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:

Jalles Machado Bagasse Cogeneration Project (JMBCP)
Version 1.2 A
30/11/2012

A.2. Description of the project activity:

This Project Design Document (PDD) is presented for the second crediting period of Project 0187: Jalles Machado Bagasse Cogeneration Project (JMBCP)[1], which was registered on 03/Mar/06. For the first crediting period, which comprised the period from 23/Apr/01 to 22/Apr/08 (renewable crediting period), the "AM0015 - Bagasse-based cogeneration connected to an electricity grid (Version 1)" was the approved methodology used by the project activity. However, for this second crediting period the approved consolidated methodology "ACM0006 - Consolidated methodology for electricity generation from biomass residues (Version 6)" was used for the project activity in order to meet the requirements of the Annex 60 of the EB 33 Report, the "Procedures for renewal of a crediting period of a registered CDM project activity (Version 02)[2]", which states that:

"***B. Preparation of a revised PDD***

> *2. Project participants shall update those sections of the project design document (CDM-PDD) relating to the baseline, estimated emission reductions and the monitoring plan using an approved baseline and monitoring methodology as follows:*
> *(…)*
>
> > *(b) If a baseline and monitoring methodology, applied in the original CDM-PDD, was withdrawn after the registration of the CDM project activity and replaced by a consolidated methodology, the latest approved version of the respective consolidated methodology shall be used;*"

This rule is applicable for JMBCP, as the approved methodology used for the project activity at the time of the project's registration (AM0015) was withdrawn after the registration of the CDM project activity and replaced by the consolidated methodology ACM0006.

Therefore, the Project Participants (PP), through this current version of the PDD, are requesting the renewal of the crediting period for the Project 0187: Jalles Machado Bagasse Cogeneration Project (JMBCP).

This project activity consists of increasing the efficiency in the bagasse (a renewable fuel source, residue from sugarcane processing) cogeneration facility at Jalles Machado S.A. (Jalles Machado) a Brazilian sugar mill. Through the implementation of this project, Jalles Machado increases the amount of electricity generated and is able to sell electricity to the S-SE-CO (South – Southeast – Midwest) Brazilian grid, avoiding the dispatch of an equal amount of energy produced by fossil-fuelled thermal plants to that grid. The initiative avoids CO_2 emissions and contributes to the regional and national sustainable development.

Jalles Machado sponsors are convinced that bagasse is a renewable source of energy that mitigates global

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[1] Available on October 15th, 2007, at: http://cdm.unfccc.int/Projects/DB/DNV-CUK1134990070.21/view.html

[2] Available on October 15th, 2007, at: http://cdm.unfccc.int/EB/033/eb33_repan60.pdf

warming and creates a sustainable competitive advantage for the agricultural production in the sugar cane industry in Brazil. Using the available natural resources, the project helps to enhance the production of renewable energy. Furthermore, the project can demonstrate that electricity generation is yet another revenue stream for the Brazilian sugar industry. It is worth to highlight that out of 346 sugar mills in Brazil, the great majority produces energy for their own internal consumption, using low-efficiency cogeneration equipments.

Bagasse cogeneration also plays an important role in the context of the country's economic development, as Brazil's sugar cane-based industry provides for approximately one million jobs and represents one of the major agribusiness products of the country's trade balance. Brazilian heavy industry has developed technology to supply the sugar cane industry with equipments that support cogeneration expansion, thus creating more jobs and contributing to sustainable development.

Jalles Machado also believes that sustainable development will be achieved not only through the implementation of a renewable energy production facility, but also by carrying out activities of social and environmental responsibility.

The industrial processes of Jalles Machado are also a very important matter for the company, and quality is the number one priority. The company has defined programs for certification of all its processes in compliance with ISO norms as a mean to incorporate technology. Some of the certifications obtained by Jalles Machado are described below:

- Quality Management - ISO 9001:2000, certified by Bureau Veritas Quality International - BVQI on March 10th, 2006;
- Environmental Management - ISO 14001:2004, certified by Bureau Veritas Quality International - BVQI on March 09th, 2006;
- Ecological an Social Management, certified by Instituto Biodinâmico - IBD (Biodynamic Institute) on November 23rd, 2006;
- Bagasse Cogeneration Project, certified by Det Norske Veritas - DNV on January 09th, 2004;
- Organic Sugar Production Management, certified by KOSHER on September 29th, 2006.

The project requires the employment of many professionals to operate and maintain the thermoelectric plant, mainly due to the project activity, as it increases the installed capacity and demands a higher number of employees. Hence, the operation of the power plant contributes not only for direct employment generation, but also for indirect employment. Indirect employment occurs mainly in the technology field, both in research and development, and in the production and maintenance of equipments. As a consequence, new jobs will be created during the sugar cane harvest period and in the industrial sector. In this context, the project contributes to income distribution because the workers to be employed for these latter positions fall within the category of unskilled labor.

The creation of new opportunities for sugar and alcohol mills through bagasse cogeneration projects will promote increased interaction between the sugar cane and the Brazilian power sectors, especially during the negotiation of the Power Purchase Agreement (PPA).

