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:

São Fernando Biomass Cogeneration Project
Current version: 02
Date: 24/08/2009

A.2. Description of the project activity:

The São Fernando Biomass Cogeneration Project foresees the operation of a new sugarcane bagasse fired cogeneration unit at the sugar and ethanol mill Usina São Fernando, located in the municipality of Dourados, in the Brazilian state of Mato Grosso do Sul.

The project developer is São Fernando Açúcar e Álcool Ltda, belonging to Grupo Bertin (Bertin Group) a Brazilian holding company that includes several different activities in its portfolio, such as energy generation, biodiesel, food companies, cosmetics, agroindustry or infrastructures.

The cogeneration unit is expected to be built during the next five years and will achieve a top installed capacity generation of 128 MW, through the installation of three turbo-generators and two boilers, as follows:

PERIOD	SUGARCANE HARVEST AREA	TOTAL INSTALLED CAPACITY
2009	21,600 Ha	1 * 48 MW
2010	41,350 Ha	1 * 48 MW
2011	46,350 Ha	2 * 48 MW
2012	40,150 Ha	2 * 48 MW + 1 * 32 MW
2013	50,150 Ha	2 * 48 MW + 1 * 32 MW

The turbines and generators installed for power generation have a top capacity of 128 MW. However, due to the absence of more bagasse available for firing and the limitations on the capacity of the boilers for heat generation, the project plant is never expected to reach its top installed capacity of generation.

When the project activity finishes its last stage of construction and the quantity of bagasse available for stoking the boilers reaches its highest value, the cogeneration unit will only be able to achieve a maximum power capacity of 114 MW.

The sugarcane plant will be able to produce both sugar and ethanol products. However, the bad infrastructures currently existing in the state of Mato Grosso do Sul, with special reference to roads and railways, suppose an enormous increase of the cost of transportation of the sugar to the retailers, in comparison with their competence. Therefore, project participants will have to deal with this extra cost in their sugar production.

The main purpose of the project activity is to increase the quantity of power generation using the sugarcane bagasse generated and to export the resulting extra power to the Brazilian grid, the National Interconnected System of Brazil, *Sistema Interligado Nacional do Brasil (SIN).*

The project activity intends to make efficient use of resources while minimizing the impact on the environment, in order to supply Brazil's rising demand of energy and to improve the supply of electricity, while contributing to the environmental, social and economic sustainability of the country by increasing renewable energy's share of the whole Brazilian power consumption.

Grupo Bertin has always been very concerned about the emissions related with its industrial activities. They have already developed several GHG emission reduction projects, such as reforestation, construction of a recycling plant for all the companies of the holding or wastewater treatments in the slaughterhouses and tanneries. Actually, Bertin was one of the first companies in Brazil which resorted to the Clean Development Mechanism, through the presentation in 2005 of two fuel switching projects at slaughterhouses and tanneries. A small hydro power plant project was also suggested under the CDM activity in 2007.

São Fernando Açúcar e Álcool, as a part of Grupo Bertin, pretends to help in the research of the sustainable development by promoting activities that agree with the social and environmental responsibilities of the company. The São Fernando cogeneration plant is one of these activities.

Environmental benefits

The main purpose of the São Fernando Cogeneration Project is to contribute to sustainable development in Brazil through the effective utilization of biomass residues available for power and heat generation. Therefore, the project helps with the climate change mitigation by generating clean power and by reducing the fossil fuel based power generation of the Brazilian grid, the National Interconnected System of Brazil.

The company has developed the *Programa Básico Ambiental* (Environmental Basic Program) which involves 14 different programs addressed to the population of Mato Grosso do Sul and is carried out in order to improve the social and environmental situation of the region. These programs include the following items:

- Vegetation Monitoring
- Fauna monitoring
- Monitoring of water quality
- Monitoring of air quality
- Land monitoring
- Solid residues management
- Land erosion processes control
- Noise monitoring
- Degraded areas recuperation
- Regulation of legal reserves
- Workplace risks prevention
- Environmental education
- Social communication
- Risks management and emergency actions

Social benefits

The project will create employment in the region for the installation, operation and maintenance of the sugarcane plant. The whole construction (sugarcane plant and cogeneration unit) will generate 1.100 direct and 4.400 indirect employments in its first year. The job creation will achieve 1.800 direct and

7.200 indirect employments after 5 year operation, when the cogeneration unit gets its top power generation. Regarding to professional qualifications, the São Fernando project pays special attention and effort to local community education, believing that this way contribute to the increase of their own income. Apart of the employments due to the straight construction and operation of the plant, there will also be job generation indirectly related to the project activity, such as research and development (R & D), production and maintenance of equipment.

The project will also help with the distribution of income and will increase the municipal tax collection, which means an indirect benefit for the citizens of the region.

Economical benefits

The implementation of the project activity creates a new option to generate revenue through the sale of electricity and CERs, which ensures a greater financial sustainability. The project also promotes a better interaction between the sugarcane and the energy sectors.

The sugarcane based industry is one of the most important economic sectors in Brazil. The most of the sugar mills are located in the Central and South regions of the country, especially in the state of São Paulo. Only around the 7% of the sugarcane plants in Brazil are located in the state of Mato Grosso do Sul. Thus, São Fernando cogeneration project will help with the economic development and at the same time will contribute to the energy needs of the region.

As it is a locally sourced fuel, bagasse will increase the reliability of electricity supply by diversifying sources and by reducing fossil fuel dependence.

The São Fernando cogeneration unit will increase the national grid stability and reliability as well decreasing the needs for costly investments in grid upgrading in the state of Mato Grosso do Sul.

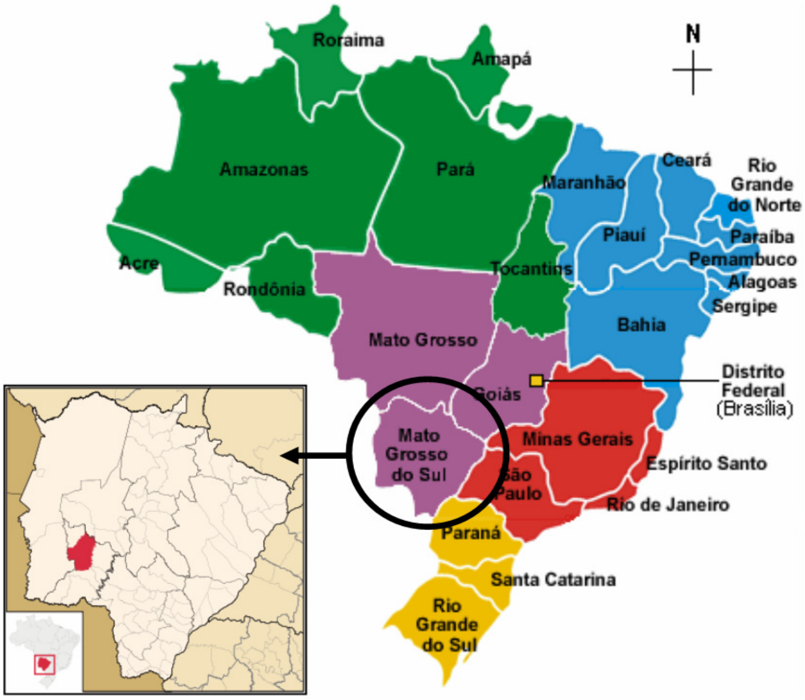
A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	São Fernando Açúcar e Álcool Ltda. (Private Entity)	No
	Zeroemissions do Brasil Ltda. (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:

São Fernando Cogeneration Project is located in the municipality of Dourados in the state of Mato Grosso do Sul.



Location of São Fernando Cogeneration Project in the State of Mato Grosso do Sul, Brazil

A.4.1.1. Host Party(ies):

Brazil.

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

Mato Grosso do Sul.

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

Dourados.

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

The exact address of the plant is km 8, MS-379 road, located in the municipality of Dourados (Paraná Hydrographical Basin and Dourados river hydrographical basin).

The exact location of the project is defined using the following coordinates, given by the technical data that the Brazilian National Electricity Agency (ANEEL) considered as the location of the cogeneration unit of São Fernando:

Latitude: 22° 18' 53" S | Longitude: 54° 55' 57" W

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:

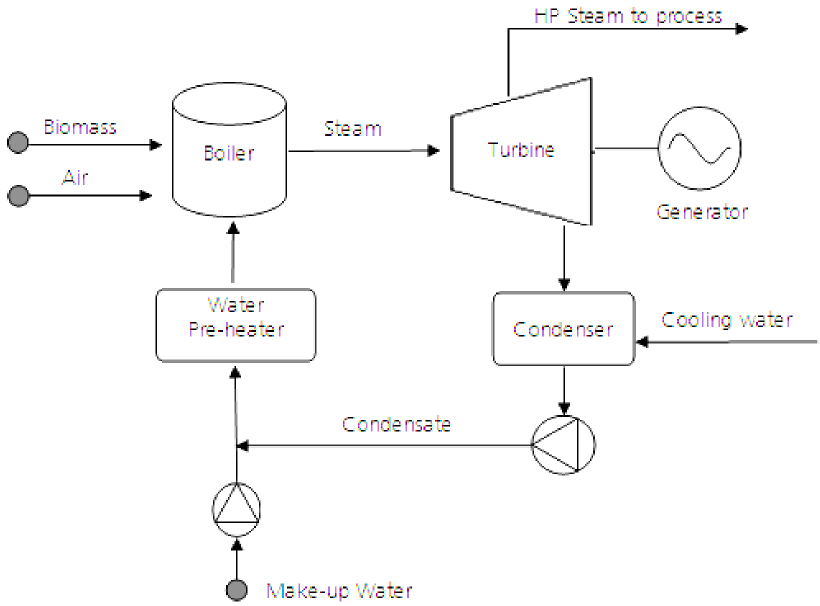
The predominant technology all around the world for generating megawatt (MW) levels of electricity from biomass is the steam-Rankine cycle. The proposed technology of this project activity will use biomass as a fuel in the high pressure boiler and high pressure steam will be generated and expanded in the back pressure turbine, generating power and steam.

