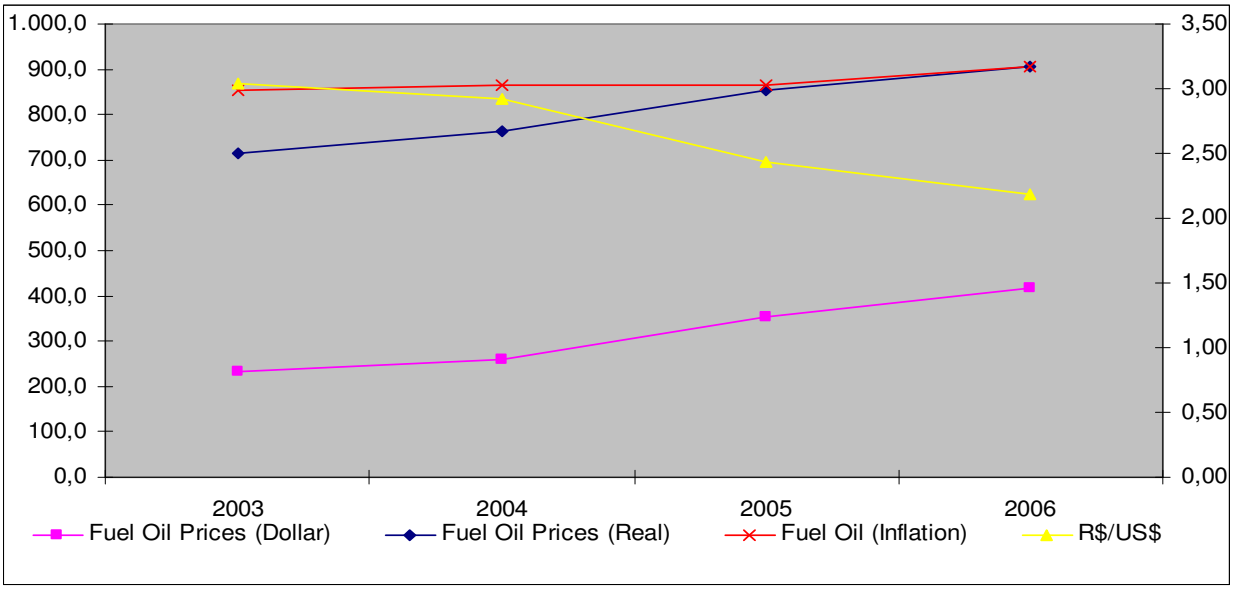
SELIC Rate or Discount Rate - The lowest value of the SELIC rate (i.e. overnight value) during the three-year period previous to the project activity (May 2004- April 2007) was 12.43% (a variation of 4 percentual points from the average 16.52%), . Given that this is the lowest single data point over this period, this would be the maximum variation possible (and extremely unlikely to occur as the SELIC rate is usually averaged over a longer time period). It is worth mentioning that the benchmark is surpassed only with a decrease of around 72% of this parameter. The analysis shows that even with this extremely unlikely discount factor applied the project is still additional.