The sugar and alcohol sector has historically explored bagasse in an inefficient way, using low pressure boilers, considered as a simple operational technology. The inefficient procedures and the lack of financial incentives for steam generation hindered additional electric energy to be produced for sale. Investments made in more efficient technology have already allowed a few companies in the sugar and alcohol sector to increase both the internal installed capacity and the amount of electricity available for sale in Brazil, with the incentive of CDM. Thus, Jalles Machado contributes to technological innovations in cogeneration using sugar cane bagasse, as they spread experience within the Brazilian sugar industry.

Moreover, the technology for expanding the electricity availability from biomass in the sugar industry is an advantage for the local utility companies, as the baseload for the utilities in Brazil are supported mainly with hydro-generation and the sugar mill, coincidentally, supplies electricity during the dry season.

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)	• Usina Jalles Machado S.A. (private entity) • Econergy Brasil Ltda (private entity)	No
Netherlands	• Corporación Andina de Fomento (CAF) acting as intermediary for the benefit of the State of the Netherlands for the purchase of Emission Reductions represented by its Ministry of Housing, Spatial Planning and the Environment	Yes
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

Goiás

A.4.1.3. City/Town/Community etc:

Goianésia

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

Jalles Machado is located at Fazenda São Pedro, Rodovia GO-080, Km 71,5, Zona Rural, in Goianésia, a town located in north of the State of Goiás, about 167 kilometers (km) far from the state capital – Goiânia – as can be seen in the following Figure 1. Jalles Machado mill can be accessed through BR-251, GO-080, GO-230 and GO-338 highways.

Geographical coordinates (Latitude: 15º 12` 50” - Longitude: 48º 59` 21”).

Figure 1 - Jalles Machado Sugar Mill site overview Geographical position of the city of Goianésia

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

Sectorial Scope: 1-Energy industries (renewable - / non-renewable sources)

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

The world-wide spread technology for generating megawatt (MW) levels of electricity from biomass is the steam-Rankine cycle. The cycle consists of direct combustion of biomass in a boiler to generate steam, which is then expanded through a turbine. 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 electric power only.

The steam-Rankine cycle involves heating pressurized water, with the resulting steam expanding to drive a turbine-generator and then condensing back to water for partial or full recycling to the boiler. A heat exchanger is used in some cases to recover heat from flue gases to preheat combustion air and a de-aerator must be used to remove dissolved oxygen from water before it enters the boiler.

Steam turbines are designed as either "backpressure" or "condensing" turbines. CHP applications typically employ backpressure turbines, wherein steam expands to a pressure that is still substantially above ambient pressure. It leaves the turbine still as a vapour which 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. Steam that is not extracted continues to expand to sub-atmospheric pressures, thereby increasing the amount of electricity generated per unit of steam compared to the backpressure turbine. The non-extracted steam is converted back to liquid water in a condenser that utilizes ambient air and/or a cold water source as the coolant.

The steam-Rankine cycle uses different boiler designs, depending on the scale of the facility and the type of the fuel being used. The initial pressure and temperature of the steam, together with the pressure to which it is expanded, determine the amount of electricity that can be generated per kilogram of steam. In general, the higher the peak pressure and temperature of the steam, the more efficient, sophisticated, and costly the cycle is.