The Rankine Cycle is a very common and mature technology. It involves boiling pressurized water and steam generation, expansion of the generated steam in backpressure turbines with power generation, and condensation of water for recycling.

Most steam cycle plants are located at industrial sites, where the waste heat from the steam turbine is recovered and used for meeting industrial-process heat needs. Such Combined Heat and Power (CHP), or cogeneration, systems provide greater levels of energy services per unit of biomass consumed than systems that generate only power.

Steam turbines are designed as either "back-pressure" or "condensing" turbines. CHP applications typically employ back-pressure 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 (CEST) might be used. This design includes the capability for some steam to be extracted at one or more points along the expansion path for meeting process needs (see figure below).

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 back-pressure 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.



Schematic diagram of a biomass-fired steam Rankine cycle for cogeneration

More than the technology, the real reasons of the success of cogeneration are some appealing economic, operational and environmental advantages. Cogeneration systems offer several potential industry and benefits for the user. Some key financial, operational and environmental advantages and benefits of cogeneration have been identified and are summarized in the following table:

Advantages & Benefits		
Financial	**Operational**	**Environmental**
Reduce primary energy cost by up to 30%	Improve the security of electrical supply	Reduce fossil fuel usage
Reduce energy expenses by up to 20%	Reduce or eliminate utility power purchases	Increase energy efficiency
Stabilize the risks associated with rapidly rising energy prices	Improve the security of heat supply	Reduce GHG emissions
Provide potential additional revenues through sales of excess power	Eliminate the need for expensive electrical connection upgrades	---
----	Provide electricity, heat and cooling simultaneously	----

Advantages and benefits of cogeneration systems

The project activity implements the necessary equipments for cogeneration during three stages, anc each one of them increases the power generation. Based in the above explanation, the list of the equipments that will be installed within the project activity is described below:

- **Stage I (2009-2010)**

Installation of the first boiler, turbine and generator. The plant will reach a total generation capacity of 48 MW. The characteristics of the equipments are the following:

	Characteristic	Description	Unit
Boiler	Manufacture	HPB/Sermatec	-
	Brand	HPB	-
	Model	VS-500/1	-
	Steam	250	t/h
	Steam Temperature	540	ºC
	Water Temperature	120	ºC
	Pressure	100	Bar
	Fuel	Bagasse	-
	Efficiency	87	%

	Characteristic	Description	Unit
Turbine	Manufacture	TGM	-
	Brand	TGM	-
	Model	BT 50	-
	Capacity MW	52.35	MW
	Capacity KVA	65,437.5	kVA
	r.p.m.	5,440	r.p.m.
	Pressure	15	Bar
	Admission Temperature	530	ºC

	Characteristic	Description	Unit
Generator	Manufacture	WEG	-
	Brand	WEG	-
	Model	SPW 1250	-
	Voltage	13.8	kV
	Frequency	60	Hz
	r.p.m.	1,800	r.p.m.
	Capacity MW	48	MW
	Capacity KVA	60,000	KVA
	Refrigeration	Air-water heat exchanger	-

	Characteristic	Description	Unit
Substation	Capacity	2 * 30,000/37,500	kVA
	Voltage	138	kV

	Characteristic	Description	Unit
Transformer	Capacity	30,000/37,500	kVA
	Voltage	138	kV

- **Stage II (2011)**

The top installed capacity will achieve 96 MW, through the installation of a new boiler, generator and turbine, as follows:

	Characteristic	Description	Unit
Boiler	Manufacture	HPB/Sermatec	-
	Brand	HPB	-
	Model	VS-500/1	-
	Steam	350	t/h
	Steam Temperature	540	ºC
	Water Temperature	120	ºC
	Pressure	100	Bar
	Fuel	Bagasse	-
	Fuel consumption	123,800	Kg/h
	Efficiency	87	%

	Characteristic	Description	Unit
Turbine	Manufacture	TGM	-
	Brand	TGM	-
	Model	BT 50	-
	Capacity MW	52.35	MW
	Capacity KVA	65,437.5	kVA
	r.p.m.	5440	r.p.m.
	Pressure	15	Bar
	Admission Temperature	276.67/530	ºC/F°

	Characteristic	Description	Unit
Generator	Manufacture	WEG	-
	Brand	WEG	-
	Model	SPW 1250	-
	Voltage	13.8 kV	kV
	Frequency	60 Hz	Hz
	r.p.m.	1,800	r.p.m.
	Capacity MW	48	MW
	Capacity KVA	60,000	KVA
	Refrigeration	Air/water exchanger	-

	Characteristic	Description	Unit
Substation	Capacity	3 * 30,000/37,500	kVA
	Voltage	138	kV

	Characteristic	Description	Unit
Transformer	Capacity	30,000/37,500	kVA
	Voltage	138	kV

- **Stage III (2012-2013)**

Installation of the last turbine and generator. The plant will achieve a top installed capacity of 128 MW. However, as explained before, according to the engineering studies carried out prior to the project implementation, with the bagasse available for firing and the limitations on the capacity of the boilers for vapor generation, the project plant will not be able to generate more than 114 MW.

Technical characteristics of the new equipments installed in the stage III, as follows:

	Characteristic	Description	Unit
Turbine	Manufacture	TGM	-
	Brand	TGM	-
	Model	BT 40	-
	Capacity MW	40	MW
	Capacity KVA	47,200	kVA
	r.p.m.	6,800	r.p.m.
	Pressure	16	Bar
	Admission Temperature	276.67/530	ºC/F°

	Characteristic	Description	Unit
Generator	Manufacture	WEG	-
	Brand	WEG	-
	Model	SPW 1,250	-
	Voltage	13.8 kV	kV
	Frequency	60 Hz	Hz
	r.p.m.	1,800	r.p.m.
	Capacity MW	32	MW
	Capacity KVA	40,000	KVA
	Refrigeration	Air/water exchanger	-

	Characteristic	Description	Unit
Substation	Capacity	4 * 30,000/37,500	kVA
	Voltage	138	kV

	Characteristic	Description	Unit
Transformer	Capacity	30,000/37,500	kVA
	Voltage	138	kV

The evolution of the installed capacity during the first five years of the project activity, until the plant reaches the top generation, is detailed in the table below:

Year	Total installed capacity (MW)
2009	48
2010	48
2011	96
2012	128
2013	128

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

The chosen crediting period for the project activity is the renewable crediting period of 7 years. The estimated amount of emission reductions appears in the following table. The project will consider the ex-post method for calculating the emission factor. In other words, the project participants will calculate the project emission reductions using the Brazilian DNA provided data (operating margin emission factor & build margin emission factor) when the verification is completed. The emission factor is calculated by the Brazilian DNA by using the *"Tool to calculate the emission factor for an electricity system",* version 01.1.

Years	Annual estimation of emission reductions (tCO_2)
2010	48,708
2011	55,047
2012	96,035
2013	121,426
2014	121,426
2015	121,426
2016	121,426
Total Estimated Emissions Reductions (tCO_2e)	685,494
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tCO_2e)	97,928

Estimated emission reductions for the first crediting period.

A.4.5. Public funding of the project activity:

There is no public funding of Annex I parties involved in the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Baseline methodology approved and consolidated ACM0006 - version 09: "*Consolidated baseline methodology for grid-connected electricity generation from biomass residues*".

- *"Tool for the demonstration and assessment of additionality"*; version 05.2.
- *"Tool to calculate the emission factor for an electricity system"*; version 01.1.

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

The project activity pretends to install a new power plant fired with sugarcane bagasse, in order to generate power in a location where no energy is currently generated. Therefore, according to methodology ACM0006, this is a *"Greenfield Power Project"*.

The project complies with the methodology applicability conditions:

> *No other biomass types than biomass residues, as defined in the Methodology ACM0006 / version 09, page 2, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired);*

The unique fuel used in the project plant is a biomass residue consisting of sugarcane bagasse. The bagasse used in the São Fernando Cogeneration Plant comes from the production of alcohol and sugar carried out in the same facility where the project is located. Therefore, the project only uses biomass residues as input.

> *For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process;*

The sugar and ethanol plant will not increase their current sugarcane processing capacity because of the CDM project, but rather due to the recent increase of the production and the demand of sugar and ethanol in the country. The supply of ethanol in the Brazilian market is not sufficient to meet the rising demand caused by the introduction of flex-fuel automobiles that run on gasoline, ethanol or a blend of both.

Moreover, according to the National Supply Company (CONAB, *Companhia Nacional de Abastecimento*, a public and reliable font belonging to the Brazilian Ministry of Agriculture), it is expected sugarcane cultivated in the South regions of Brazil for December 2008 harvest season to increase compared to the previous cycle. In words of CONAB, sugarcane production in the Central-South region in 2008 will reach the 502 million tones, which means an increase of 15.34% compared with 2007[1].

The biomass residues used by the project facility should not be stored for more than a year.

The percentage of the bagasse used per year in the cogeneration plant is almost the total production of bagasse per year in the sugar and alcohol production line. Only around 7% of the total amount of bagasse generated during the harvest season is stored for restarting the production in the next harvest. In any case, this bagasse is stored from the end of the harvest season, in November, until the beginning of the following harvest season, in April, which means less than a year.

No significant energy quantities, except from transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. esterification of waste oils).

The biomass residue for fuel combustion, the bagasse, is the product of a mechanical operation after sugarcane's reception and there is no transportation involved of bagasse in this project.

