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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Central Energética do Rio Pardo Cogeneration Project ("CERPA") – SECOND CREDITING PERIOD

PDD version number: 02

Date: 29/04/2011.

A.2. Description of the project activity:

Usina da Pedra is a sugar mill located in Serrana, state of São Paulo. The company is owned by the Biagi family, which is one of the most traditional producers in the sugar industry in Brazil. Pedra Agroindustrial S/A, the family company, owns three other sugarcane mills (Ibirá Mill, Ipê Mill and Buriti Mill). Usina da Pedra produces sugar and anhydrous and hydrated alcohol.

In May 2003, CERPA, which is the thermoelectric plant of Usina da Pedra, sold its first MWh to the local power utility CPFL (Companhia Paulista de Força e Luz). Currently, there is a PPA signed with CPFL, valid until 2013, to commercialize 18 MW during the season.

CERPA in 2003 upgraded its equipment, installing a new boiler and two new turbogenerators, with the objective of using bagasse more efficiently to cogenerate electricity. A more efficient cogeneration of this renewable fuel allows Da Pedra mill to sell a surplus of electricity to the grid and creates a competitive advantage. The electricity sold to the grid diversifies income to the mill and it helps meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to the environmental, social and economic sustainability by increasing renewable energy's share of the total Brazilian (and the Latin America and the Caribbean region's) electricity consumption.

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

The project contributes to the larger social welfare of the region; the entire Da Pedra complex directly employees about 3,000 workers.

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

In addition, the project sponsor is working with local communities on environmental education projects, reforestation of degraded areas, regular water quality assessment, support for environmental parks, hiring of local manpower, erosion control, and support for community agriculture.

A.3. Project participants:

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

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)	CERPA – Central Energética do Rio Pardo Ltda. (Private Entity)	No
United Kingdom of Great Britain and Northern Ireland[1]	Ecopart Assessoria em Negócios Empresariais Ltda. (Private Entity)	No
The Netherlands	BHP – Billiton Marketing AG. (Private Entity)	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 of requesting registration, the approval by the Party(ies) involved is required.		

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.:

Southeast Region/ State of São Paulo

A.4.1.3. City/Town/Community etc.:

Serrana

[1] The project participant Ecopart Assessoria em Negócios Empresariais Ltda. is a company based in Brazil, as shown in Annex 1 of this document. This company also holds a CER account in the UK Greenhouse Gas Emissions Trading Scheme Registry and became a project participant in the project through this country approval in order to use its CER account.

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

Project's geographical coordinates are:

South Latitude: 21º10'29.51"

West Longitude: 47º37'47.21"

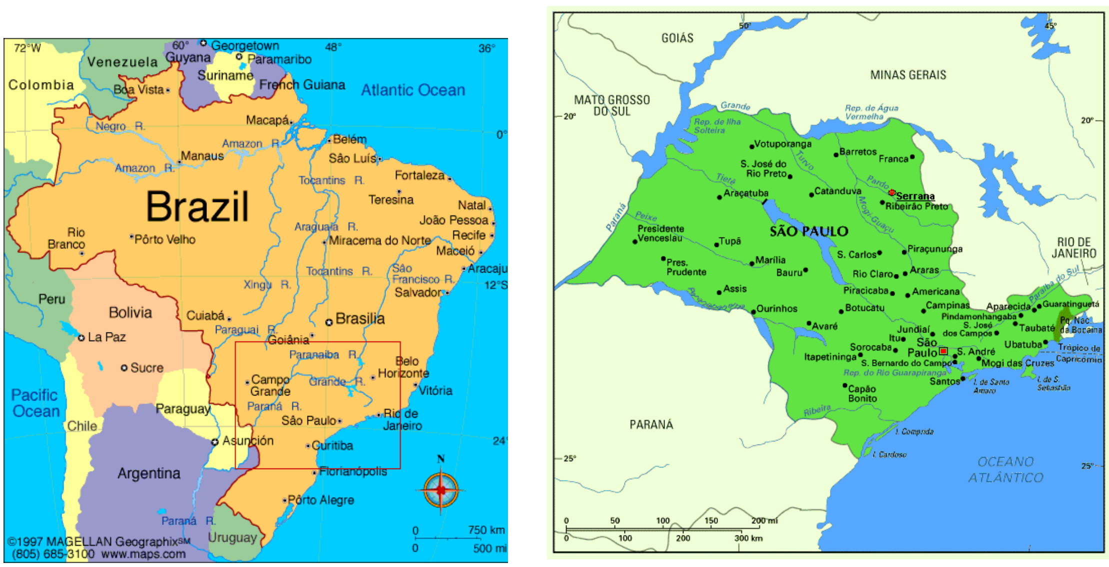

Figure 1 - Geographical position of São Paulo state and Serrana municipality (Source: City Brazil, 2008[2])

Serrana is a town of 37,500 inhabitants in the State of São Paulo. It is located in one of the main agricultural heartlands of the country (Figure 1). The sugarcane mill (Figure 2) is located near Ribeirão Preto, which is the major city of the north-eastern part of the state. Ribeirão Preto is an important road and rail hub which makes it an important distribution center for a large coffee growing and livestock-breeding area. Cotton, sugarcane, and grains are cultivated near the city, which is at the center of a region that produces 70 percent of the nation's orange juice and is considered Brazil's largest sugarcane planter and sugar and alcohol producer. In this region there are more than 40 mills, responsible for about 25% of the national production of sugarcane, sugar and alcohol. Additionally, there are a number of related industries and supply companies.

[2]Available at: <www.citybrazil.com.br>. Accessed on November 24th, 2008.

Figure 2 - Da Pedra Sugarcane Mill - Aerial Overview (Source: Usina da Pedra)

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

Type: Energy and Power.

Sectoral Scope: 1 – Energy industries (renewable - / non-renewable sources).

Category: Renewable electricity generation for a grid (energy generation, supply, transmission and distribution).

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

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

Combined Heat and Power (CHP) applications typically employ backpressure turbines, wherein steam expands to a pressure that is still substantially above ambient pressure. It leaves the turbine still as a vapour and is sent to satisfy industrial heating needs, where it condenses back to water. It is then partially or fully returned to the boiler. Alternatively, if process steam demands can be met using only a portion of the available steam, a condensing-extraction steam turbine might be used. This design includes the capability for some steam to be extracted at one or more points along the expansion path for meeting process needs. Steam that is not extracted continues to expand to sub-atmospheric pressures, thereby increasing the amount of electricity generated per unit of steam compared to the backpressure turbine.

The non-extracted steam is converted back to liquid water in a condenser that utilizes ambient air and/or a cold water source as the coolant. See detailed description of CERPA equipment below. CERPA utilize bagasse as biomass residues.

The configuration of the project is detailed below.

Technical Description:

Description of the plant before the CDM project:

Boiler (brand/model)	Capacity (ton/h)	Pressure (Kgf/Cm^2)	Efficiency (%) LHV	Date of construction	Date of start of operation
Zanini 60/131	23	15.23	84	1960	1961
Zanini 60/132	23	15.23	84	1960	1961
Zanini 64/149	34	16.70	84	1964	1965
Zanini /SZ180	65	21	84	1973	1974
Zanini /SZ 180	65	21	84	1973	1974
Zanini /SZ 180	65	21	84	1977	1978
Zanini /AZ 380	100	21	84	1980	1981
Zanini /AZ 380	100	21	84	1980	1981

Generator	Installed power (KW)	Type	Date of construction	Date of start of operation
G1	5,000	Counter-pressure	1987	05/1987
G2	5,000	Counter-pressure	1987	05/1987
G3	5,000	Counter-pressure	1988	05/1988

Description of the plant after the CDM project:

All the old equipments were kept in operation and the following new plant was installed next to the existing equipments:

Boiler (brand/model)	Capacity (ton/h)	Pressure (Kgf/Cm2)	Efficiency (%) LHV	Date of construction	Date of start of operation
Equipálcool sistemas /150-V-2-S	150	65	86	2002	2003

Steam Turbine (brand/model)	Model	Installed power (KW)	Inlet pressure (kgf/cm²)	Outlet pressure (kgf/cm²)	Extraction pressure (kgf/cm²)	Date of construction	Date of start of operation
NG Metalurgica ltda.	H3/630S	17,300	66	0.19	2.5	2002	2003
NG Metalurgica ltda.	H3/630S	17,000	63	1.5	-	2002	2003

Generator (brand/model)	Installed power (kVA)	Power factor	Date of construction	Date of start of operation
Toshiba/RCC	18,750	0.8	2002	2003
Toshiba/RCC	18,750	0.8	2002	2003

Besides heat and power equipments improvement, since the first crediting period, some process equipment will be modified in 2012 as milling starters, where electrical motors will be installed for both mills instead of steam turbines; and reducers for the second and fifth phase of A milling as well as reducers for the second and fourth phases of B milling. For such starts, an electrical distribution system will operate. And also turbo pumps (electrical motors) will be installed to supply the steam turbine that

will be deactivated of the waste water treatment, factory, distillery and spray in 2012. These modifications are due to a consortium held between *CPFL Bio Pedra SA* and *Pedra Agroindustrial SA* that will start in 2012 ending up building a new unit at the same site of CERPA. However this unit has no relation to CERPA and the primary configuration (in the first crediting period) of heat and power will be kept (see B.6.3 for more details).

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

The chosen crediting period for this project is the renewable crediting period of 7 years. The estimated amount of emission reductions for the second crediting period of the project can be seen at Table 1.

Table 1 - Estimated emission reductions for the second crediting period

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2010 (from May 1st to December 31st)	**7,586**
2011	**11,378**
2012	**11,378**
2013	**11,378**
2014	**11,378**
2015	**11,378**
2016	**11,378**
2017 (from January 1st to April 30th)	**3,793**
Total Estimated Reductions (tonnes of CO_2 e)	**79,649**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**11,378**

A.4.5. Public funding of the project activity:

No public funding was and will be used in the CERPA 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 project activity:

For this project activity the following methodologies and tools were used, since it relates to the sectoral scope 1:

ACM0006 – "Consolidated baseline and monitoring methodology for electricity grid-connected electricity generation from biomass residues", version 10.1, EB55;

ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 12.1.0, EB 58.;

"Tool to calculate the emission factor for an electricity system" version 02.1, EB60;

"Combined tool to identify the baseline scenario and demonstrate additionality", version 3.0, EB60;

"Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period", EB46, Annex 1.