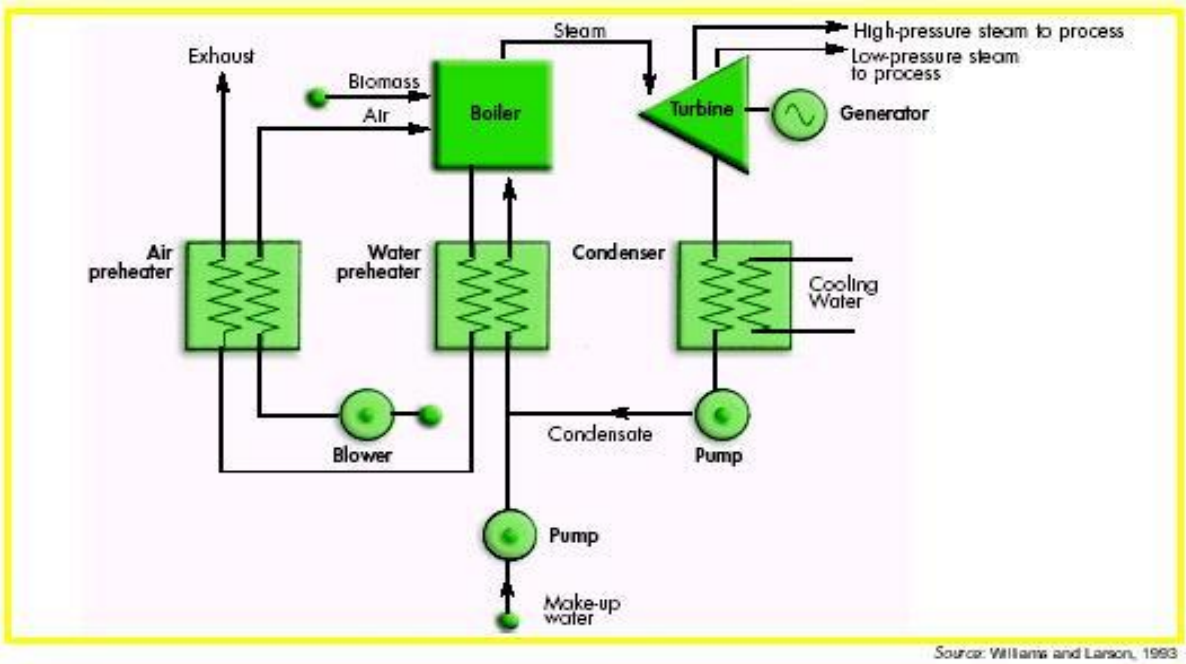


Figure 2 - Schematic diagram of a biomass-fired steam-Rankine cycle for cogeneration using a condensing-extraction steam turbine (Source: Williams & Larson, 1993 and Kartha & Larson, 2000, p.101)

The table below shows project activity implementations schedule for bagasse cogeneration project.

Equipments installed in the cogeneration plant prior and after the start of the Jalles Machado project activity				
Chronogram	**Active / In Operation**		**Stand by or Deactivated**	
Before the Expansion Plan	One 5 MW (G1) backpressure turbo generator	One 1,2 MW backpressure turbo generator		
2000	Two 21 kgf/cm^2 pressure boilers			
Phase 1	One 5 MW (G2) backpressure turbo generator	One 5 MW (G1) backpressure turbo generator		One 1,2 MW backpressure turbo generator
2001		Two 21 kgf/cm^2 pressure boilers		

Phase 2	One 5 MW (G2) backpressure turbo generator	One 5 MW (G1) backpressure turbo generator		One 1,2 MW backpressure turbo generator
2002	One 42 kgf/cm^2 pressure boiler	One 21 kgf/cm^2 pressure boilers		One 21 kgf/cm^2 pressure boiler
Phase 3	One 28 (G3) MW backpressure turbo generator		One 5 MW (G1) backpressure turbo generator One 5 MW (G2) backpressure turbo generator	One 1,2 MW backpressure turbo generator
2003	One 42 kgf/cm^2 pressure boiler	One 42 kgf/cm^2 pressure boiler		Two 21 kgf/cm^2 pressure boiler
Phase 4	One 28 (G3) MW backpressure turbo generator	One 12 (G4) MW condensing turbo generator	One 5 MW (G1) backpressure turbo generator One 5 MW (G2) backpressure turbo generator	One 1,2 MW backpressure turbo generator
2006	One 42 kgf/cm^2 pressure boiler	One 42 kgf/cm^2 pressure boiler		Two 21 kgf/cm^2 pressure boiler

In the second quarter of 2005, Jalles Machado signed a contract with state-owned electricity company Eletrobras, in order to further expand its cogeneration capacity and take part in the PROINFA program, which is a program to buy electricity from renewables in Brazil. Therefore, one 12 (G4) MW condensing turbo generator was installed in Phase 4 (2006). However, as Eletrobras doesn't allow the earnings from the CERs for the project owners,. this further expansion was not part of this CDM project.

The following figures below shows the detailed location of JMBCP installed equipments on Jalles Machado facilities.