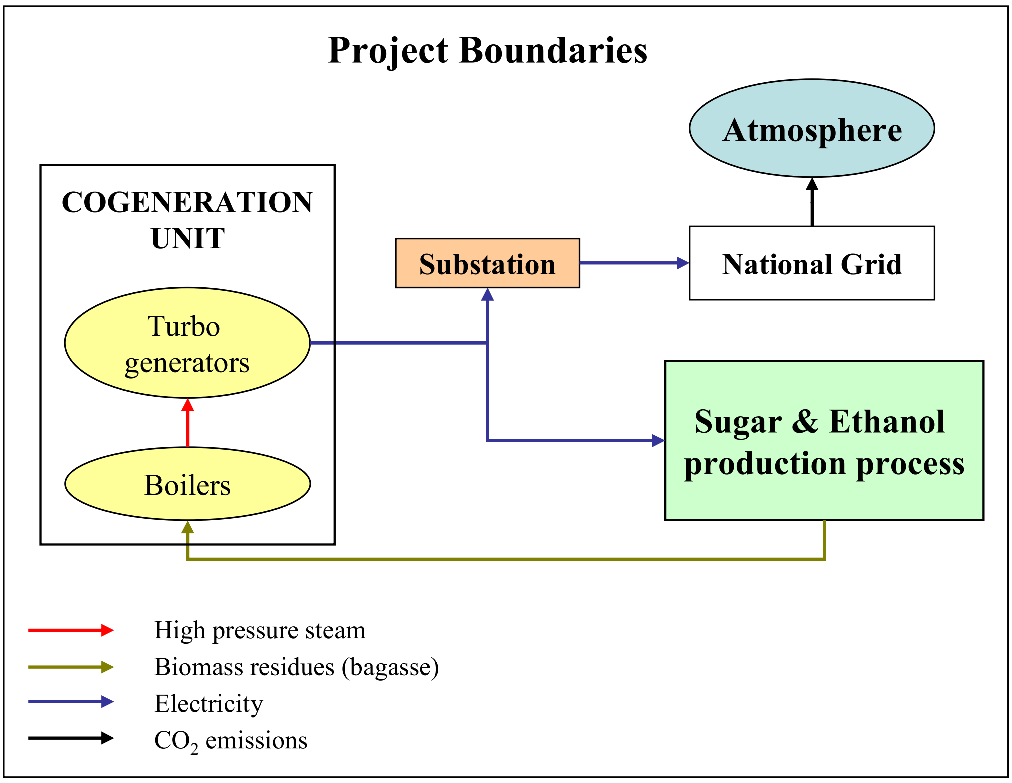
B.3. Description of the sources and gases included in the project boundary:

	Source	Gas		Justification / Explanation
Baseline	Grid 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	Excluded	The thermal efficiency of the project plant is similar compared with the thermal efficiency of the reference plant considered in baseline scenario.
		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	The applicable scenario for this project activity is B4.
		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 project activity (stationary or mobile)	CO_2	Excluded	There is no on-site fossil fuel and electricity consumption.
		CH_4	Excluded	There is no on-site fossil fuel and electricity consumption.
		N_2O	Excluded	There is no on-site fossil fuel and electricity consumption.
	Off-site transportation of biomass residues	CO_2	Excluded	There is no off-site transportation of biomass residues.
		CH_4	Excluded	There is no off-site transportation of biomass residues.
		N_2O	Excluded	There is no off-site transportation of biomass residues.
	Combustion of	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not

[1] Monitoring of the 2008 Brazilian Sugarcane Crop. Third report – December 2008. *(Acompanhamento da Safra Brasileira, Cana de Açúcar, Safra 2008 Terceiro Levantamento Dezembro/2008).* www.conab.gov.br/conabweb/download/safra/3cana_de_acucar.pdf

				lead to changes of carbon pools in the LULUCF sector.
	biomass residues for electricity and / or heat generation	CH_4	Excluded	The CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario are not included.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be 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 biomass residues are 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 CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	There is no waste water treatment (partly) under anaerobic conditions.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small.

The following flow diagram defines the project boundaries:



The cogeneration unit of the project activity consists of the following equipments (which technical characteristics were described in the section A.4.3 of the PDD):

- Two bagasse fired boilers.
- Three turbines.
- Three generators.

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

The project activity consists of the installation of a new sugarcane bagasse fired cogeneration unit in a place where no power is currently being generated. The cogeneration plant is located in the new sugarcane mill of São Fernando and will fire the bagasse resulting from the processing of the sugarcane for power and heat generation. The project plant will achieve a top capacity of generation of 114 MW through the installation of new high efficient cogeneration equipments, and the energy generated will be used for meeting the needs of the São Fernando's industrial process. The power surplus will be injected to the national grid.

In absence of the project activity, project participants would have also built a new cogeneration unit (the reference plant) at the same site, fired with the same type and quantity of bagasse, but with an efficiency of electricity generation which is common practice in the Brazilian sugarcane industry. This means that, as it is common practice in the sector, the reference plant would have lower efficiency than the project activity and it would generate power only for meeting the requirements of the sugarcane processing plant. Therefore, in this case there will not be any power generation surplus for exporting to the grid.

According to the chosen methodology, the identification of the baseline scenario is determined by the analysis of the following alternatives:

- How power demand would be covered in the absence of the CDM project activity.
- What would happen to the biomass residues in the absence of the project activity.
- In case of cogeneration projects: how the heat would be generated in the absence of the project activity.

For **power** generation, the following scenarios have been considered as plausible alternatives:

Scenario	Description	Comments	Plausible
P1	The proposed project activity not undertaken as a CDM project activity.	This could be considered as a plausible scenario. However, as it will be shown afterwards in the investment analysis, the proposed project activity without the CDM benefits is not financially attractive for project developers. Therefore, this is not a feasible scenario.	No

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.	This is a Greenfield Power Project.	No
P3	The generation of power in an existing captive power plant, using only fossil fuels.	This is a Greenfield Project Activity.	No
P4	The generation of power in the grid.	In absence of the project activity, a reference plant would be built with a less efficient technology for power generation. The reference plant would fire the same type and quantity of biomass residues as the project plant, but with a lower efficiency of power generation (the one that is common practice for sugarcane bagasse fired power plants in the state of Mato Grosso do Sul). Therefore, the difference of power generation between the project plant and the reference plant would be taken from the grid.	**Yes**
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.	In absence of the project activity, a reference plant would be built with a less efficient technology for power generation. The reference plant would fire the same type and quantity of biomass residues as the project plant, but with a lower efficiency of power generation (the one that is common practice for sugarcane bagasse fired power plants in the state of Mato Grosso do Sul).	**Yes**
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.	In absence of the project activity, a reference plant fired with the same type and quantity of biomass residue as in the project plant would be built. The amount of biomass residues available in the project activity for cogeneration is the same as in the baseline scenario, which is the quantity of bagasse produced by the sugar and ethanol production process.	No
P7	The retrofitting of an existing 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 is a Greenfield Power Project.	No
P8	The retrofitting of an existing biomass	This is a Greenfield Power Project.	No

	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.		
P9	The installation of a new fossil fuel fired captive power plant at the project site.	The objective of the project developers is to build a new grid connected cogeneration plant, in order to meet the heat and power needs of their production process and to obtain extra revenues through the sale of the power surplus to the grid. Besides, a fossil fuel fired plant would lead to higher emissions. In this case, the project activity could not receive the benefits of the CDM, which are necessary to ensure the financial feasibility of the project.	No
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.	The type and quantity of biomass residues in the baseline is the same as in the project activity. The cogeneration plant only fires biomass residues proceeding from the sugar and ethanol production process associated to the project activity.	No
P11	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	There is not any cogeneration plant currently existing at the project site.	No

For the use of **biomass**, the following scenarios are plausible alternatives:

Scenario	Description	Comments	Plausible
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.	Since the use of sugarcane bagasse as fuel for cogeneration is a common practice in the Brazilian sugarcane processing industry, in absence of the project activity, the same biomass residues would have also been fired for power and heat generation. Besides, the reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues for cogeneration, as in the project plant.	No
B2	The biomass residues are dumped or left to	Since the use of sugarcane bagasse as fuel	No

	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.	for cogeneration is a common practice in the Brazilian sugarcane processing industry, in absence of the project activity, the same biomass residues would have also been fired for power and heat generation. Besides, the reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues for cogeneration, as in the project plant.	
B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.	Since the use of sugarcane bagasse as a fuel for cogeneration is a common practice in the Brazilian sugarcane processing industry, in absence of the project activity, the same biomass residues would have also been fired for power and heat generation. Besides, the reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues for cogeneration, as in the project plant.	No
B4	The biomass residues are used for heat and/or electricity generation at the project site.	The reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues as in the project plant.	**Yes**
B5	The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants.	The reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues as in the project plant.	No
B6	The biomass residues are used for heat generation in other existing or new boilers at other sites.	The reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues as in the project plant.	No
B7	The biomass residues are used for other energy purposes, such as the generation of biofuels.	Since the use of sugarcane bagasse as a fuel for cogeneration is a common practice in the Brazilian sugarcane processing industry, in absence of the project activity, the same biomass residues would have also been fired for power and heat generation. Besides, the reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues for cogeneration, as in the project plant.	No
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).	Since the use of sugarcane bagasse as a fuel for cogeneration is a common practice in the Brazilian sugarcane processing industry, in absence of the project activity, the same biomass residues would have also been fired	No

		for power and heat generation. Besides, the reference plant that would be built in absence of the project activity would fire the same type and quantity of biomass residues for cogeneration, as in the project plant.	