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

Methodology AM0015, used in the first crediting period, was replaced by ACM0006 methodology. ACM0006 can be applied to CERPA Project because this is an energy efficiency improvement project. It uses one type of biomass residues: bagasse, a byproduct of the production of sugar. Since the project activity is based on the operation of a power and heat plant (cogenartion) located in agro-industrial plant, therefore it is not a power-only plant.

The project complies with all the conditions limiting the applicability of the methodology:

(i) *No other biomass types than biomass residues are used in the project plant and these biomass residues are the predominant fuel used in the project plant. Biomass is defined as a by-product, residue or waste stream from agriculture, forestry and related industries.*

The primary fuel in the project plant is a biomass consisting of sugar cane bagasse. The bagasse used in the CERPA Project comes from the production of sugar carried in the same facility where the project is located.

(ii) *The implementation of the project shall not result in an increase of the processing capacity of raw input or other substantial changes in the process:*

The graph below shows that the production for the sugar mills has had an increasing trend over the years, showing that the project did not have an impact in the processing capacity. The fluctuation of the amount of sugarcane produced is due to climate and crop conditions that can vary from year to year.

Table 1 – Sugarcane production of CERPA

CROP	SUGARCANE PRODUCTION (t)
2000/2001	2,584,960
2001/2002	3,051,774
2002/2003	3,381,407
2003/2004	3,699,457
2004/2005	3,792,727
2005/2006	3,910,206
2006/2007	4,101,265
2007/2008	3,878,452
2008/2009	4,006,495
2009/2010 (*)	4,200,000
2010/2011 (*)	4,200,000
2011/2012 (*)	4,200,000
2012/2013 (*)	4,200,000
2013/2014 (*)	4,200,000
2014/2015 (*)	4,200,000
Average	**3,840,450**

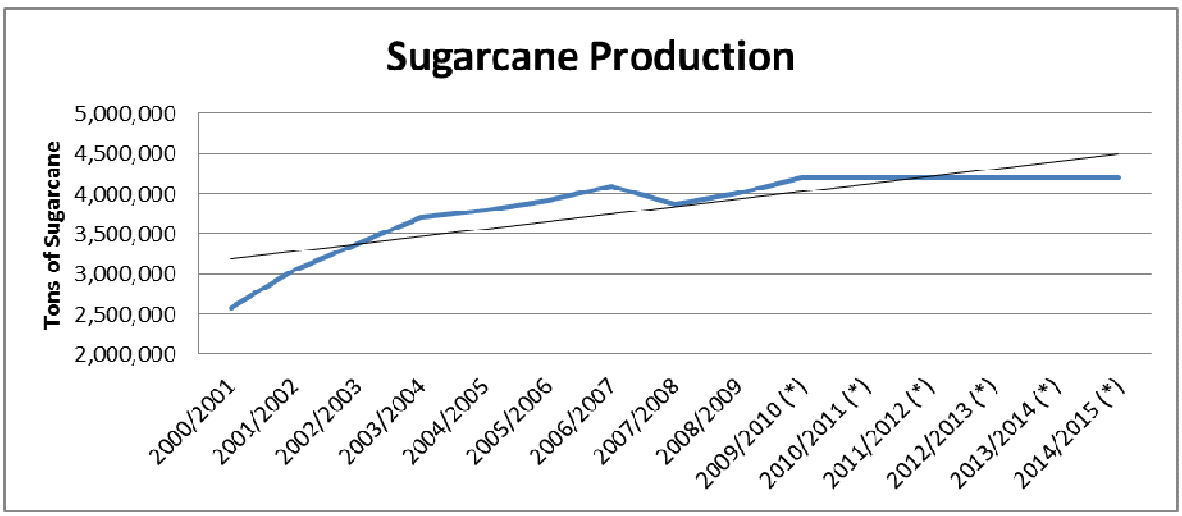

Figure 3 - CERPA - sugar cane production

Any future increase in biomass residues availability would be due to the natural expanding business (production increase of sugar and/or bioethanol) and not because of the implementation of the CDM

project. There has been a remarkable expansion of the ethanol market. In Brazil, the offer of ethanol supply cope with the rapid increasing demand caused by the use of flex-fuel vehicles (FFV), which can run on gasoline, ethanol or any blend of the two. This is shown by the figures below:

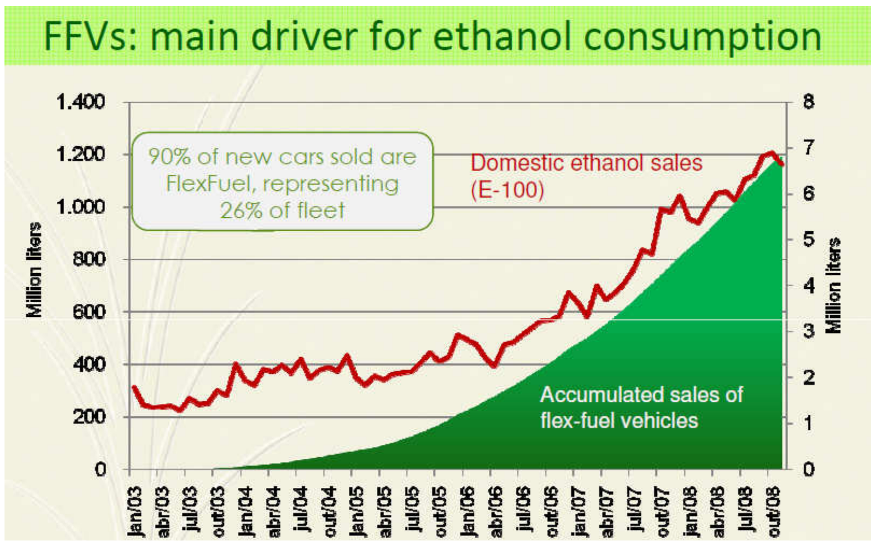

Figure 4 – Ethanol consumption in Brazil

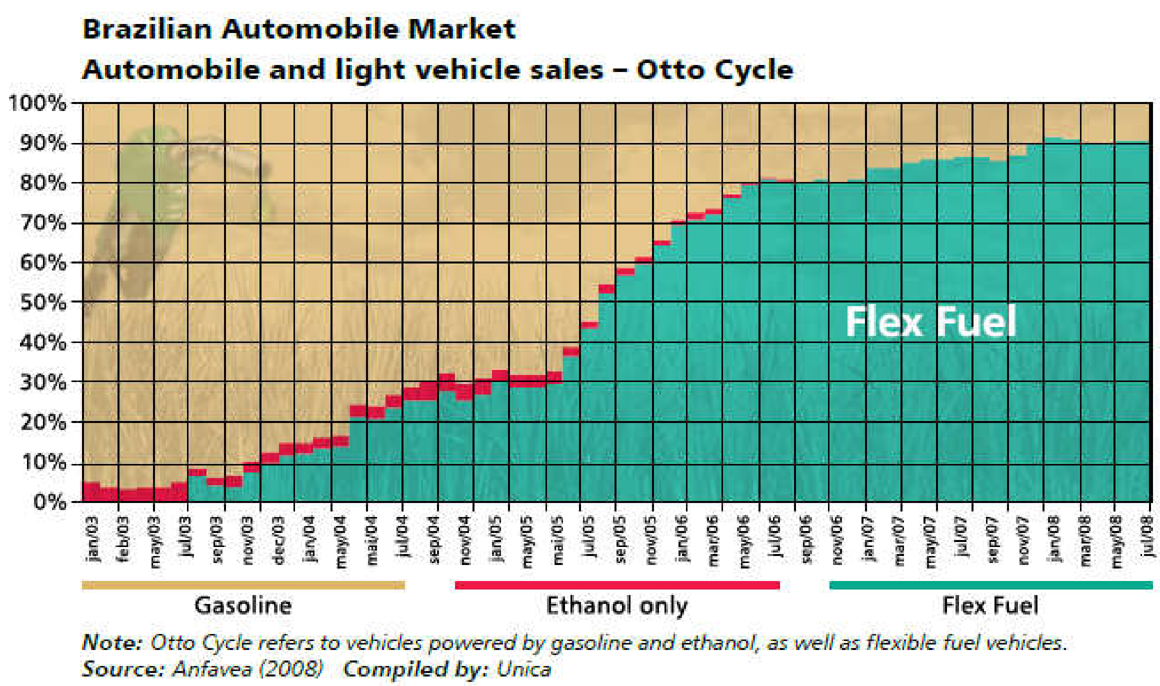

Figure 5 – Brazilian Automobile Market

Source: Única – brochure “Sugarcane industry in Brazil” (http://www.unica.com.br/multimedia/publicacao/Default.asp?sqlPage=2) and presentation “Sugarcane in Brazil: The Sustainable Expansion” **-** World Biofuels Market Congress, 18/03/2009, Brussels.

(iii) The biomass used by the project facility should not be stored for more than one year:

The sugar mills generally store a small amount of bagasse for the next season in order to start plant operations when the new crop season/ harvest begins. The bagasse is stored from the end of the harvest season until the beginning of the following harvest season. The volume of bagasse stored between seasons is less than 5% of the total amount of bagasse generated during the year or during the harvest period.

(iv) No significant energy quantities, except for transportation of the biomass, are required to prepare the biomass residues for fuel consumption:

The biomass used in this project is not transformed in any way before being used as a fuel.

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

	Source	Gas		Justification/Explanation
Baseline	Electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Heat generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Project participants decided to not include this emission source, because case B4 of ACM0006 is not the most likely baseline scenario
		N_2O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources
Project Activity	On-site fossil fuel and electricity consumption due to the	CO_2	Excluded	There are no fossil fuel consumption nor electricity consumption due to the project activity.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small

	project activity (stationary or mobile)	N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Off-site transportation of biomass residues	CO_2	Excluded	Bagasse is produced inside the mills. No off-site transportation of bagasse is necessary
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Combustion of biomass residues for electricity and / or heat generation	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	This emission source is not included because CH_4 emissions from uncontrolled burning or decay of biomass in the baseline scenario are not included
		N_2O	Excluded	Excluded for simplification. This emissions source is assumed to be very small
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Excluded for simplification. Since bagasse is stored for not longer than one year, this emission source is assumed to be small
		N_2O	Excluded	Excluded for simplification. This emissions source is assumed to be very small
	Waste water from the treatment of biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	This emission source shall be included in cases where the waste water is treated (partly) under anaerobic conditions.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small.