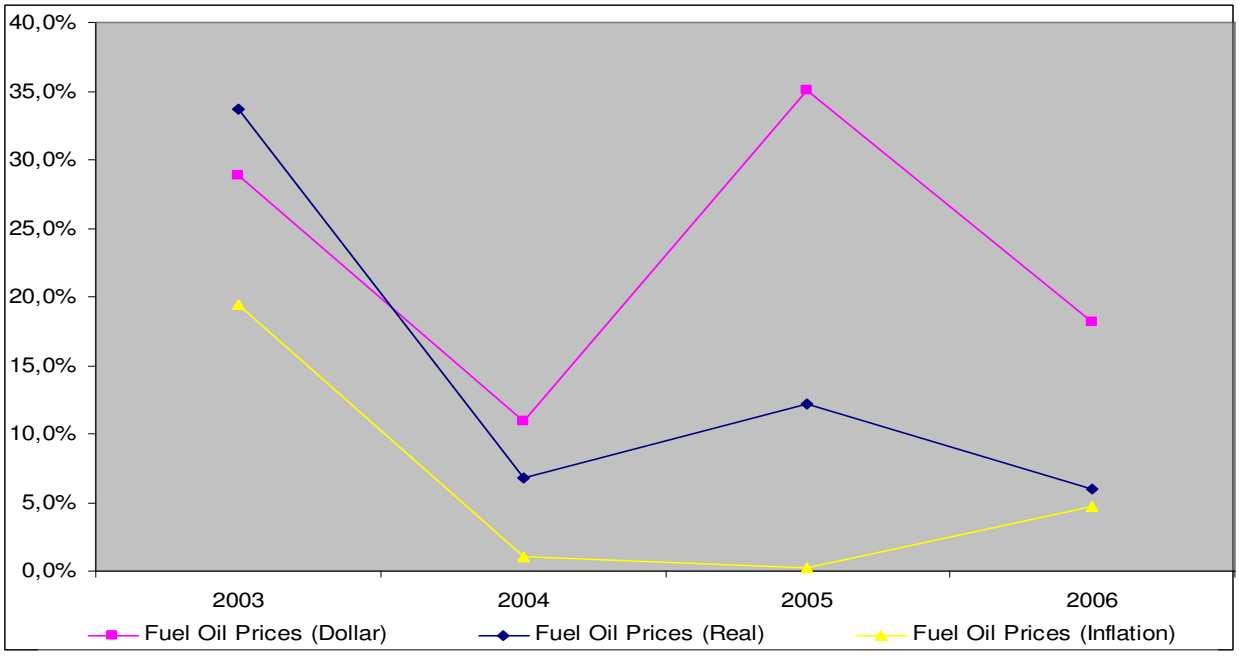
Fuel Oil Prices - The variation of fuel oil prices in the three previous years (i.e. 3 years prior to the start date of the project, May 2007) of the project activity (according to BEN (2007) – Brazilian Energetic Balance, www.ben.epe.gov.br/ - latest data available) was 3%.

This variation was determined by correcting the oil price in US dollar to Real in order to determine the actual price to the project developer who is purchasing fuel denominated in local currency. Apart from exchange rate corrections, the fuel price has also been corrected with the inflation rate in order to be consistent with all other parameters used in the financial model that are also inflation-corrected.

Exchange rate corrections are essential to apply since the exchange rate between the US Dollar and the Brazilian Real finally determines commodity prices in local currency. Oil prices at international exchanges (denominated in US$) have been increasing at high rates, but such a price escalation has not been imported into the Brazilian economy due to the appreciation of the real over time, keeping local price escalation low.

The following two charts show the oil prices at international markets as well as the corresponding oil price in Brazil. It can be observed that the price escalation in Brazil has been much lower as compared to international markets where oil is traded in USD. Moreover, the chart also shows the oil price in Brazil has increased much more at the beginning of the assessment period as compared to the most recent years of the assessment period so that a further slowdown of price escalation can be expected for the future.





Such a slowdown in oil the price escalation in Brazil can be further substantiated by the trend of the local currency which has been appreciating over the past years against the US Dollar, making imports cheaper and avoiding import of inflation from other economies. It is not unlikely that the Real continues to appreciate against the Dollar since the formation of the European Monetary Union has put pressure to the Dollar and the US government favours a weaker Dollar in order to get control over its ever increasing trade deficit.

Considering the trends in the fuel oil prices as well as the trend of a appreciating currency, at the time of making the decision to go-ahead with the project it was not expected that the prices would increase significantly above the current levels. According to national and international reports (IEA 2006)[11], with high fuel prices expected to remain in place in the short term, the trend would be a decrease on the demand side, thus, a price decrease in the medium term. According to IEA (2006): "*Real oil and gas prices are assumed to remain high in 2006 and 2007 and then to fall back gradually over the next five years or so…*". This perspective is corroborated by a series of articles published in 2007 from different authors[12].