For **heat** generation, the following scenarios have been considered as plausible alternatives:

Scenario	Description	Comments	Plausible
H1	The proposed project activity not undertaken as a CDM project activity.	This may be considered as plausible scenario. However, as it will be shown afterwards in the investment analysis, the proposed project activity without the CDM benefits is not financially attractive for project developers. Therefore, this is not a feasible scenario.	No
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).	In absence of the project activity, the same heat would be generated by the reference plant, which would use the same type and quantity of biomass residues. In the case of the reference plant, the efficiency of heat generation would be the one that is common practice in sugarcane bagasse fired plants of the state of Mato Grosso do Sul.	**Yes**
H3	The generation of heat in an existing captive cogeneration plant, using only fossil fuels.	This is a Greenfield Power Project.	No
H4	The generation of heat in boilers using the same type of biomass residues.	In absence of the project activity, the same heat would be generated by the reference plant, which would use the same type and quantity of biomass residues. Since the main objective of project developers is to generate power and heat in order to meet the energy needs of their sugar and ethanol production process, using the bagasse purchased only for heat generation in boilers is not an attractive alternative for them.	No
H5	The continuation of heat generation in an existing biomass residue fired cogeneration plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as in the project activity.	This is a Greenfield Power Project.	No
H6	The generation of heat in boilers using	Since the same quantity of sugarcane	No

	fossil fuels.	bagasse fired in the project activity for power and heat generation would be available in the baseline scenario, in absence of the project activity, the same heat would be generated by the reference plant, using the same type and quantity of biomass residues. Since the main objective of project developers is to generate power and heat in order to meet the energy needs of their sugar and ethanol production process, using the bagasse purchased only for heat generation in boilers is not an attractive alternative for them.	
H7	The use of heat from external sources, such as district heat.	There is no heat generation from external sources at the project site.	No
H8	Other heat generation technologies (e.g. heat pumps or solar energy).	There are no other heat generation technologies currently being adopted by the sector in Brazil.	No
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.	The objective of the project developers is to build a cogeneration plant fired only with the sugarcane bagasse available from the sugar and ethanol production process associated to the project activity. Using any other type of biomass residues or fossil fuels is not a convenient option for project developers.	No
H10	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	There is not any cogeneration plant currently existing at the project site.	No

Hence, the available alternatives for the baseline scenario are:

- For power generation: P4 in conjunction with P5.
- For the use of biomass residues: B4.
- For heat generation: H2.

The methodology ACM0006 – version 09, describes its scenario #4 as follows:

The project activity involves the installation of a ***new biomass residue fired power plant*** *at a site where no power was generated prior to the implementation of the project activity. In the absence of the project activity, a new biomass residue fired power plant (in the following referred to as* ***"reference plant"****) would be installed instead of the project activity at the same site and with the same thermal firing capacity but with* ***a lower efficiency of electricity generation*** *as the project plant (e.g. by using a low-*

pressure boiler instead of a high-pressure boiler). ***The same type and quantity of biomass residues as in the project plant would be used in the reference plant*** *(B4). Consequently, the power generated by the project plant would in the absence of the project activity be generated (a) in the reference plant (P5) and – since power generation is larger in the project plant than in the reference plant – (b) partly in power plants in the grid (P4). In case of cogeneration projects, the following conditions apply: The reference plant would also be a cogeneration plant;* ***the heat generated by the project plant would in the absence of the project activity be generated in the reference plant*** *(H2).*

This paragraph completely agrees with the description of the project activity, so the case #4 has been chosen as the appropriated baseline scenario.

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):

Awareness of the CDM process

Since the very beginning of the project activity, project developers knew the possibility of including the CDM benefits as a part of the São Fernando cogeneration project and they took it into account for the project economical feasibility study. A clear evidence of this early consideration is the reference to the CDM mechanism included in the minutes of the Grupo Bertin's Board meeting on September 2007, where it is agreed that the project developers would look for consultancy companies for carrying out the CDM project development.

Grupo Bertin created a CDM Department in order to study the different possibilities of including their investments into the Clean Development Mechanism. This department already studied the CDM consideration of the São Fernando project at the beginning of 2007. On the minutes of the Bertin's CDM Department meeting on January 2007 they discussed the different possibilities for CDM projects in the investments of the company. São Fernando project is one of these possibilities.

Grupo Bertin also has the copy of different offers from Zeroemissions Technologies (PDD consultant) in which the company offers its consultancy services for developing the CDM project for São Fernando Cogeneration Plant. These three offers are dated respectively on October 2007, March 2008 and August 2008.

The evidences about the prior consideration of the CDM project will be shown to the DOE during the validation.

Apart from this, as explained at the beginning of the PDD, Grupo Bertin has already developed two CDM projects in 2005, referred to fuel switching in slaughterhouses and tanneries and one more project in 2007 about clean energy generation in a small hydro power plant. This evidence helps to demonstrate that project developers had prior consideration of the CDM for the São Fernando cogeneration project and for any other project of this kind that they could carry out.

Reduction of GHG are reduced below those that would have occurred in the absence of the Project

In words of the methodology ACM0006 version 09, project participants shall identify the most plausible baseline scenario and demonstrate additionality using the latest approved version of the *"Combined tool to identify the baseline scenario and demonstrate additionality"* (version 02.2). However, as described in the last version of this tool, in cases where one or more alternative scenarios to the proposed project activity are not available options to the project participants, a different procedure would be required to demonstrate additionality and identify the baseline scenario. Such cases might include grid-connected power projects (where an alternative might be electricity produced by other facilities not under the control of project participants). In such cases, baseline scenarios might be rather complex (such as the combined margin scenario in ACM0002). The Meth Panel is considering whether expanding this tool to cover all cases would be appropriate. In the meantime, methodologies that typically involve alternatives not under the control of project participants can continue to use, if desired, the additionality tool (provides benchmark and other tools), and provide their own methods to develop and/or assess baseline scenario.

As it will be discussed later, one of the alternative scenarios to the project activity is the construction of a new cogeneration plant with less efficient equipments. This plant, with the same installed capacity, would fire the same type and quantity of biomass residues as in the project plant, but with a lower power generation. In this case, the difference between the power generated by the project plant and the power generated by the less efficient plant would be generated by other facilities that are currently connected to the grid and are not under the control of the project participants. In this possible and feasible scenario and according to the latest approved version of the Combined Tool, project participants are able to use the *"Tool for the demonstration and assessment of additionality"*[2].

Consequently, in this case additionality has been determined using the *"Tool for the demonstration and assessment of additionality";* version 05.2.

STEP 1: Identification of alternatives to the project activity consistent with current laws and regulations

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

The following alternative scenarios are available alternatives to the project activity:

- The project activity not undertaken as a CDM project activity.

- The construction of a cogeneration plant, fired with the same type and quantity of biomass residues, but with a power generation efficiency which is common practice in the sector. This

[2] The CDM Executive Board (EB) on its 47th meeting (paragraph 23 of the meeting report) asked for the deviation from the use of combined tool prescribed by the methodology and requested the Meth Panel to review the possibility of allowing the use of additionality tool, in place of combined tool.

The Meth Panel on its 39th meeting recommended the EB to approve a revision of the combined tool in the context of the overall revision of ACM0006. According to the Meth Panel, the use of the combined tool is currently restricted to situations in which all potential alternative baseline scenarios to the proposed project activity are available options to the project participants.

means the installation of less efficient boilers and turbines. The plant would not have enough capacity for generating energy in order to cover the power needs of the industrial process and should import a part of energy from the grid. As said before, in this case the difference between the power generated by the project plant and the less efficient plant would be generated by other facilities that are connected to the grid and are not under control of the project participants.

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

Considering the identified alternative scenarios, the consistency with laws and regulations has been analyzed on the basis of the exigencies and requirements established by the Secretary of Environment of the State of Mato Grosso do Sul (SEMAC) and the National Electricity Agency (ANEEL).

The Secretary of Environment of the State of Mato Grosso do Sul (SEMAC) is responsible for analyzing any possible environmental impact due to the project activity normal development. The licenses required by the Brazilian environmental regulation are:

- The preliminary license *(Licença Prévia, LP).*
- The construction license *(Licença de Instalação, LI).*
- The operating license *(Licença de Operação, LO).*

São Fernando has already all the required licenses, as detailed below:

- Preliminary licenses number 20/2009 (for the transmission line) and 27/2009 (for the substation).
- Construction license number 129/2008.
- Operating licenses protocol number 256/2009 (for the cogeneration unit), 285/2009 (for the substation) and 288/2009 (for the transmission line).

The cogeneration plant also has its authorization and registration on the National Agency of Electrical Energy (ANEEL) to operate as an independent power producer. Therefore, the project activity obeys all the mandatory laws and regulations of the state of Mato Grosso do Sul.

As detailed before, the two available scenarios for the project activity are the following:

1. The project activity not undertaken as a CDM project.

   Since the project participants have already obtained all the necessary licences for the construction and operation of the project plant, the construction of the same project plant, with the same characteristics but without considering the CDM revenues, would also be consistent with the laws and regulations currently applicable in Brazil.

2. The construction of a new cogeneration plant less efficient than the project plant, according to scenario #4 of the methodology ACM0006.

   In this case, a new biomass residue fired power plant (the reference plant) would be installed instead of the project activity at the same site and with the same thermal firing capacity but with 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.

Therefore, since the reference plant would be located at the same site as the project plant, with the same characteristics and a power generation efficiency that is common practice in the state of Mato Grosso do Sul, no mandatory laws or regulations would prevent the construction of this reference plant.

STEP 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

Since the project activity generates financial or economic benefits apart from the CDM incomes, according to the *"Tool for the demonstration and assessment of additionality"* there are two possible investment analysis methods to choose: investment comparison analysis (option II) and benchmark analysis (option III).

In this case, the benchmark analysis has been taken as investment analysis method for the project activity.

Sub-step 2b: Option III. Benchmark analysis

A benchmark analysis has been considered as a suitable option for this project, and the project Internal Return Rate (IRR) has been considered as the best financial indicator.

As it will be explained afterwards, the first real action of the project activity was the purchase of the turbine in 12/11/2007. Therefore, the investment analysis was also done in that period and Grupo Bertin used its own Weight Average Cost of Capital (WACC) to decide whether to carry out the project. The calculation of this benchmark is based on publicly available data sources.

According to the benchmark analysis, if the project IRR without CDM revenues is lower than the WACC, the project activity is not an interesting investment for the project participants.

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

In order to follow the correct PDD chronology, project participants used as benchmark the value of the company's WACC on 2007, which is the minimum return rate expected by Grupo Bertin for its investments during this period.

The project's IRR (with and without CDM benefits) has been compared with the company's WACC. At the time of the investment decision, which is 2007, the benchmark of Grupo Bertin for this type of investment was 15.82%.