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

CERPA Project uses bagasse for the generation of heat and electricity. The project activity involves the replacement of an existing biomass residue fired power plant. The replacement increases the power generation capacity.

The plausible baseline scenarios were identified using version 2.2 of the "*Combined tool to identify the baseline scenario and demonstrate additionality*" for the different components of the project activity, which are: power, heat and biomass. Hence, the following four Steps were applied:

STEP 1. Identification of alternative scenarios;
STEP 2. Barrier analysis;
STEP 3. Investment analysis (if applicable);
STEP 4. Common practice analysis.

For CERPA Project, the steps 1, 2 and 4 were held.

Step 1: Identification of alternative scenarios

Step 1a: Define alternative scenarios to the proposed CDM project activity

According to the methodology there are different possible baseline scenarios for power, heat and biomass. The description of how these scenarios were analysed is presented below.

Analysis of alternatives for power generation

P1: *The proposed project activity not undertaken as a CDM project activity*.

Not applicable in the second crediting period.

P2: *The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity*.

Excluded, because the reference biomass residue fired power plant could not provide the same amount of electrical energy, which will be provided by the project plant.

P3: *The generation of power in an existing plant, on-site or nearby the project site, using only fossil fuels*

Excluded, because neither there are plants nearby the project site, nor sugar mills in Brazil use fossil fuels for power generation. This can be checked at the site of Unica (*União da Indústria de Cana-de-Açúcar* – Sugar Cane Industry Association).

This is cited from the site (http://www.unica.com.br/content/show.asp?cntCode={0C8534A8-74A7-4952-8280-C5F6FB9276B7, accessed on 8 April 2010):

"Auto-suficiência Energética: toda energia utilizada no processo industrial da produção de etanol e açúcar no Brasil é gerada dentro das próprias usinas a partir da queima do bagaço da cana". *(Energy self-sufficiency: all the energy used in the industrial process of ethanol and sugar production in Brazil is generated inside the mills, through the burning of sugarcane bagasse).*

P4: *The generation power in the grid.*

This can be considered as an alternative baseline scenario.

P5: *The installation of a new biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.*

This can be considered as an alternative baseline scenario.

P6: *The installation of a new biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case.*

Excluded, because the new plant would process the same amount – and not higher - of biomass residues as in the project activity - since the sugar mill core business is the production of sugar and ethanol, to which the production of biomass residues is related.

P7: *The retrofitting of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.*

Excluded, because the baseline plant would need to generate the same amount of heat for the process as in the project activity, which is higher than the amount that could be generated by retrofitted boilers of the pre-project plant.

P8: *The retrofitting of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.*

Excluded, because the baseline plant would process the same amount – and not higher - of biomass residues as in the project activity - since the sugar mill core business is the production of sugar and ethanol, to which the production of biomass residues is related.

P9: *The installation of a new fossil fuel fired captive power plant at the project site.*

Excluded, because sugar mills in Brazil do not generate heat nor power burning fossil fuels.

P10: *The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity*

power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity.

Excluded, because the baseline plant would process the same amount – and not lower - of biomass residues as in the project activity - since the sugar mill core business is the production of sugar and ethanol, to which the production of biomass residues is related.

P11: *The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.*

Excluded, because sugar mills in Brazil do not generate heat nor power burning fossil fuels.

Therefore, the only plausible baseline scenarios for power generation are Scenarios P4 and P5.

Analysis of alternatives for heat generation

H1: *The proposed project activity not undertaken as a CDM project activity.*

Not applicable in the second crediting period.

H2: *The proposed project activity (installation of a cogeneration power plant), fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an efficiency that is common practice in the relevant industry sector).*

This can be considered as an alternative baseline scenario.

H3: *The generation of heat in an existing cogeneration plant, on-site or nearby the project site, using only fossil fuels.*

Excluded, because sugar mills in Brazil do not use fossil fuels for heat generation.

H4: *The generation of heat in boilers using the same type of biomass residues.*

Excluded, because the boilers in the pre-project plant do not have the capacity to generate the same amount of heat for the process as the boilers of the project activity.

H5: *The continuation of heat generation in an existing cogeneration plant, fired with the same type of biomass residues as in the project activity, and implementation of the project activity, not undertaken as a CDM project activity, at the end of the lifetime of the existing plant.*

Excluded, because the boilers in the pre-project plant do not have the capacity to generate the same amount of heat for the process as the boilers of the project activity.

H6: *The generation of heat in boilers using fossil fuels.*

Excluded, because sugar mills in Brazil do not use fossil fuels for heat generation.

H7: *The use of heat from external sources, such as district heat.*

Excluded, because sugar mills in Brazil do not use heat from external sources.

H8: *Other heat generation technologies (e.g. heat pumps or solar energy).*

Excluded, because sugar mills in Brazil do not use other heat generation technologies.

H9: *The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity.*

Excluded, because the baseline plant would have a lower - and not the same- power capacity, since it would not export electricity to the grid and would process exactly the same type and amount – and not lower - of biomass residues as in the project activity -, since the sugar mill core business is the production of sugar and ethanol, to which the production of biomass residues is related.

H10: *The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.*

Excluded, because sugar mills in Brazil do not generate heat nor power burning fossil fuels.

Therefore, the only plausible baseline scenario for heat generation is Scenario H2.

Analysis of alternatives for biomass generation

B1: *The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.*

Excluded, because sugar mills in Brazil have a long history of biomass residues use for energy generation purposes.

B2: *The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields.*

Excluded, because sugar mills in Brazil have a long historic of biomass residues use for energy generation purposes.

B3: *The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.*

Excluded, because sugar mills in Brazil have a long historic of biomass residues use for energy generation purposes.

B4: *The biomass residues are used for heat and/or electricity generation at the project site.*

This can be considered as an alternative baseline scenario. Only the use of sugarcane bagasse is forecasted, nevertheless biomass used in the project will be monitored

B5: *The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants.*

Excluded, because sugar mills in Brazil use biomass residues for their own energy generation, as a common practice.

B6: *The biomass residues are used for heat generation in other existing or new boilers at other sites.*

Excluded, because sugar mills in Brazil have a long historic of biomass residues use for own energy generation purposes.

B7: *The biomass residues are used for other energy purposes, such as the generation of biofuels.*

Excluded, because sugar mills in Brazil have a long historic of biomass residues use for own energy generation purposes.

B8: *The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry).*

Excluded, because sugar mills in Brazil have a long historic of biomass residues use for own energy generation purposes.

Therefore, the only plausible baseline scenario for biomass residues is Scenario B4.

Outcome of Step 1a: From the above, the results can be summarized as follows:

- For power: P4 in conjunction with P5 is the plausible scenario;
- For heat: H2 is the plausible scenario;
- For biomass: B4 is the only plausible scenario.

Sub-step 1b: Consistency with mandatory applicable laws and regulations

All the alternatives listed above are in compliance with the laws and regulations of the host country.

Step 2: Barrier analysis

Sub-step 2a: Identify barriers that would prevent the implementation of alternative scenarios

No barriers that could prevent the above mentioned alternatives can be identified.

Outcome of Step 2a: none barriers can be listed.

Sub-step 2b: Eliminate alternative scenarios which are prevented by the identified barriers

The alternatives scenarios cannot be eliminated through the barrier analysis.

Since the plausible alternatives for each baseline scenario (P, H, B) have only one option, the above mentioned scenarios are the baseline scenarios for this project.

The result of the analysis of components gave the following results: a) the power generated by the project plant would in the absence of the project activity be generated (a) in the reference plant (alternative P5) and – since power generation is larger in the project plant than in the reference plant – (b) partly in power plants in the grid (alternative P4). The new project plant has the same technical lifetime as the reference plant; b) biomass: in the absence of the project, the biomass residues would have used for heat and/or electricity generation at the project site (alternative B4); c) Heat: in the absence of the project activity, the heat generated by the project plant would be generated in the reference plant, fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an

efficiency that is common practice in the relevant industry sector) (alternative H2). The identified alternatives for the different components of the project activity correspond to scenario 18.

In the absence of the project activity, the existing plant would also be replaced by a new biomass residue fired power plant; however, this reference plant would have a lower efficiency of electricity generation than the project plant. The same type and quantity of biomass residues as in the project plant would be used in the reference plant.

According to Dedini, a manufacturer of boilers, the efficiency of a low-pressure boiler with pressure of 42 kgf/cm^2 is similar to the efficiency of a 66 kgf/cm^2 boiler, while the efficiency of a 21 kgf/cm^2 boiler is lower. Hence, for conservativeness reasons, the emission reductions from heat are excluded, i.e., $ER_{heat,y} = 0$, since it is given in the methodology for scenario 18 that $\varepsilon_{th,project\ plant} < \varepsilon_{th,reference\ plant}$ the quantity of heat generated in the project plant is smaller than the quantity of heat that would be generated in the absence of the project activity. This implies that the project implementation may involve additional heat generation from other sources or a longer operation of the project plant. This may result in an increase in GHG emissions. Therefore, it is demonstrated that the thermal efficiency in the project plant is larger when compared with the thermal efficiency of the plant considered in baseline scenario and then, it is assumed that $ER_{heat,y} = 0$.

The thermal efficiency of the project plant (project data of the thermal equipment predicted by the supplier) 86%, and the thermal efficiency of the reference plant is 63.4%, as can be checked in CTC reference plant study (*Centro de Tecnologia Canavieira* **-** 2010). Determinação da eficiência elétrica das usinas brasileiras para produção exclusiva de açúcar e/ou etanol. Available at: <http://www.ctcanavieira.com.br/site/media/Usina_Referencia_MDL_r0a.pdf>). Therefore, $ER_{heat,y} = 0$.

Neither there was biomass residues decay, nor has the biomass been burned in an uncontrolled manner, as biomass residues were used in the past to generate electricity at the project site, for internal consumption. For scenario #18, $BE_{biomass,y} = 0$.

Step 4. Common practice analysis

An article by *Marcos Sawaya Jank*, president of *Unica* (Sugarcane Industry Association), published on 17/11/2009, states that only 20% of Brazilian sugar mills export electricity to the grid (source: http://www.unica.com.br/opiniao/show.asp?msgCode={26DB2C11-036E-4DB3-BB56-D24C50442EF1}, accessed on December 2010).