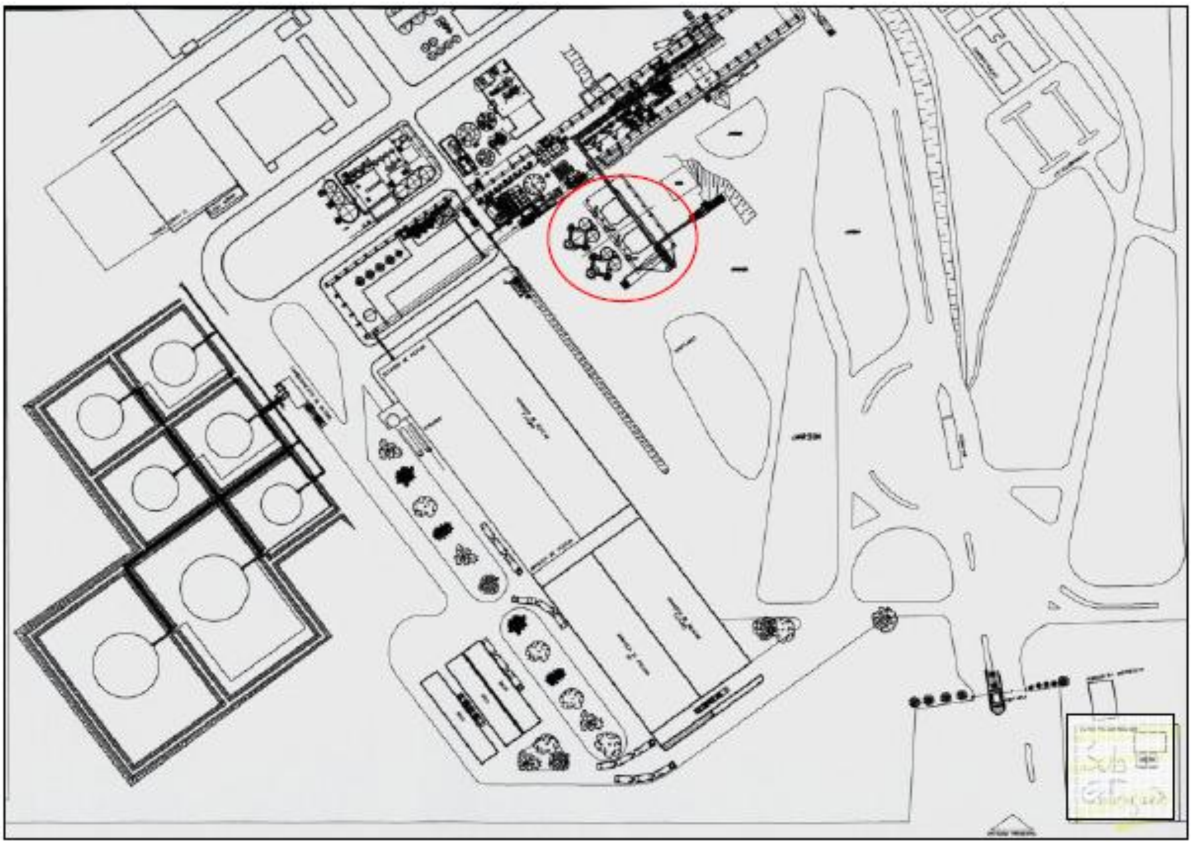


Figure 3 - Location of installed equipments for bagasse cogeneration at Jalles Machado site

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

For the fixed 2nd crediting period (from 23/04/2008 to 22/04/2015), the estimation of emission reductions is:

Years 2nd crediting period (from 23/04/2008 to 22/04/2015)	**Annual estimation of emission reductions in tonnes of CO_2e**
2008	11,864
2009	12,824
2010	12,824
2011	12,824
2012	12,824
2013	12,824
2014	12,824
2015	0*
Total estimated reductions (tonnes of CO_2e)	**88,808**
Total Number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**12,687**

(*): The emissions reductions between 01/01/2015 and 22/04/2015 are not expected because the crop season of the mill usually starts during the second quarter of the year. Therefore, there is no guarantee if the cogeneration facility related to the project activity will start its operations until 22/04/2015.

A.4.5. Public funding of the project activity:

There is no Annex I public funding involved in the Jalles Machado project.

SECTION B. Application of a baseline and monitoring methodology

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

- "ACM0006 Version 06: Consolidated methodology electricity generation from biomass residues";
- "ACM0002 Version 06: Consolidated baseline methodology for grid-connected electricity generation from renewable sources";
- "Version 02.1 of the combined tool to identify the baseline scenario and demonstrate additionality".

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

This project activity is a grid-connected and biomass residue fired electricity cogeneration plant. It includes the improvement of energy efficiency of an existing power plant (energy efficiency improvement project), by installing a more efficient plant that replaces the existing plant.

The project activity is based on the operation of a power plant located in an agro-industrial plant generating the biomass residues.

The ACM0006 (version 6) methodology is applicable under certain conditions, which are addressed as follows:

- No other biomass types than *biomass residues*, as defined above, are used in the project plant and these biomass residues are the only fuel used in the project plant;
    - No other fuels but biomass are used in the project activity.
- The biomass residues come from a production process and the implementation of the project does not result in an increase of the processing capacity of raw input or in other substantial changes in this process;
    - The biomass residue comes from the production of sugar and alcohol, and the implementation of Jalles Machado Bagasse Cogeneration Project does not result in any substantial changes in the production process.
- The biomass residues used by the project facility are not stored for more than one year;
    - The biomass residues are usually stored for approximately 6 months, which corresponds to the interval between the ending and the starting date of the crop seasons.
- No energy is required to prepare the biomass residues for fuel combustion.
    - All the bagasse utilized by Jalles Machado is produced internally and used in its cogeneration facility (boilers and steam turbines) for steam and power generation. It is internally transported to its cogeneration facility through electrical and/or mechanical conveyor belts which operate using electricity and/or steam generated in the biomass residue cogeneration facility. Therefore, there is no fossil fuel consumption within the project activity.

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 biomass residues for electricity and / or heat generation	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	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.

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

The identification of the baseline scenario is determined by the analysis of the following alternatives:

- How power would be generated 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 would the heat be generated in the absence of the project activity.

For **power** generation, the realistic and credible alternatives may include:

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.

P5 is applicable because the power generated by the project plant would be generated (a) in the retrofitted baseline plant.

For **heat** generation, realistic and credible alternatives may include:

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).

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

H2 and H4 are a possible baseline scenario as the heat generated by the project plant would in the absence of the project activity be generated in the reference plant with a different efficiency.