Regarding the IRR of the project activity and according to the "*Guidance on the Assessment of Investment Analysis"*, included as an annex of the "*Combined tool to identify the baseline scenario and demonstrate additionality"*, the investment analysis has been done in order to reflect the period of expected operation of the project activity. Thus, it has been considered a 20 years period, which is, in words of the manufacturer, the expected operational lifetime of the first boiler in perfect conditions.

In words of the "*Guidance on the Assessment of Investment Analysis"*, input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. The use of investment analysis to demonstrate additionality is intended to assess whether or not a reasonable investor would decide to proceed with a particular project activity without the benefits of the CDM. This decision will therefore be based on the relevant information available at the time of the investment decision and not information available at an earlier or later point.

Therefore, since the financial analysis was carried out in 2007, when the investment decision was taken, the estimations of power surplus available for sale that are considered in the financial analysis correspond to the more optimistic calculations taken from the engineering study that project owners ordered prior to the project implementation in order to ensure the technical feasibility of the project. This report was carried out by a Brazilian engineering company with 15 years of recognised experience in the sugarcane processing sector. According to the feasibility report, the sugarcane plant will achieve its top production of sugarcane (4,000,000 tones and 50.150 hectares) in 2017.

The estimations of sugarcane production and power generation from the engineering report used for discussing the project feasibility at the time of the investment decision will be shown to the DOE during the validation period.

The São Fernando Biomass Cogeneration Project's cash flow shows that the IRR for the Project activity development, with and without CER revenues, is the following:

	IRR
With CER revenues	14.15%
Without CER revenues	10.63%

The result of the financial analysis shows that the IRR of the project activity without CER revenues is much lower than the company's benchmark. Therefore, as a conclusion of this financial analysis we can affirm that the project without the CDM incentive is not attractive for the company as a financial investment. The inclusion of the CER revenues makes the project return to increase, thus compensating the risks that project participants take with the project activity. Besides, CER revenues suppose an additional benefit for project owners, since they are generated in stronger currencies (Euro or US Dollar) than the local currency.

The calculation of the company's WACC and the full detailed cash flow spreadsheet will be presented to the DOE during the validation process.

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III)

According to the "*Guidance on the Assessment of Investment Analysis"*, the ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis. Therefore, the parameters and the range of fluctuation of the sensitivity analysis have to be chosen considering realistic situations.

Although the electricity price is a meaningful parameter of the investment analysis, it can not been considered as parameter likely to fluctuate since the company has already signed a 15 year Power Purchase Agreement (PPA) starting at 2010, with a fix price of 156 R$/MWh. The PPA of São Fernando plant has been signed with the Brazilian Government, through an energy public tender on August 2008, so there is no possibility of variation of the electricity price for the following 15 years. Any alternative financial scenario considering the fluctuation of the power price would not be realistic.

Thus, the sensitivity analysis was made by altering the parameters that are considered as likely to fluctuate over time. These are the following ones:

- Investments in Property, Plant and Equipment (PP&E).
- Operation Costs (Variable Cost).
- General & Administrative Expenses.
- Energy output.

As per the *"Guidance on the Assessment of Investment Analysis"* recommendations, as a general point of departure variations in the sensitivity analysis should at least cover a range of ±10%, unless this is not deemed appropriate in the context of the specific project circumstances.

Therefore, the sensitivity analysis was performed altering each parameter by a range realistically likely to happen and assessing the impact on the project IRR (without the CER revenues). The results are shown in the table below.

PARAMETER	VARIATION	IRR
Investments in PP&E	-10%	12.20%
	0	10.63%
	+10%	9.24%
Operation Costs	-10%	11.00%
	0	10.63%
	+10%	10.26%
General & Administrative Expenses	-10%	10.86%
	0	10.63%
	+10%	10.40%
Energy Output	-10%	8.27%
	0	10.63%
	+10%	12.79%

As we can see, the IRR of the project activity without being registered as a CDM project is below the considered benchmark, even considering a hypothetical positive or negative variation of the main parameters within a range likely to happen.

The result of the sensitivity analysis makes evident that the project activity itself (without CDM revenues) is not financially attractive for the investor. Therefore, the most plausible baseline scenario for the project activity is given by the scenario #4 of the methodology.

STEP 3: Barrier analysis

After the sensitivity analysis it has been concluded that the proposed CDM project activity without CER revenues is unlikely to be financially/economically attractive for the project owners. Therefore, according to the recommendations of the "*Tool for the demonstration and assessment of additionality*", the Step 3 of the procedure (barrier analysis) will be omitted.

STEP 4: Common practice analysis

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

Until July 1999, power exports from mills to the grid were legally not possible in Brazil and until 2000 they were inexistent, so the sugarcane processing industry developed low pressure, low efficiency 2-100 MWe units for self-supply only to ensure that excess bagasse would not accumulate and become a disposal problem. Almost all sugar mills and alcohol distilleries in Brazil employed small bagasse-fired steam turbine systems to provide just enough steam and electricity to meet the onsite factory needs. Most of these units date from about 20 years ago. Therefore, as a result of this situation, although most of the sugar and ethanol factories in Brazil currently consume their biomass residues, they do it in an inefficient manner, by using low efficient boilers and turbo-generators. Thus, there is usually no surplus electricity to sell. Actually, the first ethanol and sugar companies coming into the electricity market did not do it until recent years.

According to the Brazilian National Electricity Agency (ANEEL) power generation from sugarcane bagasse represents only 3.53%[3] of the total power generation installed capacity in Brazil, which means approximately 3,956 MW of 111,871 MW. Recent researches of the National Supply Company (CONAB) declare that setting up modern equipments, sugarcane industry would have a potential generation capacity up to 15,000 MW[4]. This means that around 11,000 MW from bagasse cogeneration are being wasted because of the use of inefficient equipments.

Despite the percentage of the total installed capacity that power generation from bagasse represents, the effective quantity of power exported from bagasse fired cogeneration units to the national grid (the National Interconnected System, SIN) is almost negligible. According to the National System Operator (ONS), the entity that coordinates the operation of the transmission and distribution units connected to the SIN, in 2008 only 178.1 GWh were injected to the grid from biomass fired power plants (not only bagasse fired, but the whole biomass fired for power generation), which means a 0.04% of the whole

[3] National Electricity Agency (ANEEL). www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp

[4] National Supply Company (CONAB). www.conab.gov.br/conabweb/index.php?PAG=73&NSN=605

power generation of the national grid (448,802 GWh in 2008). The prior years this percentage was even lower, only 0.01% in 2007 and 0.006% in 2006[5].

Regarding the thermoelectric generation in the national grid by type of fuel, in words of the ONS, in 2008 only 0.35% was from biomass (48.2% was from gas, 12.3% from coal and 27.4% nuclear power). These entire data make clear that, although power generation from bagasse is a common practice in the sugarcane industry, it is not common practice at all to export power from the sugarcane facilities to the Brazilian grid.

According to the Brazilian Ministry of Mines and Energy, bagasse fired power generation is currently addressed to meet the energy needs of the sugarcane processing plants, by using low efficiency thermal units. The technology commonly used consists of back-pressure cycles with low pressure and low efficiency boilers[6].

In words of ANEEL, hydroelectricity accounts for approximately 70% of Brazilian installed capacity for electricity generation. As said before, the new 10-year Energy Plan 2008-17 of the Brazilian Government to avoid the dependence of water in electricity generation bets on an increasing use of fossil fuels. The plan created by de Ministry of Mines and Energy envisages the construction of 68 new power stations fired by coal, gas, diesel and oil by 2017, besides the 77 fossil fuel-based plants in operation. The Governmental Energy Plan until 2030 follows in the same steps as the 10-year plan, and foresees the increase of the fossil fuel fired power generation from the current 8% of the whole national energy up to 18%[7].

As it will be detailed afterwards, according to the National Supply Company (CONAB) the use of bagasse for power generation is almost limited to the sugarcane processing industry. Sugar and ethanol companies consume for cogeneration almost all their available bagasse (more than 89%). In terms of efficiency of power generation, the average of power generation per tonne of bagasse consumed barely exceeds 100 KWh/ton. This efficiency is even lower in the state of Mato Grosso do Sul[8].

As shown in all these references and data, it is evident that sugarcane bagasse used as an energy source is not (and it will not be in the medium term) expressive in the national grid. Actually, the National Agroenergy Plan 2006-2011[9], developed by the Ministry of Agriculture, foresees for 2020 a decreasing participation of the sugarcane bagasse cogeneration in the composition of the national grid and an increase of the gas generation.

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[5] Source: National System Operator (*Operador Nacional do Sistema*, ONS).
www.ons.org.br/download/biblioteca_virtual/publicacoes/dados_relevantes_2008/index.swf

[6] Source: Ministry of Mines and Energy. National Matrix of Energy 2030.
www.mme.gov.br/spe/galerias/arquivos/Publicacoes/matriz_energetica_nacional_2030/MatrizEnergeticaNacional2030.pdf

[7] Ministry of Mines and Energy. www.mme.gov.br/mme/menu/todas_publicacoes.html

[8] National Supply Company (CONAB) – Profile of the Brazilian Industry of Sugar and Ethanol *(Perfil do Setor do Açúcar e do Álcool no Brasil)* April 2008 www.conab.gov.br/conabweb/download/safra/perfil.pdf

[9] *Ministry* of Agriculture. National Plan of Agroenergy 2006-20011.
www.agricultura.gov.br/portal/page?_pageid=33,2864458&_dad=portal&_schema=portal

Therefore, the proposed high efficiency electricity generation from sugarcane bagasse shall not be considered as a common practice in Brazil.

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

As said before, almost all the sugar and ethanol plants in Brazil generate electricity from their bagasse for self consumption. There are currently 413 registered sugarcane units in Brazil[10] and 270 of them generate electricity, according to the National Electricity Agency (ANEEL). But, in words of João Sampaio, Secretary of Agriculture of São Paulo, only few of them, around 10%, export electricity to the grid[11]. This means that only around 41 units generate extra energy and export it to the grid. There are 26 similar Brazilian projects registered in the CDM pipeline and 33 more at validation. Therefore, sugarcane bagasse cogeneration projects in Brazil without CDM are not a common practice.