Generation of electricity by sugar mills for the grid cannot be considered common practice in Brazil, where only 5.17% of the installed capacity (reference date: April, 2011) consists of sugarcane bagasse generation (most of this for sugar mills own consumption and operation only in the harvest season. In other words, if one wants to consider electricity supplied to the grid, the share is considerably smaller).

Power Plants in Operation							
Type		Type		Type	Type		Type
		N.° de Usinas	(kW)		N.° de Usinas	(kW)	
Hydro	Hydro	Hydro	Hydro	Hydro	Hydro	Hydro	Hydro
Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas
	Processo	36	1,781,283	1.46%			
Oil	Oil	Oil	Oil	Oil	Oil	Oil	Oil
	Óleo Residual	32	3,132,207	2.56%			
Biomass	Biomass	Biomass	Biomass	Biomass	Biomass	Biomass	Biomass
	Licor Negro	14	1,245,198	1.02%			
	Madeira	41	359,527	0.29%			
	Biogás	13	69,942	0.06%			
	Casca de Arroz	6	18,908	0.02%			
Nuclear	Nuclear	Nuclear	Nuclear	Nuclear	Nuclear	Nuclear	Nuclear
Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal
Wind	Wind	Wind	Wind	Wind	Wind	Wind	Wind
Imports	Imports	Imports	Imports	Imports	Imports	Imports	Imports
	Argentina		2,250,000	1.84%			
	Venezuela		200,000	0.16%			
	Uruguai		70,000	0.06%			
	Total	Total	Total	Total	Total	Total	Total

Figure 6 - Electricity Grid – Operation units. (Source: ANEEL, 2011[3])

The potential to generate electricity for commercialization (exporting to the grid), is estimated at around 8.7 GW, for 2012-2013[4]. This potential has always existed and has grown as the sugarcane industry has grown. However, investment to expand the sugar mills' power plants has only occurred since 2000. Although flexible legislation allowing independent energy producers has existed since 1995, it was only after 2000 that sugar producers started to study this proposed project activity as an investment alternative for their power plants in conjunction with the introduction of the CDM.

Coopersucar is one of the biggest cooperatives of the sector in Brazil (*Jornal da Cana* – Sugarcane branch newspaper, October, 2006). Among *Coopersucar* member plants, considering the plants that do not have CDM projects, only 10% have increased their capacity in order to export energy to the grid in 2006[5].

CERPA project is in the state of São Paulo, which is the state with the highest number of mills which export electricity. From the 123 mills listed in the *Anuário 2002/2003* for the state of *São Paulo*,

3 ANEEL (2011). Banco de Informações de Geração - BIG. Matriz de Energia Elétrica. http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp. Accessed on April, 14th 2011.

4 UNICA - *União da Indústria de Cana-de-Açúcar* – Union of the Sugarcane Industry (www.portalunica.com.br)

5 Copersucar - Cooperativa Produtores de Cana-de-açúcar, Açúcar e Álcool do Estado de São Paulo (São Paulo State Sugarcane, sugar and alcohol producers cooperatives). Data available to cooperative members. Similar information can be also assessed in the article "*Usinas aproveitam co-geração e lucram com créditos de carbono*" available at: http://www.seagri.ba.gov.br/noticias.asp?qact=view&notid=8143 (accesssed on 12 December 2010).

28 export electricity to the grid. Out of these 28, 17 are CDM projects, and 11 are not (see spreadsheet provided to the validation team). The average export rate of the CDM projects is 88.8 KWh/ton bagasse, while the average export rate of the non-CDM plants is 23.06 KWh/ton bagasse. The average export rate of CDM projects is almost four times higher. The export rate of CERPA, 263.6 KWh/ton bagasse, is almost three times the average of the CDM projects listed in the *Anuário*.

A comparison of CERPA's electrical efficiency will be made with the sugar mills which are *Coopersucar* members, but not CDM projects. Financial data about these sugar mills is not publicly available. Hence, only a technical comparison can be made.

CERPA has a ratio *total generated KWh/tones of bagasse* of 173.6. Among *Coopersucar* members, the average ratio is 50.0 *generated KWh/tones of bagasse.*

CERPA's efficiency is more than three times higher than the average efficiency among the mills which are not CDM projects. Hence, this project cannot be considered common practice.

A list of sugar mills, which are present in the Brazilian Electricity Regulatory Agency database of power generation with biomass (BIG - ANEEL, accessed on 12 May 2009) with an installed capacity over 50 MW since the *Tool of Additionality* recommends the comparison of projects with similar scale, is presented below.

Sugar mill	**Installed Power (KW)**	**City/State**	**Situation regarding CDM and Coopersucar membership**
Colombo	65,500	Ariranha - SP	cdm
Rafard	50,000	Rafard - SP	cdm
Vale do Rosário	93,000	Morro Agudo - SP	cdm
Barra Grande de Lençóis	62,900	Lençóis Paulista - SP	CDM/Copersucar
Cerradinho	75,000	Catanduva - SP	cdm
Colorado	52,760	Guaira - SP	cdm
Equipav	58,400	Promissão - SP	cdm
Santa Terezinha (Tapejara)	50,500	Tapejara - PR	cdm
Costa Pinto	75,000	Piracicaba - SP	cdm
Santa Elisa - Unit I	58,000	Sertãozinho - SP	cdm
Equipav II	80,000	Promissão - SP	cdm

It has become apparent that all of the above are CDM projects, in different phases, and most of them are also *Coopersucar* members.

This way, there are no plants in the state of *São Paulo*, which are not CDM projects and are able to export energy at the same scale as CERPA. This information stresses the fact that the proposed project activity referred in this PDD is not a common practice.

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

As shown above, there is a rising demand for energy in Brazil, but it is not being attended by biomass plants. In the most recent energy auctions in Brazil, the results were the following: in an auction which took place on July 26, 2007, there was in an increase of 1.781,8 MW into National Electric System, entirely from oil thermo plants[6]; in an auction which took place on October 16, 2007, there was in an increase of 4,353 MW into National Electric System, from which 69% originated from fossil fuel (oil, coal and natural gas) plants[7].

In the energy auction for alternative energy sources, that took place on June 18, 2007, 2,803 MW were qualified, but only 638.64 MW were negotiated[8], which shows the lack of interest by most of the participants, due to the price and conditions presented. From the estimated 2,000 to 3,000 MW available from sugarcane bagasse plants, only 542 MW were sold.

This situation stresses that the project activity shall not be considered as common practice.

Sub-steps 4a and 4b are satisfied, then the proposed project activity is additional.

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):

The "Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" will be applied:

Step 1: Assess the validity of the current baseline for the next crediting period:

The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario determined in section B4 above (scenario 18) is valid for both the first and the second crediting period. There are no new relevant national and/or sectoral policies and circumstances in this sector, in comparison to the time of the Project's start, which would alter the baseline scenario at the time of requesting renewal of crediting period. As shown in the editorial of newspaper Folha de S. Paulo, on 10/01/2008 (http://www1.folha.uol.com.br/fsp/opiniao/fz1001200801.htm):

---

6 Source: Empresa de Pesquisa Energética (http://www.epe.gov.br/leiloes/Paginas/Leil%C3%A3o%20de%20Energia%20A-3%202007/LeilaoA32007_44.aspx?CategoriaID=42, accessed on December 2010).

7 Source: Folha de S. Paulo, 17/10/2007.

8 Source: http://www.epe.gov.br/leiloes/Paginas/Leil%C3%A3o%20de%20Fontes%20Alternativas%202007/LeilaoFA2007_32.aspx?CategoriaID=43 and http://www.epe.gov.br/leiloes/Paginas/Leil%C3%A3o%20de%20Fontes%20Alternativas%202007/LeilaoFA2007_33.aspx?CategoriaID=43 (accessed on December 2010)

"*Energy conservation program (Procel) and Renewable sources program (Proinfa) are little more than just 'ecologically correct window dressing'. There is little use from the wind energy potential in Brazilian Northeast region as well as from the energy generation with biomass (sugarcane bagasse) in Brazilian Southeast region, because of lack of regulation and compensating prices. There is a lot to be done*".

An article written in 2004 by two professors of Energy Planning at the *Universidade Federal do Rio de Janeiro*[9] analyses Brazilian energy regulations and identifies four fragilities that can undermine their suitable implementation. Those fragilities refer to:

1) The guarantee of the purchase of electricity. Some points are still to be clarified, regarding:

   a) Minimum and maximum limits for the purchase of energy;
   b) the possibility of the ONS - Electrical System Operator to determine production increase or decrease, depending on the demand variation;
   c) Payment for the availability of production capacity, in periods when there is abundant energy offer.

2) The definition of the role of the three different regulatory agents: MME – Ministry of Mines and Energy, ANEEL - Brazilian power regulatory agency - *Agência Nacional de Energia Elétrica* and Eletrobrás – Brazilian Electricity Company – *Centrais Elétricas Brasileiras*. There are coordinated functions among the three agents, what leads to investor's insecurity, because they have three different interlocutors, instead of one.

3) Juridical problems in the public calls legislation. Some rules are not totally compatible with the legislation, what might even lead to contract annulations.

4) The way the energy price is presently established, through the calculation of an average price for each type of energy source, penalizes projects with a lower cost-benefit rate. The authors suggest that the prices should be set according to the characteristics of each project.

There is a rising demand for energy in Brazil, but it is not being attended by biomass plants. In the most recent energy auctions in Brazil, the results were the following: in an auction which took place on July 26, 2007, there was in an increase of 1.781,8 MW into National Electric System, all of them from oil thermo plants[10]; in an auction which took place on October 16, 2007, there was in an increase of 4,353 MW into National Electric System, from which 69% originated from fossil fuel (oil, coal and natural gas) plants[11].

[9] Link to this article (with an abstract in English): http://www.seeds.usp.br/pir/arquivos/congressos/CBPE2004/Artigos/PROINFA%20E%20CDE%20-%20QUESTIONAMENTOS%20SOBRE%20A%20LEGISLA%C7%C3O%20E%20REGULA.pdf (accessed on December 2010).

[10] Source: EPE, 2007 http://bit.ly/cVwI0T accessed on December 2010.

[11] Source: Newspaper Folha de S. Paulo, 17/10/2007, http://www1.folha.uol.com.br/fsp/dinheiro/fi1710200730.htm accessed on December 2010. (This document was provided in electronic format to the validation team.)