For the use of **biomass**, the realistic and credible alternative(s) may include:

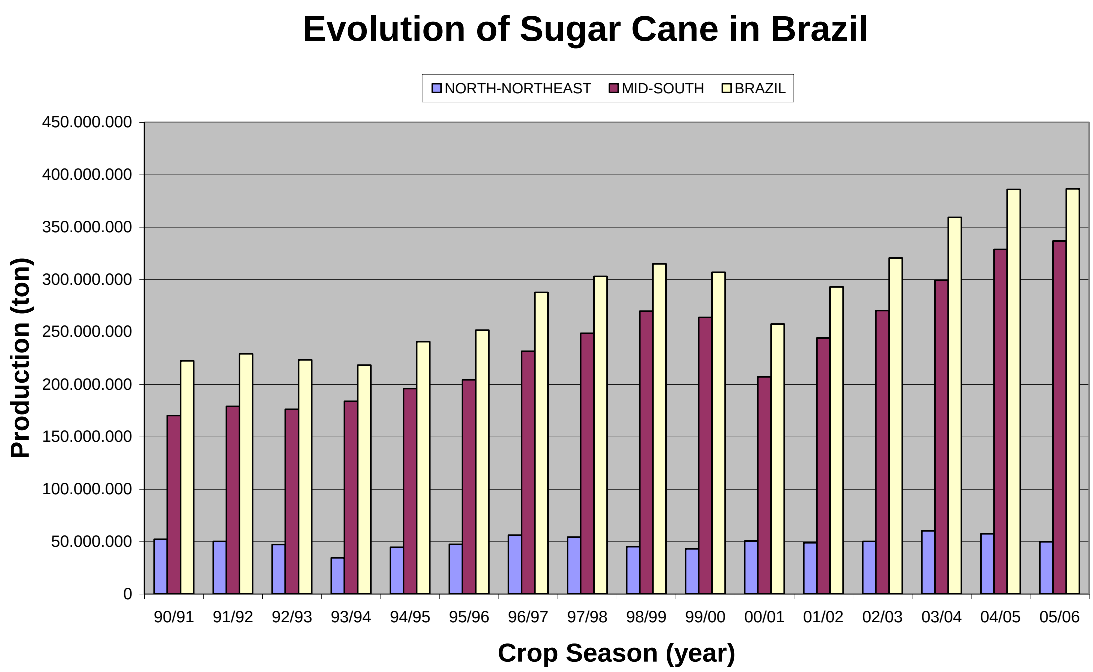
B4 The biomass residues are used for heat and/or electricity generation at the project site.

The same type and quantity of biomass residue would be used as in the project plant for heat and electricity generation, thus satisfying alternative B4.

Thus, the combination of the above alternatives (P5, H2 and B4) defines scenario 18 of ACM0006 (version 6).

A reference plant shall be defined in the baseline scenario, due to the increase of the market demand of the core business of Jalles Machado. The evolution of sugar cane production in Brazil is illustrated below and can demonstrate that the expansion of the mill is a demand of the sugar and alcohol market. Moreover, it is expected an increase of 11.9% of the sugar cane cultivated area in Mid – South regions of Brazil for the 2007/08 crop season, comparing to the previous cycle, according to Conab[3] (Companhia Nacional de Abastecimento).

[3] CONAB - Companhia Nacional de Abastecimento (http://www.conab.gov.br). "Acompanhamento da Safra Brasileira Cana-de-Açúcar Safra 2007/2008, segundo levantamento, agosto/2007 / Companhia Nacional de Abastecimento. - Brasília: Conab, 2007", available on 05/10/2007 at: http://www.conab.gov.br/conabweb/download/safra/2lev-cana.pdf.



The reference plant corresponds to the new biomass residue fired power plant that would be installed in the absence of the project activity. It represents the business as usual scenario. The reference plant would be able to provide only the necessary thermal and electric energy to supply the internal consumption of the sugar cane production process at Jalles Machado, taking into consideration the expansion of the sugar mill industry due to the natural increase of this industrial sector in Brazil.

Moist bagasse represents around 27.57% of total sugar cane weight and the Net Calorific Value of moist bagasse is 0.0019 MWh/kg.

The expected total steam demand at Jalles Machado sugar mill process is approximately 330 ton/hour in 2014

As the project activity is composed by two 42 bar boiler, in the reference cogeneration plant three 21 bar boilers would be enough to meet the steam demand of the mill and the turbo-generator should have an installed capacity of 11 MW.

Data of the 11 MW turbine in the reference plant			
Steam Turbine	Pressure (bar)	Temperature (^{o}C)	Enthalpy (kJ/kg)
Inlet	21	300	3021
Outlet	1.5	111.4	2661.9

To calculate the real outlet steam turbine enthalpy, an isoentropic efficiency of 70%[4] was used.

[4] SANCHEZ, Prieto Mario Gabriel, Cogeneration Alternatives in Sugar and Alcohol Factories, Case of Study, Campinas,: Faculdade de Engenharia Mecânica, Universidade Estadual de Campinas, 2003. 280 p. PHD Thesis.

The calculation of steam required to attend the demand of electricity in Jalles Machado is demonstrated in the following equation:

$$W = Mv * (Ho - Hi)$$

Where:
W – installed power capacity in kW;
Mv – steam flow, expressed in kg/s;
Ho – outlet steam turbine enthalpy;
Hi – inlet steam turbine enthalpy.