The Agroenergy Plan 2006-2011, developed by the Ministry of Agriculture[12], foresees a great increase of the Brazilian sugarcane industry during the following years. According to this report, in 2020 the industry could achieve a potential cogeneration between 16 and 21 GW per year. However, the economically feasible potential is less than 65% of this forecast, and it is concentrated in a few plants. Due to the current policy of investments of the sugarcane companies, which usually adopt low efficient technological solutions, the potential cogeneration of the industry will achieve in 2010 only around 0.5 and 2 GW. Considering the expansion of the sugarcane production, if technologically more advanced solutions were implemented in the sector, the economically feasible cogeneration could reach until 3.8 GW in 2010.

According to a recent sectoral report[13] of the CONAB in cooperation with the Ministry of Agriculture, none of the sugar and alcohol production plants located in the state of Mato Grosso do Sul currently export electricity to the national grid.

In terms of efficiency, the table below shows how the sugarcane bagasse is used in each state of the south and central areas of Brazil.

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[10] Ministry of Agriculture. www.agricultura.gov.br/pls/portal/docs/PAGE/MAPA/SERVICOS/USINAS_DESTILARIAS/USINAS_CADASTRADAS/UPS_15-05-2009_0.PDF

[11] Magazine Valor Econômico. 208.96.41.18/valoreconomico/home.aspx?pub=4&edicao=1

[12] Ministry of Agriculture. National Plan of Agroenergy 2006-20011. www.agricultura.gov.br/portal/page?_pageid=33,2864458&_dad=portal&_schema=portal

[13] National Supply Company (CONAB) – Profile of the Brazilian Industry of Sugar and Ethanol *(Perfil do Setor do Açúcar e do Álcool no Brasil)* April 2008. www.conab.gov.br/conabweb/download/safra/perfil.pdf

	Sugarcane production (thousand tonnes)	% of bagasse used for cogeneration	Power generation per tonne of bagasse (KWh/ton)	Power generation per tonne of milled sugarcane (KWh/ton)
São Paulo	78,979	90.8%	91.3	23.04
Paraná	10,774	92.2%	121.5	27.77
Minas Gerais	10,090	76.7%	155.6	31.01
Mato Grosso do Sul	**4,293**	**76.7%**	**69.4**	**14.90**
Goiás	6,429	89.8%	124.4	32.68
Mato Grosso	4,395	79.8%	89.6	20.53
Rio de Janeiro	742	90.5%	81.9	21.37
Espírito Santo	1,132	99.5%	78.7	22.70
Total Central-South Areas	**106,272**	**88.84%**	**99.9**	**24.35**

Using of bagasse- Source: CONAB, April 2008. www.conab.gov.br/conabweb/download/safra/perfil.pdf

As shown in the table, sugar and ethanol plants in Mato Grosso do Sul have the lowest efficiency of power generation (69.4 KWh per tonne of bagasse consumed, which means 2.68% efficiency, considering the NCV of the bagasse used in the project plant). In other states like Minas Gerais, the most efficient one, sugarcane plants generate electricity per tonne of bagasse in average more than twice as much as Mato Grosso do Sul. Plants from Mato Grosso do Sul also have the lowest percentage of bagasse used for cogeneration, which means that these plants barely generate electricity for self consume and they do it in a very inefficient way. Therefore, these data make evident that the use of high efficiency equipments for electricity generation from sugarcane bagasse is not a common practice in the state.

On the other hand, according to the project participants' data, when São Fernando achieves its top generation capacity the plant will generate around 468 KWh per tonne of bagasse consumed, which means 18.07% of efficiency. This means that, thanks to the high efficiency equipments installed in the cogeneration unit, the plant will generate with the same bagasse consumption more than six times as much power as the currently existing plants in Mato Grosso do Sul.

Besides, all the bagasse generated in the São Fernando's sugarcane production process will be used for power generation.

As a conclusion, we can affirm that generating electricity for exporting to de grid is not a common practice in the sugarcane industry of Brazil, but even less common in the state of Mato Grosso do Sul.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The project activity mainly reduces CO_2 emissions through substitution of power and heat generation with fossil fuels by energy generation with biomass residues. The emission reduction, ER_y, carried out by the project activity during a given year *y* is the difference between the emission reductions through substitution of electricity generation with fossil fuels ($ER_{electricity,y}$), the emission reductions through substitution of heat generation with fossil fuels ($ER_{heat,y}$), project emissions (PE_y), emissions due to leakage (L_y) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass residues ($BE_{biomass,y}$), as follows:

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

Where:

ER_y	= Emission reductions of the project activity during the year *y* (tCO_2/yr).
$ER_{electricity,y}$	= Emission reductions due to displacement of electricity during the year *y* (tCO_2/yr).
$ER_{heat,y}$	= Emission reductions due to displacement of heat during the year *y* (tCO_2/yr)
$BE_{biomass,y}$	= Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tCO_2e/yr).
PE_y	= Project emissions during the year *y* (tCO_2/yr).
L_y	= Leakage emissions during the year *y* (tCO_2/yr).

Emission reductions due to displacement of heat, $ER_{heat,y}$

The emission reductions due to displacement of heat are assumed as zero ($ER_{heat,y} = 0$) because the thermal efficiency in the project plant is similar compared with the thermal efficiency of the reference plant considered in the baseline scenario.

Project emissions, PE_y

Project emissions include:

- CO_2 emissions from transportation of biomass residues to the project site (PET_y).
- CO_2 emissions from on-site consumption of fossil fuels due to the project activity ($PEFF_y$).
- CO_2 emissions from consumption of electricity ($PE_{EC,y}$).

Project emissions are calculated as follows:

$$PE_y = PET_y + PEFF_y + PE_{ECy} + GWP_{CH4} \cdot \left(PE_{Biomass,CH4,y} + PE_{ww,CH4,y}\right)$$

Where:

PET_y	= CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2/yr).
$PEFF_y$	= CO_2 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 (tCO_2/yr).
$PE_{EC,y}$	= CO_2 emissions during the year y due to electricity consumption at the project site that is attributable to the project activity (tCO_2/yr).
GWP_{CH4}	= Global Warming Potential for methane valid for the relevant commitment period.

$PE_{BiomassCH4,\ y}$ = CH_4 emissions from the combustion of biomass residues during the year *y* (tCH_4/yr).
$PE_{WW,CH4,y}$ = CH_4 emissions from wastewater generated from the treatment of biomass residues in year *y* (tCH_4/yr).

There are no emissions due to transport of the biomass to the plant during the project activity, so PET_y = 0. There will be no on-site consumption of fossils fuels during the project activities, therefore $PEFF_y$ = 0. The electricity demand of the projected plant will be satisfied with the bagasse electricity generation, therefore, $PE_{EC,y}$ = 0.

Emissions from the combustion of biomass residues and from wastewater generated from the treatment of biomass are excluded.

Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues, $BE_{biomass,y}$

Baseline emissions due to uncontrolled burning or decay of the biomass residues are zero ($BE_{biomass,y}$ = 0), since the biomass residues would not decay or be burnt in the absence of the project activity.

Leakage emissions, L_y

Where the most likely baseline scenario is the use of the biomass residues for energy generation (as in scenario 4), the diversion of biomass residues to the project activity is already considered in the calculation of baseline reductions. In this case, leakage effects do not need to be addressed, therefore L_y = 0.

Emission reductions due to displacement of electricity, $ER_{electricity,\ y}$

Emission reductions due to the displacement of electricity are relevant for scenario 4 and are calculated by multiplying the net quantity of increased electricity generated with biomass residues as a result of the project activity (EG_y) with the CO_2 baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows:

$$ER_{electricity,y} = EG_y \cdot EF_{electricity,y}$$

Where:

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

The project activity displaces electricity from other grid-connected sources.

The emission factor for displacement of electricity ($EF_{electricity,y}$) corresponds to the grid emission factor ($EF_{electricity,y} = EF_{grid,y}$), and its calculation is done following the procedures established by the *"Tool to calculate the emission factor for an electricity system"*; version 01.1. The $EF_{grid,y}$ is determined in section B.6.3.

EG_y is determined as the difference between the electricity generation in the project plant and the quantity of electricity that would be generated by other power plant(s) using the same quantity of biomass residues that is fired in the project plant, as follows:

$$EG_y = EG_{project\ plant,y} - \varepsilon_{el,other\ plant(s)} \cdot \frac{1}{3.6} \sum BF_{k,y} NCV_k$$

Where:

EG_y	= Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year *y* (MWh).
$EG_{project\ plant,y}$	= Net quantity of electricity generated in the project plant during the year *y* (MWh).
$\varepsilon_{el,\ other\ plant(s)}$	= Average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass residues fired in the project plant in the absence of the project activity ($MWh_{el}/MWh_{biomass}$).
$BF_{k,y}$	= Quantity of biomass residue type *k* combusted in the project plant during the year *y* (tons of dry matter or litre).
NCV_k	= Net calorific value of the biomass residue type *k* (GJ/ton of dry matter or GJ/litre).

Therefore: $ER_y = ER_{electricity,\ y}$

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

Data / Parameter:	$\varepsilon_{el,reference\ plant}$
Data unit:	-
Description:	Average net energy efficiency of electricity in the reference plant that would be built in the absence of the project activity.
Source of data used:	*Perfil do sector do Açúcar e do Álcool no Brasil. Abril 2008* (Profile of the sugar and ethanol sector in Brazil. April 2008) which is a relevant study from the National Supply Company (CONAB, a public and reliable font).
Value applied:	2.68%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The efficiency generation that is commonly installed in bagasse fired cogeneration plants in the sugarcane sector in the state off Mato Grosso do Sul. The efficiency of the reference plant has been calculated using the net calorific value (NCV) of the bagasse utilized by the project plant for power

	generation. The efficiency was chosen in a conservative manner, using CONAB data.
Any comment:	Applicable to scenario 4.