In the energy auction for alternative energy sources, that took place on June 18, 2007, 2,803 MW were qualified, but only 638.64 MW were negotiated[12], what shows the lack of interest by most of the participants, due to the price and conditions presented. From the estimated 2,000 to 3,000 MW available from sugarcane bagasse plants, only 542 MW were sold.

The barriers mentioned above in the PDD are still valid, what can be evidenced by the fact that the generation of electrical energy from sugarcane bagasse represents only 5.17% of the total generation of electricity in Brazil (see table below).

[12] Source: EPE, 2007: http://www.epe.gov.br/leiloes/Paginas/Leil%C3%A3o%20de%20Fontes%20Alternativas%202007/LeilaoFA2007_32.aspx?CategoriaID=43 and

http://www.epe.gov.br/leiloes/Paginas/Leil%C3%A3o%20de%20Fontes%20Alternativas%202007/LeilaoFA2007_33.aspx?CategoriaID=43

Table 2 - Sources of electricity generation in Brazil, as of 14/04/2011[13]

Power Plants in Operation							
Type		Installed Capacity		%	Total		%
		Number of Plants	(kW)		Number of Plants	(kW)	
Hydro		903	81,008,172	66.26%	903	81,008,172	66.26%
Gas	Natural	97	11,340,594	9.28%	133	13,121,877	10.73%
	Processed	36	1,781,283	1.46%			
Oil	Diesel	854	3,923,685	3.21%	886	7,055,892	5.77%
	Residual	32	3,132,207	2.56%			
Biomass	Sugarcane bagasse	328	6,325,536	5.17%	402	8,019,111	6.56%
	Black Liquor	14	1,245,198	1.02%			
	Wood	41	359,527	0.29%			
	Biogás	13	69,942	0.06%			
	Rice residues	6	18,908	0.02%			
Nuclear		2	2,007,000	1.64%	2	2,007,000	1.64%
Coal	Mineral Coal	10	1,944,054	1.59%	10	1,944,054	1.59%
Wind		51	928,986	0.76%	51	928,986	0.76%
Imports	Paraguay		5,650,000	4.62%		8,170,000	6.68%
	Argentina		2,250,000	1.84%			
	Venezuela		200,000	0.16%			
	Uruguay		70,000	0.06%			
Total		**2,387**	**122,255,092**	**100%**	**2,387**	**122,255,092**	**100%**

This trend is about to continue, as shown by the huge difference between biomass thermal plants and fossil fuel thermal plants power capacity granted by ANEEL, as of 19/10/2009[14]:

---

[13] ANEEL (2011). Banco de Informações de Geração - BIG. Matriz de Energia Elétrica. http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp. Accessed on April, 14th 2011.

[14] Source: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/Combustivel.asp accessed on December 2010.

Class of fuels used in Brazil - Grants			
Fuel	Quantity	Power (kW)	%
Biomass	49	1,997,220	15.81
Fossil	94	10,590,202	83.81
Others	9	49,100	0.39
Total	152	12,636,522	100

Table 3 - Sources of energy to generate electricity – Grants (as of 19/10/2009)

Step 1.2: Assess the impact of circumstances

As shown in sub-step 1.1 above, there are no new relevant national and/or sectoral circumstances in this sector.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) is technically possible

The baseline scenario of the project activity determined in section B4 above is scenario 18 (The project activity involves the installation of a new biomass residue fired power and heat plant, only fired with biomass residues and continue to operate after the installation of the new plant with the same thermal firing capacity but with a lower efficiency of electricity generation as the project plant - by using of a low-pressure boiler instead of a high-pressure boiler). Since this scenario is not the continuation of the current practice (i.e., the continued operation of the existing plant), this sub-step is not applicable.

Step 1.4: Assessment of the validity of the data and parameters

Brazilian electricity emission factor will be updated.

Conclusion of ***Step 1***: the baseline scenario is still valid for the 2nd period and the Brazilian electricity emission factor must be updated.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

Applicable only to the Brazilian electricity emission factor.

Step 2.2: Update the data and parameters

Brazilian electricity emission factor will be updated according to item B.6.1 below.

Information about additionality is presented in section B.4, as required by the version 10.1 of the methodology ACM0006.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

a) ACM0006 - "Consolidated methodology for electricity generation from biomass residues in power and heat plants", version 10.1, EB55, was chosen.

The chosen methodology is applicable to biomass-based cogeneration projects connected to the grid. The methodology considers emission reductions generated from cogeneration projects using sugarcane bagasse. This fits perfectly the operation at TSACP, so the choice of methodology is justified.

The equations which will be used in calculating emission reductions are the following:

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$ **Equation 1**

Where:

ER_y	=	are the emission reductions of the project activity during year *y*
$ER_{heat,y}$	=	are the emissions reductions due to displacement of heat during the year *y*
$ER_{electricity,y}$	=	are the emissions reductions due to displacement of electricity in year *y*
$BE_{biomass,y}$	=	Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tCO2e/yr)
PE_y	=	are project emissions in year *y* (zero for this project activity)
L_y	=	are the leakage emissions in year *y* (zero for this project activity)

Estimated emissions reductions due to the displacement of heat:

As shown in section B.4, emissions reductions due to the displacement of heat are considered zero.

Estimated emissions reductions due to the displacement of electricity:

The amount of electricity to be considered for the displacement of power from the grid is calculated using the equation below. This equation corresponds to the chosen scenario #18 of the ACM0006 methodology:

$$EG_y = EG_{projectplant,y} * \left(1 - \frac{\varepsilon_{el,baselineplant}}{\varepsilon_{el,projectplant,y}}\right)$$ **Equation 2**

EGy is determined based on the average net efficiency of electricity generation in the reference plant that would be installed in the absence of the project activity and that would have a lower efficiency of electric generation than the project plant ($\varepsilon_{el,baseline\ plant} = \varepsilon_{el,reference\ plant}$), and the average net efficiency of electricity generation in the project plant after project implementation, $\varepsilon_{el,project\ plant,y}$, shown in Equation 2, where:

EG_y	=	is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year *y* in MWh,
$EG_{project\ plant,y}$	=	is the net quantity of electricity generated in the project plant during the year *y* in MWh
$\varepsilon_{el,baseline\ plant}$	=	is the average efficiency of electricity generation in the baseline plant ($MWh_{el}/MWh_{biomass}$)
$\varepsilon_{el,project\ plant,y}$	=	is the average net energy efficiency of electricity generation in the project plant, expressed in $MWh_{el}/MWh_{biomass}$.

The average net energy efficiency of electricity generation in the project plant ($\varepsilon_{el,project\ plant,y}$) is determined by dividing the electricity generation during the year *y* by the sum of all fuels (biomass residue types *k* and fossil fuel types *i*), expressed in energy units, as follows:

$$\varepsilon_{el,project\ plant,y} = \frac{EG_{project\ plant,y}}{\sum_k NCV_k \cdot BF_{k,y} + \sum_i NCV_i \cdot FF_{project\ plant,i,y}}$$ **Equation 3**

Where:

$\varepsilon_{el,project\ plant,y}$	=	Average net energy efficiency of electricity generation in the project plant
$EG_{project\ plant,y}$	=	Net quantity of electricity generated in the project plant during the year *y* (MWh)
$BF_{k,y}$	=	Quantity of biomass residue type *k* combusted in the project plant during the year *y* (tonnes of dry matter or liter)
NCV_k	=	Net calorific value of the biomass residue type *k* (GJ/t of dry matter or GJ/liter)
NCV_i	=	Net calorific value of fossil fuel type *i* (GJ / mass or volume unit)
$FF_{project\ plant,i,y}$	=	Quantity of fossil fuel type *i* combusted in the project plant during the year *y* (mass or volume unit per year)

Estimate of biomass baseline emissions:

As shown in section B.4, biomass baseline emissions are zero.

Estimate of project emissions:

Project emissions are calculated as follows:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4} * (PE_{Biomass,CH4,y} + PE_{WW,CH4,y}$$ **Equation 4**

Where:

PET_y = CO2 emissions during the year y due to transport of the biomass residues to the project plant (tCO2/yr).

$PEFF_y$ = CO2 emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity (tCO2/yr).

PE_{ECy} = CO2 emissions during the year y due to electricity consumption at the project site that is attributable to the project activity (tCO2/yr).

GWP_{CH4} = Global Warming Potential for methane valid for the relevant commitment period.

$PE_{Biomass,CH4,y}$ = CH4 emissions from the combustion of biomass residues during the year y (tCH4/yr).

$PE_{WWCH4,y}$ = CH4 emissions from waste water generated from the treatment of biomass residues in year y (tCH4/yr).

In the present project activity is not identified any GHG emission as:

• CO2 emissions from transportation of biomass residues to the project site since the biomass is produce inside the project boundary.

• CO2 emissions from on-site consumption of fossil fuels due to the project activity:

Sugar mills in Brazil do not use fossil fuels either for power or heat generation. This can be checked at the site of *Unica*. This is cited from the site (http://www.unica.com.br/content/show.asp?cntCode={0C8534A8-74A7-4952-8280-C5F6FB9276B7, accessed on 10 June 2010):

> *"Auto-suficiência Energética: toda energia utilizada no processo industrial da produção de etanol e açúcar no Brasil é gerada dentro das próprias usinas a partir da queima do bagaço da cana"*. That means "Energy self-sufficiency: all the energy

used in the industrial process of ethanol and sugar production in Brazil is generated inside the mills, through the burning of sugar cane bagasse".

• CO2 emissions from consumption of electricity from the grid are not observed in ethanol and sugar production in Brazil. In the same reference above, it is mentioned that these units in Brazil are Energy self-sufficiency, where all the energy used in the industrial process of ethanol and sugar production in Brazil is generated inside the mills, through the burning of sugar cane bagasse

• Where this emission source is included in the project boundary and relevant: CH_4 emissions from the combustion of biomass residues. It is determined in the version 10.1 of ACM0006 that this emission source must be included if CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario are included. Since in Brazil there is no burning or decay of the cane bagasse yet it is used to generate steam to the process, this emission source is not accounted.

• Where waste water from the treatment of biomass residues degrades under anaerobic conditions: CH_4 emissions from waste water. The cane bagasse suffers no treatment with water and therefore there is no waste water in the project boundary.

Therefore, no estimation of project emissions is necessary. The project emissions (PE_y) are zero.