The results obtained from this calculation are presented below:

Data of the Reference Plant	
Installed Capacity (MW)	Turbine Steam Consumption (ton/h)
11	110.28

The three 21 bar boilers are considered in the reference plant and are able to generate the total steam required by the sugar mill, including the power generation, according to the results below.

Reference Plant: One 11 MW turbine and three 21 bar boilers				
Year	Bagasse Consumed (ton/h)	Total Steam Generated (ton/h)	Steam Consumed for Electricity Generation (ton/h)	Steam for the Process (ton/h)
2014	153.17	329.83	110.28	219.56

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):

Additionality was determined using the “Combined tool to identify the baseline scenario and demonstrate additionality (version 2.1)”.

STEP 1. Identification of alternative scenario

Sub-step 1a. Define alternative scenarios to the proposed CDM project activity

The alternative scenario to the project activity is defined in section B.4.

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

The alternative scenario is in compliance with all mandatory applicable legal and regulatory requirements of Brazil.

STEP 2. Barrier analysis

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

Despite the expansion of the sugar and alcohol production in Brazil, the investments in the energy cogeneration from biomass are not growing at the same rate. The sugar and alcohol mills in Brazil have a potential installed capacity from 6 thousand MW to 8 thousand MW, but only commercialize circa of 1.7 thousand MW in the market, according to the sugar cane industry union of São Paulo, Brazil - Unica[5] (União da Indústria de Cana-de-açúcar).

Some reasons for that are:

- The price paid for electricity by the government doesn't pay the costs of implementation of a high efficiency cogeneration system;
- The mills are obliged to install the transmission lines in order to commercialize the electricity.

COELHO *et alii* (2002)[6] stand out that the potential energy surplus from the sugar and alcohol industry "will only become effectively available in its totality if adequate politics are implemented in the country." Such politics should refer to the several barriers that limit the development of the sector, which are:

- **Cultural barriers:**

Due to the nature of the business in the sugar industry the marketing approach is narrowly focused on commodity (sugar and ethanol) type of transaction. Therefore, the electricity transaction based on long-term contract (PPA – Power Purchase Agreement) represents a significant breakthrough in their business model. In this case, the electricity transaction has to represent a secure investment opportunity from both economical and social-environmental perspective for convincing the sugar mills to invest in.

Nevertheless, some barriers pose a challenge for implementation of this kind of projects. In most cases, the sponsors' culture in the sugar industry is very much influenced by commodities – sugar and ethanol – market. Therefore, they need an extra incentive to invest in electricity production due to the fact that it is a product that cannot be stored for price speculation. Power Purchase Agreements (PPAs) require different negotiation skills, which are not core to the sugar industry. For instance, when signing a long-term electricity contract, the PPA, the sugar mill has to be confident that it will produce sufficient biomass to supply its cogeneration project. Although it seems easy to predict, the volatility of sugar cane productivity may range from 75 to 120 ton of sugar cane per hectare annually depending on the rainfall.

It is worth to stand out that the bagasse cogeneration in the country usually works with systems of low thermodynamic efficiency, which generates few surpluses or even limits to the self-sufficiency.

According to the World Alliance for the Decentralized Energy, WADE (2004)[7], as, until recently, the sale of surpluses was not a common practice in the sector, the industry developed units of low efficiency exclusively to guarantee self-sufficiency of energy and steam and to deal with the problem of the bagasse accumulation and elimination. Moreover, at the time the sugar mills' cogeneration facilities are replaced, or when a new cogeneration unit is created, the equipments will have a lifetime of more than 20 years. The decision to go for purchasing low efficiency equipments addresses that plant to not take advantage of

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[5] ÚNICA – União da Indústria de Cana-de-açúcar (Sugar Cane Industry Union), available at: http://www.portalunica.com.br/portalunicaenglish/

[6] COELHO, S.T., VARKULYA JR, A., PALETTA, C.E.M., SILVA, O.C. – *A importância e o potencial brasileiro da cogeração de energia a partir da biomassa.* CENBIO – Centro Nacional de Referência em Biomassa. Instituto de Eletrotécnica da USP. 2002.

[7] WADE *Bagasse Cogeneration – Global Review and potential.* 2004. Available on http://www.cogensp.com.br

its potential surpluses of electricity for sale. Therefore, the choice of the equipments is decisive in order the plant to make its electricity surplus potential available (COELHO, 2004).

Thus, in Brazil, the distributed generation has a minimum participation in the supply of electric energy, despite the great potential. The energetic potential of the sugar cane biomass residues is used with low efficiency in the alcohol and sugar cane industry, because of the difficulty to export electricity for the electric sector.

- **Institutional and Political Barriers:**

From the electric sector point of view, according to COELHO (2004), many utilities still don't demonstrate interest in purchasing electricity generated by self-producers, independent energy producers, especially when it comes to long-term contracts. In the case bagasse cogeneration specifically, the electricity is generated only during the crop season, which, in the utilities' point of view, does not characterize an offer of firm energy.