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

As described in B.6.1, emission reductions of the project activity in a given year *y* are:

$$ER_y = ER_{electricity,y} = EG_y \cdot EF_{electricity,y}$$

The emission factor for the displacement of electricity ($EF_{electricity,y}$) corresponds to the Brazilian grid emission factor ($EF_{gridy,y}$). The value of the grid emission factor has been taken from the data of the Brazilian DNA[14], which has used *"Tool to calculate the emission factor for an electricity system"* in order to calculate it.

STEP 1. Identify the relevant electric power system

For the purpose of determining the electricity emission factors, a **project electricity system** is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

In June of 2008, the Brazilian DNA published in the Official Journal a Resolution[15] which adopts a unique electricity system for CDM projects. This is known as *Sistema Interligado Nacional* (SIN), the National Interconnected System.

STEP 2. Select an operating margin (OM) method

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.

As the responsible for calculating the OM emission factor in Brazil, the Brazilian DNA uses the Dispatch data analysis OM method. For this method it is necessary to use the year in which the project activity displaces grid electricity and to update the emission factor annually during monitoring.

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[14] Ministry of Science and Technology. www.mct.gov.br/index.php/content/view/74689.html

[15] Ministry of Science and Technology. www.mct.gov.br/index.php/content/view/14797.html

STEP 3. Calculate the operating margin emission factor according to the selected method

The dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the power units that are 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 $EF_{grid,OM-DD,y}$.

The emission factor is calculated as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

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 month *m* of year *y* (MWh).
$EF_{EL,DD,h}$	= CO_2 emission factor for power units in the top of the dispatch order in month *m* in year *y* (tCO_2/MWh).
$EG_{PJ,y}$	= Total electricity displaced by the project activity in year *y* (MWh).
m	= Months in year *y* in which the project activity is displacing grid electricity.
y	= Year in which the project activity is displacing grid electricity.

The $EF_{EL,DD,h}$, $EF_{EL,DD,d}$ and $EF_{EL,DD,m}$ are displayed on the Brazilian DNA website[16] for the every year, but only the $EF_{EL,DD,m}$ will be used in order to calculate the emission reductions.

According to the DNA data, $EF_{grid,OM-DD,2008}$ for the first crediting period is:

$$EF_{grid,OM-DD,2008} = 0.4766\ tCO_2/MWh.$$

STEP 4. Identify the cohort of power units to be included in the build margin

The build margin is also calculated by the Brazilian DNA.

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor *ex-ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period,

[16] Ministry of Science and Technology. www.mct.gov.br/index.php/content/view/303077.html#ancora

the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, *ex-post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex-ante*, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The option 2 has been chosen for the project activity.

STEP 5. Calculate the build margin emission factor

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:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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).
$EF_{ELm,y}$	= 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.

According to the DNA data, $EF_{grid,BM,2008}$ for the first crediting period is:

$$EF_{grid,BM,2008} = 0.1458\ tCO_2/MWh.$$

STEP 6. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where:

$EF_{grid,BM,y}$ = Build 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).
w_{OM} = Weighting of operating margin emissions factor (%).
w_{BM} = Weighting of build margin emissions factor (%).

In this case, the default weights are 50%. Therefore, according to Brazilian DNA data, the combined margin emissions factor for the first crediting period is:

$$EF_{2008} = EF_{grid,CM,2008} = 0.4766 \times 0.5 + 0.1458 \times 0.5 = 0.3112 (tCO_2 / MWh)$$

Therefore, the estimated emission reductions for the first crediting period are the following:

Year	Net quantity of electricity generated in the project plant (MWh)	Quantity of bagasse combusted in the project plant	Ex-ante Emission Factor (tCO2e/MWh)	Estimation of overall Emission Reduction (tCO_2)
2010	184,758	406,852	0.3112	48,708
2011	210,528	484,653	0.3112	55,047
2012	364,336	802,993	0.3112	96,035
2013	458,143	978,980	0.3112	121,426
2014	458,143	978,980	0.3112	121,426
2015	458,143	978,980	0.3112	121,426
2016	458,143	978,980	0.3112	121,426

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

Year	Estimation of Baseline Emissions (tCO_2)	Estimation of Project Activity Emissions (tCO_2)	Estimation of Leakage (tCO_2)	Estimation of overall Emission Reduction (tCO_2)
2010	48,708	0	0	48,708
2011	55,047	0	0	55,047
2012	96,035	0	0	96,035
2013	121,426	0	0	121,426
2014	121,426	0	0	121,426
2015	121,426	0	0	121,426
2016	121,426	0	0	121,426
Total (tonnes CO_2)	**685,494**	**0**	**0**	**685,494**

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

B.7.1. Data and parameters monitored:

Data / Parameter:	**$EG_{project\ plant,y}$**
Data unit:	MWh/year
Description:	Net quantity of electricity generated in the project plant during the year y.
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	As the plant will be built in three different stages, the power generation will be different for each year of the crediting period. The value of data applied for the purpose of calculating expected emission reductions in section B.5 are detailed in section B.6.3.
Description of measurement methods and procedures to be applied:	This parameter will be continuously measured through electronic meters, according to standards and monitoring patterns of the CCEE.
QA/QC procedures to be applied:	The consistency of metered net electricity generation will be cross-checked with receipts from electricity sales (if available, since there will be sale receipts only for the power exported to the grid, not for the whole power generation of the plant) and the quantity of bagasse fired (check whether the electricity generation divided by the quantity of bagasse fired results in a reasonable efficiency that is comparable to previous years when data will be available). Data will be archived in database. Data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity.
Any comment:	

Data / Parameter:	**$EF_{grid,y}$**
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor for grid electricity during the year *y.*
Source of data to be used:	Data obtained from the Brazilian DNA. www.mct.gov.br/index.php/content/view/303077.html#ancora
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.3112
Description of measurement methods and procedures to be applied:	The CO_2 emission factor for the grid is calculated by the Brazilian DNA, using the *"Tool to calculate the emission factor for an electricity system"*; version 01.1. According to methodology, baseline emission factor (EF_y) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors. The calculation of the operating margin emission factor(s) must be based on one of the following methods: • Simple operating margin • Simple adjusted operating margin

	• Dispatch data analysis operating margin • Average operating margin. Dispatch data analysis operating margin is the methodological choice chosen by the Brazilian DNA to calculate the operating margin and the build margin. The electricity baseline emission factor is determined ex-post and will be yearly updated for each verification.
QA/QC procedures to be applied:	Since this is a public data calculated and given by the Brazilian DNA, no QA/QC procedures will be applied.
Any comment:	

Data / Parameter:	$\mathbf{EF_{BM,grid,y}}$
Data unit:	tCO_2/MWh
Description:	CO_2 build margin emission factor for grid electricity during the year *y*.
Source of data to be used:	Data obtained from the Brazilian DNA. www.mct.gov.br/index.php/content/view/303077.html#ancora
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.1458
Description of measurement methods and procedures to be applied:	The CO_2 build margin emission factor for the grid is calculated by the Brazilian DNA. The electricity baseline emission factor is determined ex-post and will be yearly updated for each verification.
QA/QC procedures to be applied:	Since this is a public data calculated and given by the Brazilian DNA, no QA/QC procedures will be applied.
Any comment:	

Data / Parameter:	$\mathbf{EF_{OM,grid,y}}$
Data unit:	tCO_2/MWh
Description:	CO_2 operating margin emission factor for grid electricity during the year *y*.
Source of data to be used:	Data obtained from the Brazilian DNA. www.mct.gov.br/index.php/content/view/303077.html#ancora
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.4766
Description of measurement methods and procedures to be applied:	The CO_2 operating margin emission factor for the grid is calculated by the Brazilian DNA. The electricity baseline emission factor is determined ex-post and will be yearly updated for each verification.
QA/QC procedures to be applied:	Since this is a public data calculated and given by the Brazilian DNA, no QA/QC procedures will be applied.

Any comment:	

Data / Parameter:	**$BF_{K,y}$**
Data unit:	Tons of dry matter.
Description:	Quantity of biomass residue type *k* combusted in the project plant during the year *y*.
Source of data to be used:	On site indirect measurements.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	As the plant will be built in three different stages, the quantity of bagasse combusted will be different for each year of the crediting period, according to the installed power generation capacity. Data applied for the purpose of calculating expected emission reductions in section B.5 are detailed in section B.6.3.
Description of measurement methods and procedures to be applied:	As per common practice in the sugarcane processing sector and in this type of CDM projects in Brazil, bagasse quantity measurement in the project activity is done in an indirect way. The total bagasse consumed in the facility is based on the total sugarcane crushed and the percent amount of bagasse in the sugarcane. The percentage of bagasse per unit of cane is measured in the plant's own internal laboratory. The quantity of biomass combusted will be monitored continuously, with an annual energy balance. Weight meters will be used. Data will be adjusted for the moisture content in order to determine the quantity of dry biomass. The values will be crosschecked with the quantity of electricity generated.
QA/QC procedures to be applied:	Measurements will be cross-checked with an annual energy balance that is based on purchased quantities (if possible) and stock changes.
Any comment:	There is nor fuel neither biomass purchase.