Estimated leakage emissions:

The main source of leakages in the ACM0006 methodology is considered to be the increase of fossil fuel consumption due to the diversion of the biomass. No diversion of biomass occurs, therefore no leakages are present. For the reasons explained, leakages (L_y) are considered to be zero.

The emission reduction by the project activity (ER_y in tCO_2e) during a given year (y) is given by equation 1 above:

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$

After the analysis done above, follows:

$$ER_y = ER_{\text{electricity,y}} = EG_y * EF_{electricity,y}$$ **Equation 5**

Where:

$ER_{electricity,y}$	=	Emission reduction due to the displacement of electricity during the year y (tCO2/yr)
$EF_{electricity,y}$	=	CO_2 emission factor for the electricity displaced due to the project activity during the year *y* (tCO_2/MWh)
EG_y	=	is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year *y* in MWh

b) For the calculation of emissions from grid electricity (EF_y) the approved methodology tool "*Tool to calculate the emission factor for an electricity system*" version 2 is applied.

The Emission Factor ($EF_{EL,j,y}$) is calculated as the Combined Margin (CM), comprised by two components: the Built Margin (BM) and the Operation Margin (OM). The BM evaluates the contribution of the power plants which would have been built if the project plant would not have been implemented. The OM evaluates the contribution of the power plants which would have been dispatched in the absence of the project activity.

The "Tool to calculate the emission factor for an electricity system", version 2, presents the following steps to calculate the Emission Factor:

STEP 1 **-** Identify the relevant electricity systems.

STEP 2 – Choose whether to include off-grid power plants in the project electricity system (optional).

STEP 3 **-** Select a method to determine the operating margin (OM).

STEP 4 **-** Calculate the operating margin emission factor according to the selected method.

STEP 5 **-** Identify the group of power units to be included in the build margin (BM).

STEP 6 **-** Calculate the build margin emission factor.

STEP 7 **-** Calculate the combined margin (CM) emissions factor.

- **STEP 1 -** Identify the relevant electricity systems

According to the tool, "*If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. If such delineations are not available, project participants should define the project electricity system and any connected electricity system and justify and document their assumptions in the CDM-PDD*".

Brazilian DNA has published the Resolution nr. 8 issued on 26th May, 2008 that defines the Brazilian Interconnected Grid as a single system that covers all the five macro-geographical regions of the country

(North, Northeast, South, Southeast and Midwest). Hence, this figure will be used to calculate the baseline emission factor of the grid.

- **STEP 2 - Choose whether to include off-grid power plants in the project electricity system (optional).**

Project participants choose to follow Option I (Only grid power plants are included in the calculation).

- **STEP 3 -** Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The Brazilian DNA made available the operating margin emission factor calculated using option c – Dispatch data analysis OM. Detailed information on the methods and data applied can be obtained in the DNA's website (http://www.mct.gov.br/index.php/content/view/74689.html), site accessed on November 2010).

- **STEP 4 -** Calculate the operating margin emission factor according to the selected method

The dispatch data analysis OM emission factor ($EF_{grid,OM\text{-}DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM\text{-}DD,y}$. As consequence it will be calculated ex-post. Only for the purpose of estimative, the numbers of the most recent years will be used.

The $EF_{grid,OM\text{-}DD,y}$ will be calculated using the formula below:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$ **Equation 6**

Where,

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour *h* of the year *y* (MWh);

$EF_{EL,DD,h}$ = CO_2 emission factor for power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh);

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year *y* (MWh);

h = Hours in year *y* in which the project activity is displacing grid electricity;

y = Year in which the project activity is displacing grid electricity.

As mentioned above, the host country's DNA will provide $EF_{EL,DD,h}$ in order to Project Participants to calculate the operating margin emission factor. Hence, this data will be updated annually applying the published number by the Brazilian DNA. For estimative purposes, the data of the most recent year available in the DNA website will be used.

- **STEP 5 -** Identify the group of power units to be included in the build margin (BM)

The build margin will also be calculated by the DNA. The number is published in the website, http://www.mct.gov.br/index.php/content/view/74689.html, and for estimative purposes the data for the most recent year will be used.

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently; or

(b) The set of power capacity additions in the electricity system that comprises 20% of the system generation (in MWh) and that have been built most recently.

The option (b) is chosen by the Brazilian DNA.

- **STEP 6 –** Calculate the build margin emission factor ($EF_{BM,y}$)

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$ **Equation 7**

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh);

m = Power units included in the build margin;

y = Most recent historical year for which power generation data is available.

- **STEP 7 –** Calculate the combined margin (CM) emissions factor $EF_{y.}$

The combined margin is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y}$$ **Equation 8**

Where:

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh);

w_{OM} = Weighting of operating margin emissions factor (%);

w_{BM} = Weighting of build margin emissions factor (%).

The weights w_{OM} and w_{BM}, for second crediting period, are 0.25 and 0.75, respectively.

With these numbers, applying the formula presented above, we have:

$$EF_y = 0.25 \times 0.2476 + 0.75 \times 0.0794$$

$$EF_y = 0.1214 \text{ tCO}_2\text{e/MWh.}$$

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

Data / Parameter:	$\mathbf{EF_{BMgrid,y}}$
Data unit:	tCO_2/MWh
Description:	CO2 build margin emission factor for grid electricity during the year *y*
Source of data used:	Data provided by the Brazilian DNA (http://www.mct.gov.br/index.php/content/view/303076.html#ancora)
Value applied:	0.0794
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	As per the “Tool to calculate the emission factor for an electricity system”.

Data / Parameter:	$\varepsilon_{el,\ reference\ plant}$
Data unit:	MWhel / MWhbiomass
Description:	Average net energy efficiency of electricity generation in in the reference plant that would be installed in the absence of the CDM project activity
Source of data used:	See section B.6.3.
Value applied:	0.0363
Justification of the choice of data or description of measurement methods and procedures actually applied :	See calculation in section B.6.3.
Any comment:	

B.6.3. Ex-ante calculation of emission reductions:

The tables below show data estimated on energy export and bagasse consumption of the Project from starting date of the second crediting period of the project activity:

Year	Energy exported (MWh)
2010 (from May 1st to December 31st)	58,504
2011	87,756
2012	87,756
2013	87,756
2014	87,756
2015	87,756
2016	87,756
2017 (from January 1st to April 30th)	29,252

Year	Energy consumed (MWh)
2010 (from May 1st to December 31st)	20,600
2011	30,900
2012	30,900
2013	30,900
2014	30,900
2015	30,900
2016	30,900
2017 (from January 1st to April 30th)	10,300

* It is important to mention that some process equipment will be modified in 2012. And instead of using steam from the turbines, will operate with electricity (motors for milling, reducers, distribution system, turbo pumps). These modifications are better described in section A.4.3.

Year	Bagasse consumption (tonnes)
2010 (from May 1st to December 31st)	224,721
2011	337,082
2012	337,082
2013	337,082

2014	337,082
2015	337,082
2016	337,082
2017 (from January 1st to April 30th)	112,361

From these values, EG_y is calculated, according to the equations in section B.6.1, as shown in the attached spreadsheet, with the results shown below:

Year	$EG_{projectplant, y}$ (MWh)	$\varepsilon_{el, project, y}$ (non dimensional)	EG_y (MWh)
2010 (from May 1st to December 31st)	79,104	0.1744	62,463
2011	118,656	0.1744	93,694
2012	118,656	0.1744	93,694
2013	118,656	0.1744	93,694
2014	118,656	0.1744	93,694
2015	118,656	0.1744	93,694
2016	118,656	0.1744	93,694
2017 (from January 1st to April 30th)	39,552	0.1744	31,231

(*) Estimative

Calculation of $\varepsilon_{el, reference plant, y}$

In his PhD thesis Seabra (2008)[15] evaluated the use of bagasse and cane trash for power generation with conventional steam cycles. Taking as reference plant a configuration with a low-pressure boiler (22 kgf/cm^2), he concluded that, at current energy prices, the only financially interesting option would be the use of a configuration with a high-pressure boiler of 65 kgf/cm2 and extraction condensing turbines, which is the usual configuration for CDM projects in Brazil.

The figure below shows comparison of the costs of surplus energy generation for different configurations with 65 and 90 kgf/cm^2 boilers.

[15] Seabra, J. E. A. (2008) "Technical-economic evaluation of options for whole use of sugar cane biomass in Brazil," UNICAMP, Brazil (available at http://libdigi.unicamp.br/document/?code=vtls000446190, accessed on 1 April 2010).

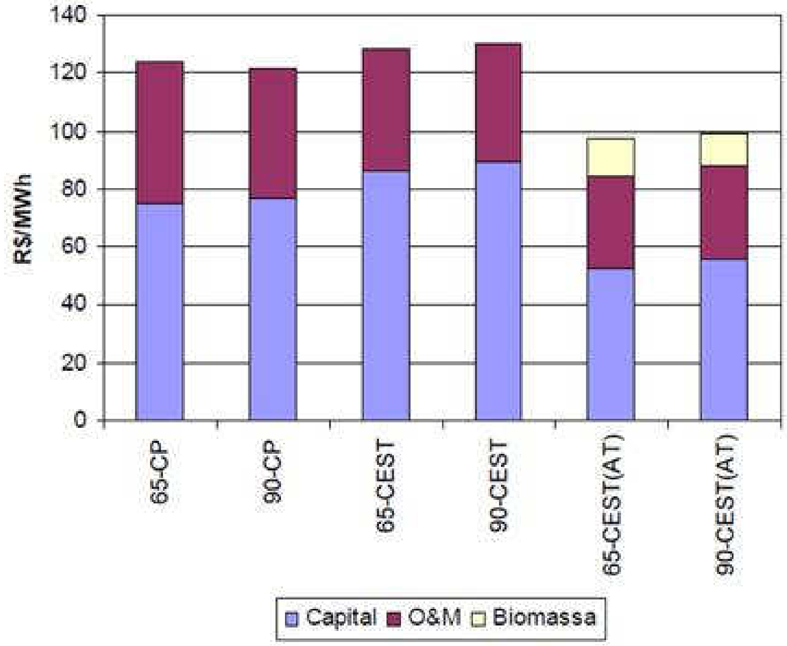

Figura 3.9. Custo da energia elétrica excedente.

Note: CP stands for “counter-pressure turbines;” CEST for “condensing extraction steam turbines” and AT for “co-firing of straw.”