Therefore, the utilities see as a disadvantage what is one of the biggest advantages of the bagasse cogeneration: the energy is produced during the drought, when the hydroelectric power stations face difficulties due to the low level of rain. (COELHO, 1999)[8] "By not having a legal compulsory nature for the purchase of the electricity generated from renewable sources (as in other countries), the utilities can choose other options in the offer of energy".

From the sugar mill's point of view, one can notice an "important change of mentality in the sector's mills, which start to demonstrate a significant interest for the generation of electricity, which didn't happen until some time ago". Even though this change of mentality is already widespread, the reluctance in what regards the sale of spare electric power still persists. According to COELHO (2004), such reluctance can be explained by the "fear as for the involved risks and for the distrust regarding the maintenance, in the medium and long terms, of a solid politics of institutional incentive." The politics of the public section for renewable energy are not considered reliable enough for the executives of the private sector to give support to the expansion of the cogeneration in the sugar mills.

Still to be considered is the lack of a direct communication channel between the mills, ANEEL and BNDES, in order to facilitate the explanation of doubts, mainly in what refers to the implantation or expansion of electricity generation plants (COELHO, 2004).

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

The alternative scenario to this project activity is to maintain the current situation and focus strictly in its core business, which is the production of sugar and alcohol. Therefore, as the barriers mentioned above are directly related to entering into a new business (electricity sale), there is no impediment for sugar mills to maintain or even invest in its core business.

The impact of registration of this project will contribute to overcoming the barriers described above.

The company's decision to sign a long-term PPA with the local distributor undoubtedly represented a significant risk that the mill was willing to take, partially because of the expected CDM revenue.

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[8] COELHO, Suani T. *Mecanismos para implementação da cogeração de eletricidade a partir de biomassa*: um modelo para o Estado de São Paulo. São Paulo: Programa interunidades de pós-graduação em energia, 1999

The renewal of the project's registration will also have an impact on other sugar cane industry players, who will see the feasibility of implementing renewable energy commercialization projects in their facilities with the CDM. Moreover, hard-currency inflows are highly desirable in a fragile and volatile economy as is the Brazilian one.

Notwithstanding, some other benefits and incentives will be experienced by the project activity such as: the project will achieve the aim of anthropogenic GHG reductions; financial benefit of the revenue obtained by selling CERs will bring more robustness to the project's financial situation; and its likelihood to attract new players and new technology (currently there are companies developing extra-efficient boilers and turbo-generators) and reducing the investor's risk.

STEP 4. Common practice analysis

The sugar sector, historically, always exploited the biomass residue in an inefficient manner by making use of low-pressure boilers. Although they consume almost all of their bagasse for self-energy generation purposes, it is done in such a manner that no surplus electric energy is available for sale and no sugar company has ventured in the electricity market until recent years.

Similar project activities have been implemented by leading companies in this industry, Vale do Rosário project served as a sector benchmark. However, there are few examples in a universe of about 346 sugar mills. Added together, similar projects in the sugar industry in Brazil account to approximately 10% of the sugar industry. The additional 90% are still burning their bagasse for on-site use only in the old-fashioned inefficient way. That clearly shows that just a small part of this sector is willing to invest in efficient technologies in the cogeneration plants.

This project activity type is not considered as a widely spread activity in Brazil, as only a small portion of the existing sugar mills in the country actually produce electricity for sale purposes, then the proposed project activity is additional.

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 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 ($BE_{biomass,y}$), are described as follows:

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

Where:

ER_y = Emissions 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)

Project emissions shall not be considered, because there is no transportation of biomass residues to the project site ($PET_y = 0$), no on-site consumption of fossil fuels due to the project activity ($PEFF_y = 0$), no consumption of electricity ($PE_{EC,y} = 0$) and no CH_4 emissions from the combustion of biomass residues ($PE_{Biomass,CH4,y} = 0$). Thus, $PE_y = 0$.

Emission reductions due to the displacement of electricity 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 emission factor for the displacement of electricity should correspond to the grid emission factor ($EF_{electricity,y} = EF_{grid,y}$) and $EF_{grid,y}$ is determined in section B.6.3.

According to scenario 18, EG_y is determined based on the average efficiency of electricity generation in the reference plant that would be installed in the absence of the project activity and that would have a lower efficiency of electric generation than the project plant ($\varepsilon_{el,baseline\ plant} = \varepsilon_{el,reference\ plant}$) and the average net efficiency of electricity generation in the project plant after project implementation $\varepsilon_{el,project\ plant,y}$, as follows:

$$EG_y = EG_{project\ plant,y} \cdot \left(1 - \frac{\varepsilon_{el,baseline\ plant}}{\varepsilon_{el,project\ plant,y}}\right)$$

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)
$\varepsilon_{el,\ baseline\ plant}$ = Average efficiency of electricity generation in the baseline plant ($MWh_{el}/MWh_{biomass}$)
$\varepsilon_{el,project\ plant,y}$ = Average efficiency of electricity generation in the project plant ($MWh_{el}/MWh_{biomass}$)