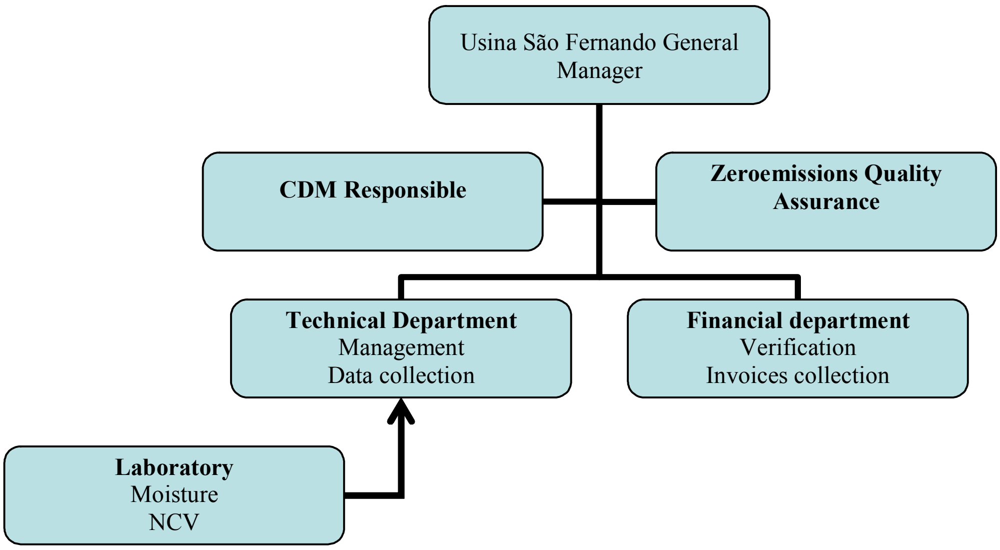
Data / Parameter:	**Moisture content of the biomass residues**
Data unit:	% Water Content.
Description:	Moisture content of the biomass residue.
Source of data to be used:	On site measurements.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	48%
Description of measurement methods and procedures to be applied:	Moisture content of biomass residue will be continuously monitored. Mean values will be calculated at least annually. Samples will be determined by the internal laboratory on site.
QA/QC procedures to be applied:	Data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity.
Any comment:	

Data / Parameter:	**NCV_K**
Data unit:	GJ/ton dry matter
Description:	Net Calorific Value of biomass residue type *k*.

Source of data to be used:	Measurements.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	19.42
Description of measurement methods and procedures to be applied:	Measurements will be carried out at internal laboratory of Usina São Fernando and according to relevant international standards. The measure of the NCV will be based on dry biomass. Analysis will be done at least every six months, taking at least three samples for each measurement. Data will be kept for the later of, two years after the end of the crediting period or the last issuance of CERs for the project activity.
QA/QC procedures to be applied:	Since there are no NCV measurements from previous years, the consistency of the measurements will be checked by comparing the measurement results with default values by the IPCC.
Any comment:	

B.7.2. Description of the monitoring plan:

For the monitoring plan, the following structure will be established:



The following parameters will be monitored:

1. Electricity generated in the project plant.

This data will be measured through electricity meters. The measure of the power exported to the grid will be done according to standards and monitoring patterns of the CCEE (*Câmara de Comercialização de Energia Elétrica*, a governmental institution linked to ANEEL, *Agência Nacional de Energia Elétrica*).

The consistency of metered net electricity generation will be cross-checked with receipts from the electricity sales. However, it must be taken into account that there will be sale receipts only for the power exported to the grid, not for the whole power generation of the plant.

In order to ensure data consistency, the readings of the devices will be recorded in an electronic spreadsheet and the invoices of electricity sales will be archived.

2. Quantity of combusted bagasse in the project plant.

As per common practice in the sugarcane sector, the measurement of the quantity of bagasse combusted in the project activity is done in an indirect way. The total bagasse consumed in the facility is based on the total sugarcane crushed and the percent amount of bagasse in the sugarcane. The percentage of bagasse per unit of cane is measured in the plant's internal laboratory.

Trucks carrying the sugarcane will be weighted (loaded and empty) in a weight bridge located at the entrance of the plant. Samples of the sugarcane carried by each truck will be analyzed and the percentage of fiber in the cane will be calculated. The quantity of fiber in a specific amount of sugarcane is the same as in the bagasse proceeding from it; therefore, the quantity of bagasse available for cogeneration is directly proportional to the sugarcane produced. Data will be adjusted for the moisture content in order to determine the quantity of dry biomass. The quantity will be crosschecked with the quantity of electricity (and heat) generated.

The quantity of bagasse combusted in the project plant is based on the quantity of heat generated in each boiler. The performance guarantee of the boilers establishes the exact proportion between the bagasse consumed and the heat generated. Heat generation is continuously monitored in both boilers.

Data will be recorded on a working day basis by the Technical department and archived in electronic spreadsheets. It will also be prepared annually an energy balance for all the installed boilers, based on stock changes.

The whole bagasse production of the sugarcane plant will be used for power generation. Only a small percentage of each crop is stocked for restarting the cogeneration unit after the intercrop period.

3. Moisture content of bagasse (in order to determine the quantity of biomass residue in dry matter).

Moisture content of the biomass residue will be continuously monitored. Mean values will be calculated at least annually. Samples will be determined by the plant's own qualified laboratory, which follows the procedures of the Center of Sugarcane Technology (CTC, *Centro de Tecnologia Canavieira*).

4. Net caloric value of bagasse (in order to determine NCV of biomass residue).

The net caloric value of the bagasse will be analyzed according to the relevant national standards, and measured by the plant's own qualified laboratory. As per the methodology specifications, analysis will be done at least every six months, taking at least three samples for each measurement.

The procedures for calibration and maintenance of the instruments will be done according to the regulations of Associação Brasileira de Normas Técnicas (ABNT), and Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (INMETRO), and will be done during preventive maintenance operation of Usina São Fernando.

The São Fernando plant will organise the staff training in the appropriate monitoring, measurement and reporting techniques. The responsible for the cogeneration unit of the plant will also be the person in charge for organising the staff training.

In order to ensure the correct development of the monitoring, the plant has implemented the following documents of procedures:

- CDM Responsible Procedure: it appoints a responsible for the monitoring and explains which his duties and obligations are.
- Formation for Monitoring Procedure: it resumes the procedures that must be taken into account in order to achieve a proper training for the staff that is in charge for the monitoring.

Both documents will be shown to the DOE during the validation period.

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):

Date of completion of the current version of baseline study and monitoring methodology: 24/08/2009

The name and contact data of the responsible person/entity are:

Zeroemissions do Brasil Ltda.

Mr. Javier Becerra Sánchez / Mr. Ferran Tejada Valero

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Email: javier.becerra@zeroemissions.abengoa.com

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:

12/11/2007, date of purchase of the first turbine.

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

20 years.

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

C.2.1. Renewable crediting period:

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

01/01/2010, or on the registration date of the project activity, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The Secretary of Environment of the State of Mato Grosso do Sul (SEMAC) is responsible for analyzing any possible environmental impact due to the project activity normal development. The licenses required by the Brazilian environmental regulation are:

- The preliminary license *(Licença Prévia, LP).*
- The construction license *(Licença de Instalação, LI).*
- The operating license *(Licença de Operação, LO).*

The project plant has all the licenses required by the Brazilian environmental regulation, with the following numbers:

- Preliminary licenses number 20/2009 (for the transmission line) and 27/2009 (for the substation).
- Construction license number 129/2008.
- Operating licenses protocol number 256/2009 (for the cogeneration unit), 285/2009 (for the substation) and 288/2009 (for the transmission line).

The power plant also has its authorization and registration on the National Agency of Electrical Energy (ANEEL) to operate as an independent power producer.

No transboundary impacts resulting from this project activity are expected. All the relevant impacts occur within Brazilian borders and have been mitigated to comply with the environmental requirements for project's implementation.

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. The project activity expects no significant environmental impacts.

SECTION E. Stakeholders' comments

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

According to Brazilian legislation, in order to obtain all the licenses for operating the plant, the project must go into public discussion with local stakeholders. It is also mandatory the announcement of the issuance of the licences in the Official Journal (*Diário Oficial da União*) and in regional newspapers (*Diário MS*) to ensure that the process is public and allows for public comments.

Regarding the CDM activity, to get the letter of approval from the Brazilian DNA it is also required the invitation of selected stakeholders to comment the project design document that is sent to validation. The project developers sent a cover letter to the stakeholders, in order to introduce themselves and the project activity. This cover letter will be available for the DOE during the validation process.

The organizations and entities invited to comment on the project were:

Entity	Website
Dourados City Council	www.dourados.ms.gov.br
Dourados Municipal Chamber	www.camaradourados.ms.gov.br
Public Ministry of the State of Mato Grosso do Sul	www.mp.ms.gov.br/portal
Federal Prosecutor's Office	www.pgr.mpf.gov.br
Environmental Secretary (SEMAC)	www.semac.ms.gov.br
Public Federal Ministry (Procuradoria MS)	www.prms.mpf.gov.br
Union of the Sugar and Alcohol Industry of the State of Mato Grosso do Sul	www.sindalms.com.br
Institute of Environment of Mato Grosso do Sul (IMASUL)	www.imasul.ms.gov.br
UDOP – Bioenergy Producers Association	www.udop.com.br
UNICA – Sugarcane Industry Association	www.unica.com.br
CTC – Sugarcane Technology Centre	www.ctc.com.br
Brazilian Forum of NGOs and Social Movements for Environment and Development – FOBMS	www.fboms.org.br

Since the municipality of Dourados does not have any Environmental Secretary or other relevant local environmental institution, project participants decided to invite to comment on the project activity to the City Council and the two main environmental institutions of the state of Mato Grosso do Sul, which are SEMAC and IMASUL.

E.2. Summary of the comments received:

The Sugarcane Technology Centre (CTC) asked for more information about the CDM projects carried out by sugarcane processing companies that are associated to this institution.

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

In order to solve the comments received from the Sugarcane Technology Centre (CTC), a Project Idea Note (PIN) of the São Fernando Cogeneration Project was sent to them. The PIN extended the information about the project contained in the first stakeholders' notification. The project developers also informed to the institution that the full version of the Project Design Document was available for public comments at the UNFCCC website until 23 May 2009. The stakeholder also received a copy of the first version of the PDD translated into Portuguese and the report of the project activity's contribution under the Clean Development Mechanism towards sustainable development, as per Annex III of Resolution no. 1 of the Brazilian DNA.

The stakeholder's request of information, the project developers' reply, the PIN sent to the Sugarcane Technology Centre, the Portuguese version of the PDD and the report of the project activity's contribution towards sustainable development will be available for the DOE during the validation period.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I parties involved in the project activity.

Annex 3

BASELINE INFORMATION

Baseline information has already been discussed.

Annex 4

MONITORING INFORMATION

Monitoring has already been discussed in section B.7.2.