A plant with a 22 kgf/cm^2 boiler is taken by the author as “reference plant” (see the excerpt of the original text below), which is “only interested in the production of sugar and ethanol”. The author adds: “Since the potential capacity for the generation of energy surplus in this reference plant is very small (and not always commercialized), values associated to a possible sale of energy were not considered”.

3.3.2. Aspectos econômicos

O principal objetivo da análise de custos foi determinar o custo da energia elétrica excedente gerada para cada configuração adotada, considerando o seu uso em substituição à configuração padrão das usinas de hoje (22-CP). Para o caso desta configuração, foram determinados somente os custos dos produtos convencionais da usina (açúcar e álcool), que foram adotados como referência para os demais casos. Neste estudo considerou-se que na configuração de referência a usina estaria somente interessada na produção de açúcar e álcool, e, portanto, todos os custos foram distribuidos somente entre estes produtos. Como o potencial de geração de energia elétrica excedente para este caso é muito pequeno (e nem sempre chega a ser efetivamente comercializado), os valores associados à possível venda de energia não foram considerados. Pela grande importância no balanço da usina, a produção interna de melaço

This information on the reference plant is supported by the number and type of boilers installed in the sugar and ethanol industry in the state of São Paulo, which concentrates 60% of Brazilian sugarcane production.

Out of 439 boilers installed in the state of São Paulo, 366 are 21 kgf/cm^2 boilers, representing 83% of the total[16].

Based on data informed by Seabra (2008), it is possible to estimate the electrical efficiency of this reference plant.

Tabela 3.4. Principais parâmetros para a modelagem da planta de geração da usina, de acordo com as configurações selecionadas.

		22-CP	65-CP	90-CP	65-CEST	90-CEST	65-CEST(AT)	90-CEST(AT)
Pressão [a]	bar	22	65	90	65	90	65	90
Temperatura [a]	°C	300	480	520	480	520	480	520
Consumo de energia								
Vapor BP [b]	kg/tc	480	480	480	340	340	340	340
Vapor MP [c]	kg/tc	10	10	10	5	5	5	5
Mecânica	kWh/tc	16	16	16				
Elétrica	kWh/tc	12	12	12	30	30	30	30
Eficiências								
Caldeira (PCI)	%	75	85	86	85	86	85	86
Turbogerador	%	70	80	80	80	80	80	80
Turbinas AM [d]	%	45	45	45				
Pressão de condensação	bar				0,11	0,11	0,11	0,11
Retorno de condensado	%	95	95	95	95	95	95	95
Reserva de bagaço	%	5	5	5	5	5	5	5
Recuperação de palha	%						40	40

[a] Pressão e temperatura do vapor vivo gerado.
[b] Vapor de baixa pressão (saturado a 1,5 bar man.) – vapor de escape das turbinas.
[c] Vapor de média pressão (7-12 bar man.) – provido pela expansão do vapor de 22 bar.
[d] Turbinas de acionamento mecânico (todas operam a 22 bar).

[16] Source: São Paulo State Sanitation and Energy Secretary ("Secretaria de Saneamento e Energia do Estado de São Paulo", presentation available at http://www.energia.sp.gov.br/energia/foldfin2008.pdf, accessed on 1 April 2010).

Main parameters for a model of the generation plant, according to the selected settings								
		22-CP	65-CP	901-CP	65-CEST	90-CEST	65-CEST (AT)	90- CEST (AT)
Pressure[a]	bar	22	65	90	65	90	65	90
Temperature[a]	°C	300	480	520	480	520	480	520
Energy Consumption								
Steam BP[b]	kg/tc	480	480	480	340	340	340	340
Steam MP[c]	kg/tc	10	10	10	5	5	5	5
Mechanical	kWh/tc	16	16	16				
Electrical	kWh/tc	12	12	12	30	30	30	30
Efficiency								
Boiler (PCI)	%	75	85	86	85	86	85	86
Turbogenerator	%	70	80	80	80	80	80	80
Trbine Am[d]	%	45	45	45				
Condensing Pressure	bar				0.11	0.11	0.11	0.11
Condensing Return	%	95	95	95	95	95	95	95
Bagasse Reserve	%	5	5	5	5	5	5	5
Straw Recovery	%						40	40

[a] - Pressure and Temperature of the generated steam

[b] - Low pressure steamn (saturated in 1.5 bar man) - exhaus steam of turbines

[c] - Medium pressure steam (7 -12 bar man) - provided by the steam expansion of 22 bar

[d] - Mechanical turbine (all operates in 22 bar)

According to the table above, the consumption of energy for the reference plant to produce electricity is 12 kWh/t-sugarcane (kWh/tc). Considering that the reference plant produces energy only for own consumption, and conservatively[17] assuming that the amount of bagasse produced is 25% of the amount of sugarcane produced, the consumption of energy, in kWh/t-bagasse is 48. Taking a bagasse NCV of 8.2 MJ/kg (source: IPCC), i.e., one tonne of bagasse generating 2.28 MWh, the electrical efficiency of this reference plant would be 2.11%. This would be the average electrical efficiency of the "average reference plant" in Brazil.

CTC (2010)[18], the largest sugarcane technology center in Brazil[19], estimated the efficiency of electricity generation in typical (reference) Brazilian sugarcane mills that do not export electricity into the grid. The study assess typical configurations for plants built/retrofitted before 2001 (21 kgf/cm^2 boilers with multiple-stage turbo-generators for power generation and steam-driven mills with single-

[17] Compared to the literature: 26-27% (FIESP/CIESP, 2001, "Ampliação da oferta de Energia através da Biomassa," available athttp://www.fiesp.com.br/publicacoes/pdf/ambiente/relatorio_dma.pdf, accessed on 6 April 2010) and 25.5-28% (BNDES, 2008, "Bioetanol de cana-de-açúcar: energia para o desenvolvimento sustentável," available at http://www.bioetanoldecana.org/, accessed on 6 April 2010).

[18] Centro de Tecnologia Canavieira (2010). Determinação da eficiência elétrica das usinas brasileiras para produção exclusiva de açúcar e/ou etanol. Available at: <http://www.ctcanavieira.com.br/site/media/Usina_Referencia_MDL_r0a.pdf>

[19] See http://www.ctcanavieira.com.br/site/index.php?option=com_content&view=article&id=166&Itemid=1269, accessed on 8 April 2010.

stage turbines) and after 2001 (21 kgf/cm^2 boilers with multiple stage turbo-generators for power generation and steam-driven mills with multiple-stage turbines). For average plants built/retrofitted before 2001 the average electrical efficiency obtained is 2.5%. For average plants built/retrofitted before 2001 the average electrical efficiency obtained is 3.5%.

Project participants also studied the electrical efficiency of "recently constructed reference plants".

First, it was compared the list of sugar mills in Brazil, in harvests 2004/2005 and 2006/2007, from the information provided by Unica (http://www.unica.com.br/dadosCotacao/estatistica/, site accessed on 6 April 2010). Mills which were present in the 2006/2007 sugar cane production ranking, but not in 2004/2005, were considered new.

Then, it was checked in the site of ANEEL (Brazilian Electricity Regulatory Agency, http://www.aneel.gov.br/aplicacoes/capacidadebrasil/CombustivelListaUsinas.asp?classe=Biomassa&combustivel=13&fase=3, accessed on 1 April 2010) the registration of these new mills, to verify which of them are already operating and producing electricity. Four mills were found, with high pressure boilers (65 kgf/cm^2), and all of them are CDM projects (in different phases). Only two mils were found, which are independent energy producers and not CDM projects. They have low-pressure boilers (21 kgf/cm^2) and may export their energy surplus to the grid (they have the legal permission to export). Five other new mills with low-pressure boilers are registered in the site of ANEEL, but are not operating yet.

The reference plants selected are the mills with low-pressure boilers which may have a small energy surplus (confidential spreadsheet with the plants data and efficiency calculation supplied to the validating DOE):

- A (started operations in May/2006) - electrical efficiency: 3.47%
- B (started operations in April/2005) - electrical efficiency: 3.63%;

Conservatively disregarding the smallest average values of electrical efficiency from the studies of Seabra (2008) and CTC (2010), project participants will use the highest efficiency value found in the country, 3.63%, for the electrical efficiency of the reference plant.

Taking the highest efficiency of these plants, $\varepsilon_{el,\ reference\ plant}$ = 0.0363, and using the Emission Factor of the national grid (base-year: 2009) of EF_y = 0.1214 tCO_2e/MWh results:

Year	ER_y
2010 (from May 1st to December 31st)	7,586
2011	11,378
2012	11,378
2013	11,378
2014	11,378
2015	11,378
2016	11,378
2017 (from January 1st to	3,793

April 30th)	
Total	79,649

(*) estimated

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

The full implementation of the CERPA project connected to the Brazilian electricity interconnected grid will avoid an average estimated yearly emission of around 11,378 tCO_2e, and a total reduction of about 79,649 tCO_2e over the second 7 years crediting period (up to and including 2017, see Table 4):

Table 4 - Estimation of emission reductions

Years	**Estimation of project activity emissions** (tonnes of CO2e)	**Estimation of baseline emissions** (tonnes of CO2e)	**Estimation of leakage** (tonnes of CO2e)	**Estimation of emissions reductions** (tonnes of CO2e)
2010 (*) (from May 1st)	0	7,586	0	7,586
2011 (*)	0	11,378	0	11,378
2012 (*)	0	11,378	0	11,378
2013 (*)	0	11,378	0	11,378
2014 (*)	0	11,378	0	11,378
2015 (*)	0	11,378	0	11,378
2016 (*)	0	11,378	0	11,378
2017 (*) (until April 30)	0	3,793	0	3,793
Total (tonnes of CO2e)	**0**	**79,649**	**0**	**79,649**

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

B.7.1 Data and parameters monitored:

All the monitored information listed in this section will be archived for two years following the end of the crediting period. Data will be recorded electronically and/or in paper.

Data / Parameter:	$EG_{project\ planty}$
Data unit:	MWh
Description:	Net quantity of electricity generated in the project plant during the year y
Source of data to be used:	Readings of the energy metering connected to the project plant
Value of data applied	118,656

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	CERPA will measure the quantity of exported electricity, the quantity of electricity consumed internally and the quantity of electricity consumed by the auxiliary systems.
QA/QC procedures to be applied:	Continuously
Any comment:	The consistency of metered net electricity generation should be cross-checked with receipts from electricity sales and/or a declaration from buyer of the amount of purchased electricity and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years).