High oil prices also promote structural adjustments in the energy sectors and bring along more competition between oil and alternative fuels and alternative energy technologies which in turn result in the medium to long term in a downward pressure to oil prices.

The fuel oil price would need to increase at least 6% (around 4% using the 12.5% SELIC tax) above the inflation to reach a NPV equal to zero. Given the views on the impact of supply and demand on fuel pricing it was viewed as improbable that the prices would increase as significantly along a time line of 10 to 20 years.

Biomass Prices - The variation of biomass prices in sensitivity analysis was the same variation as fuel oil. This was motivated by the analysis of historical prices from biomass and fuel oil, showing same tendency of variation throughout the years.

Given the continuous increase of biomass demand in the country, strong falls in the biomass prices are not expected, and perhaps, it may even increase. The reason for an increase of biomass prices is what people are calling "Forestry blackout". In the last five years, the consumption of forestry products have been bigger than the offer and the re plantation. Thus, it is expected that in short and medium term, while the biomass stocks are not replaced, the biomass prices (including biomass residues and briquettes) may be stable, or even increase. [13]

Considering the stable Brazilian economy in the last years, and given that the average increase of prices to make the NVP equal to zero is twice the average increase in the last years, it is not expected that the price will have a variation twice bigger than recently. It is worth mentioning that the benchmark is surpassed only with a decrease of around 6% (around 4% using the 12.5% SELIC tax) of this parameter. Thus, variations above the values presented in the sensitive analysis are not expected.

[11] "World energy Outlook 2006", report prepared by the International Energy Agency (IEA), including a chapter specially designed for brazilian situation,

[12] http://www.iht.com/articles/2007/10/31/business/oil.php ;
http://www.nytimes.com/2007/12/06/business/worldbusiness/06opec.html?_r=1&oref=slogin

[13] http://www.bndes.gov.br/conhecimento/seminario/florestal11.pdf ;
http://www.celuloseonline.com.br/pagina/pagina.asp?iditem=869 ;
http://www.fiesp.com.br/agencianoticias/2006/08/22/7710.ntc

Investment - The variation of investments are not expected to decrease (usually the costs are higher than expected given unexpected problems). Frequently, in project evaluation, a contingency tax of 10% is used for investment estimation. The frequent value used is +10%, however, to be conservative in the sensitive analysis, the value of -10% was applied. It is worth mentioning that the benchmark is surpassed only with a decrease of around 72% of this parameter.

Operation and Maintenance - Operation and maintenance costs were considered as zero for financial analysis. This is considered conservative, as the operational and maintenance costs from biomass boilers are widely known in the host country as being higher than the same costs for fuel oil.

Please refer to Section B.5 for Baseline and Sensitivity analysis.

Fuel oil boilers data:

Data	1	2	3	4
Efficiency of fuel oil boilers	88.9%	90.7%	90.7%	88.0%
Pressure (manometric) kgf/cm2	10.55	15.82	12.24	21.00
Capacity (tonne/hour)	15.00	15.00	15.00	6.00
Operation started	jan/91 (Retrofitted in 2001)	dez/97	jul/02	nov/05
Manufacturer	ATA	ATA	AALBORG	STEAMMASTER
Model	MP-815	AWN-15	Mission M3P-15	FOUR-6000
Type	Fire-tube	Fire-tube	Fire-tube	Fire-tube
Fuel consumption per hour (average) (Kg)	596.83	555.29	1.034.07	263.81
Steam produced per hour (average) (MWh)	5.92	5.62	10.46	2.59

Biomass boilers data:

Data	1	2
Efficiency of biomass boilers	85%	85%
Pressure (manometric) kgf/cm2	21	21
Capacity (tonne/hour)	22	22
Steam enthalpy (kcal/kg)	648.7	648.7
Operation starts	Apr/08	Apr/08
Manufacturer	AALBORG	AALBORG
Model	FAM	FAM
Type	Fire-tube	Fire-tube
Capacity (kcal/kg)	14,271,400	14,271,400

Annex 4

MONITORING INFORMATION

Please refer to section B.7.2 to all necessary monitoring information.

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