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net quantity of increased electricity generation as a result of the project activity during the year y
Source of data to be used:	Calculated according to equation 2, in section B.6.1
Value of data applied for the purpose of calculating expected emission reductions in section B.5	93,694
Description of measurement methods and procedures to be applied:	CERPA will measure the quantity of exported electricity, the quantity of electricity consumed internally. This data will be monitored by the project proponent through a kWh-meter and double checked by CCEE registration and reports of generated energy. Data will be archived during the crediting period and two years after.
QA/QC procedures to be applied:	The consistency of metered net electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years). This measurement is supervised by internal procedures of Quality Department.
Any comment:	Check calibration and monitoring details in section B.7.2.

Data / Parameter:	**$BF_{bagasse,y}$**
Data unit:	Metric tones
Description:	Quantity of bagasse combusted in the project plant during the year *y*
Source of data to be used:	On-site indirect measurements, based on the percentage of fibre in cane and of bagasse in fibre.
Value of data applied for the purpose of	337,082 (annual average for the 2nd period)

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Monitored continuously through an annual energy balance. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be crosschecked with the quantity of electricity (and heat) generated and any fuel purchase receipts (if available). Data will be archived during the crediting period and two years after.
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	For more details, check section B.7.2.

Data / Parameter:	**NCV_k**
Data unit:	GJ/ton
Description:	Net calorific value of bagasse
Source of data to be used:	Measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See tables in section B.6.3. Measurements by a laboratory will be carried out for the second crediting period. The value used for the estimations is 7.36 GJ/ton = 2.04 MWh/ton
Description of measurement methods and procedures to be applied:	Measurements shall be carried out at reputed laboratories and according to relevant international standards. Measure the NCV based on dry biomass.
QA/QC procedures to be applied:	Every six months, taking at least three samples for each measurement.
Any comment:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass.

Data / Parameter:	**Moisture content of the biomass residues**
Data unit:	% Water content
Description:	Moisture content of bagasse
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	51

Description of measurement methods and procedures to be applied:	The moisture content will be monitored for each batch of biomass of homogeneous quality. The weighted average will be calculated for each monitoring period and used in the calculations.
QA/QC procedures to be applied:	Continuously, mean values calculated at least annually.
Any comment:	This data is archived daily in CERPA electronic system.

B.7.2. Description of the monitoring plan:

As per the procedures set by the approved monitoring methodology ACM0006 , data that will be monitored during the life of the contract are the net quantity of electricity generated at the project plant ($EG_{project\ plant,y}$) and the quantity of bagasse (and its NCV). The project owner will continuously measure these values.

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

The measurement of the energy generated to the grid will be done by two *CCEE* (*Câmara de Comercialização de Energia Elétrica* – Electrical Energy Chamber of Commerce) standard energy meters. Since the system is redundant, if there is any problem with the meter which is used to collect data for energy sales invoice, measurements will be taken from the second meter. If both have problems, *CERPA* will have an additional measurement, which is used for internal control. Concerning the quantity of electricity generated at the project plant, it is performed a daily tracking of the measurements reports available at *CCEE* website, in which the exported and imported electricity are collected through a remote measurement system. The daily reports present electricity data measured hourly.

The calibration of the instruments will be done according to the regulations of *ANEEL*, *Procedimentos de Distribuição de Energia Elétrica no Sistema Elétrico Nacional – PRODIST – Módulo 5 – Sistemas de Medição*, document PND1A-DE8-0550, of October 20, 2005 (http://www.aneel.gov.br). All the energy information related to both plants are archived in the system named *Supervisório.* Those information feed numbers that generate excel reports in order to control the entire energy operation of the plant. Also following *ANEEL* regulations and *ONS* requirements, in the substation of the plant, the principal and backup meters are installed in order to provide the communication with *CCEE SINERCOM* system.

Since the amount of burned bagasse is calculated analytically, the instruments used for laboratory analysis are all calibrated by CERPA, what can be checked on-site. Since the amount of bagasse is calculated analytically, the instruments used for laboratory analysis are all calibrated by CERPA, what can be checked on-site. For this measurement, Sampling and Analysis Plan for each sector in the plant is elaborated. There are specific Methods of Tests, Operational Standards and Norms of procedures for each parameter in order to calculate the amount of bagasse (such as daily analysis of *BRIX* - soluble solids percent by weight of broth, *POL* - sucrose content apparent percent by weight of broth, fiber content, purity). These methods are defined by *Copersucar* – Brazilian Cooperative of Sugar and Alcohol

through the "Industrial efficiency and losses of sugar in the process" Manual, Manual of chemical control for the manufacture of sugar by *CTC* and *CONSECANA* **-** Council of Producers of Sugar Cane, Sugar and Alcohol of the State of *São Paulo* **-** manual.

Measurement of bagasse NCV will be done by independent laboratories (such as *CTC* **-** *Centro de Tecnologia Canavieira*) every six months through compost sample, so that CERPA is not responsible for their calibration.

All the information related to the bagasse and sugarcane are archived and calculated in electronic format through GAtec system in the plant.

The methodology considers monitoring emissions reductions generated from cogeneration projects using sugarcane bagasse. The monitoring plan, for emissions reductions occurring within the project boundary, is based on monitoring the amount of electricity supplied to the grid. The electricity baseline emission factor will be determined *ex-post*. The value used in this PDD was determined *ex-ante* only for estimation purposes.

CERPA is responsible for the project management, monitoring and reporting as well as for organising and training of the staff in the appropriate monitoring, data collection, measurement, archiving and reporting techniques. The person in charge for the project monitoring and reporting is Mr. Eduardo Brondi.

General maintenance and maintenance of equipment and installations will be done yearly, according to the internal procedures of CERPA and the manufacturers' recommendations. The established procedures reflect good monitoring and reporting practices.

CERPA train the local staff yearly focusing on the following issues:

- NR 10[20]: Technical instruction for electric installation and services;
- NR 13: Technical instruction for boilers and pressure vessels;
- Boiler combustion (in accordance with the equipment supplier).

The operation and maintenance of the facility are administered by the sugar mill. The activities are divided in:

- Special predictive maintenance: vibration analysis (monthly), thermo inspections (twice during the season), analysis of the transformer's insolating oil (once during the season);
- Standard predictive maintenance: according ISO 9001.

---

[20] *Ministério do Trabalho e Emprego* (Ministry of Labour and Employment, http://www.mte.gov.br/).

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 and monitoring studies were conducted according to approved methodology ACM0006 – "Consolidated baseline methodology for grid-connected electricity generation from biomass residues", version 10.1, EB55. They were completed on 29/04/2011, by Adriana Berti of Ecopart Ltda.

Ecopart Assessoria em Negócios Empresariais Ltda.
Rua Padre João Manoel, 222
São Paulo, 01411-000
Brazil

Tel.: +55 (11) 3063-9068
Fax: +55 (11) 3063-9069
E-mail: adriana.berti@eqao.com.br

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:

01/05/2003.

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

25y-0m

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

C.2.1. Renewable crediting period:

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

01/05/2010.

C.2.1.2. Length of the first crediting period:

7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

Not applicable for the second crediting period. The plant possesses valid operation licenses (copy under request).

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:

Not applicable for the second crediting period.

SECTION E. Stakeholders' comments

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

Not applicable for the second crediting period.

E.2. Summary of the comments received:

Not applicable for the second crediting period.

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

Not applicable for the second crediting period.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Cerpa – Central Energética Rio Pardo Ltda.
Street/P.O.Box:	Usina da Pedra, Zona Rural
City:	Serrana
State/Region:	São Paulo
Postfix/ZIP:	14150-000
Country:	Brazil
Telephone:	+ 55 (16) 39879001
FAX:	+ 55 (16) 39879019
Represented by	Luiz Roberto Kaysel Cruz
Title:	Director
Salutation:	Mr.
Last Name:	Kaysel Cruz
First Name:	Luiz Roberto
Department:	Administrative
Personal E-Mail:	biocycle@biocycle.com.br

Organization:	BHP Billiton Marketing AG
Street/P.O.Box:	Verheeskade 25
City:	The Hague
State/Region:	
Postfix/ZIP:	2521BE
Country:	Netherlands
Telephone:	
FAX:	+3170 315 6653
E-Mail:	+3170 315 6653
URL:	http://www.bhpbillliton.com/
Represented by:	Mr. Christopher Atkinson
Title:	
Salutation:	Mr.
Last Name:	Atkinson
First Name:	Christopher
Department:	
Personal E-Mail:	chris.atkinson@bhpbilliton.com

Organization:	Ecopart Assessoria em Negócios Empresariais Ltda.
Street/P.O.Box:	Rua Padre João Manoel, 222

Building:	
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	01411-000
Country:	Brazil (United Kingdom of Great Britain and Northern Ireland [21])
Telephone:	+55 (11) 3063-9068
FAX:	+55 (11) 3063-9069
E-Mail:	info@eqao.com.br
URL:	
Represented by:	Mrs. Melissa Sawaya Hirschheimer
Title:	Projects Manager
Salutation:	Mrs.
Last Name:	Hirschheimer
Middle Name:	Sawaya
First Name:	Melissa
Department:	
Mobile:	
Direct FAX:	+55 (11) 3063-9069
Direct tel:	+55 (11) 3063-9068
Personal E-Mail:	focalpoint@eqao.com.br

[21] The project participant Ecopart Assessoria em Negócios Empresariais Ltda. is a company based in Brazil, as shown in Annex 1 of this document. This company also holds a CER account in the UK Greenhouse Gas Emissions Trading Scheme Registry and became a project participant in the project through this country approval in order to use its CER account.

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the present project.

This project is not a diverted ODA from an Annex 1 country.

Annex 3

BASELINE INFORMATION

The Brazilian electricity system, for the purpose of CDM activities, was delineated as a single interconnected system comprehending the five geographical regions of the country (North, Northeast, South, Southeast and Midwest). This was determined by the Brazilian DNA through its Resolution nr. 8 issued on 26th May, 2008.

More information is available at the Brazilian DNA website (http://www.mct.gov.br/index.php/content/view/72764.html).

Annex 4

MONITORING INFORMATION

This section is intentionally left blank (see section B.7.2 for monitoring plan).

- - - - -