The average net efficiency of electricity generation in the project plant ($\varepsilon_{el,project\ plant,y}$) should be calculated by dividing the electricity generation during the year *y* by the sum of bagasse, expressed in energy units, as follows:

$$\varepsilon_{el,project\ plant,y} = \frac{EG_{project\ plant,y}}{\sum_k NCV_k \cdot BF_{k,y}}$$

Where:

$\varepsilon_{el,project\ plant,y}$ = Average net energy efficiency of electricity generation in the project plant
$EG_{project\ plant,y}$ = Net quantity of electricity generated in the project plant during the year *y* (MWh)
$BF_{k,y}$ = Quantity of bagasse combusted in the project plant during the year *y* (tons of dry matter or liter)
NCV_k = Net calorific value of the bagasse (GJ/ton of dry matter or GJ/liter)

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

As $ER_{heat,y}$ can be estimated as zero, according with ACM0006, the variables $Q_{project\ plant,\ y}$ (net quantity of heat generated from firing biomass in the project plant), ε_{boiler} (Average net energy efficiency of heat generation in the boiler that is operated next to the project plant) do not need to be monitored on the project activity.

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

The diversion of biomass residues to the project activity is already considered in the calculation of baseline reductions. Then, leakage effects do not need to be addressed (L_y. = 0).

Thus, $ER_y = ER_{electricity,y}$.

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

Data / Parameter:	$EF_{S\text{-}SE\text{-}C0,2004\text{-}2006}$
Data unit:	tCO_2 / MWh
Description:	Combined margin CO_2 emission factor of the grid
Source of data used:	Calculated
Value applied:	0.1864
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data will be archived electronically and according to internal procedures, until 2 years after the end of the crediting period.
Any comment:	The emission factor of the grid applied for this project activity was calculated *ex-ante* and, therefore, the combined margin emission coefficient of 0.1864 tCO_2e/MWh (calculated as weighted sum of the w_{OM} = 0.25 w_{BM} = 0.75 emission factors, as explained in STEP 6 of the *Tool to calculate the emission factor for an electricity system*) shall be applicable for the entire 7 years of the second crediting period.

Data / Parameter:	$\varepsilon_{el,reference\ plant}$
Data unit:	-
Description:	Average net energy efficiency of power or heat generation in the reference power plant that would use the biomass residues fired in the project plant in the absence of the project activity.

Source of data used:	Calculated
Value applied:	3.63 %
Justification of the choice of data or description of measurement methods and procedures actually applied :	The efficiency was calculated in a conservative manner, with a higher value within a plausible range, using relevant sources of information provided by the project owner.
Any comment:	Applicable to scenario 18

B.6.3 Ex-ante calculation of emission reductions:

In order to calculate the ex-ante estimation of emission reductions for the crediting period, estimated figures were used for parameters that are not available when validation is undertaken or that are monitored during the crediting period.

As detailed in B.6.1:

$$ER_y = ER_{electricity,y}$$

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

The 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. Calculations for this combined margin were based on data from an official source and made publicly available.

Power plant capacity additions registered as CDM project activities were excluded from all calculations below.

STEP 1. Calculate the Operating Margin emission factor ($EF_{OM,y}$)

The method that will be chosen to calculate the Operating Margin (OM) for the electricity baseline emission factor is the option (b) *Simple Adjusted OM*, since the preferable choice (c) *Dispatch Data Analysis OM* would face the barrier of data availability in Brazil.

The provided information comprised years 2004, 2005 and 2006, and these are the most recent information available at this stage. The ONS data as well as the spreadsheet data with the calculation of emission factors were provided to the DOE (Designed Operational Entity) and are indicated in Annex 3.

According to the methodology, the Simple Adjusted OM Emission Factor ($EF_{OM,\ simple\ adjusted,\ y}$) is determined using the following equation:

$$EF_{OM,simple\_adjusted,y} = (1-\lambda_y)\frac{\sum_{i,j} F_{i,j,y}.COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y \frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_k GEN_{k,y}}$$

It is assumed here that all the low-cost/must-run plants produce zero net emissions.

$$\frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_{k} GEN_{k,y}} = 0$$

The Lambda factors were calculated in accordance with methodology requests and its values are available in Annex 3. Using appropriate data for the fossil fuels factors, $F_{i,j,y}$ and $COEF_{i,j}$, the Operating Margin emission factors are determined as follows:

$$EF_{OM,simple\_adjusted,2004} = (1-\lambda_{2004}) \frac{\sum_{i,j} F_{i,j,2004}.COEF_{i,j}}{\sum_{j} GEN_{j,2004}} \therefore EF_{OM,simple\_adjusted,2004} = 0.4937 \ tCO_2/MWh$$

$$EF_{OM,simple\_adjusted,2005} = (1-\lambda_{2005}) \frac{\sum_{i,j} F_{i,j,2005}.COEF_{i,j}}{\sum_{j} GEN_{j,2005}} \therefore EF_{OM,simple\_adjusted,2005} = 0.5275 \ tCO_2/MWh$$

$$EF_{OM,simple\_adjusted,2006} = (1-\lambda_{2006}) \frac{\sum_{i,j} F_{i,j,2006}.COEF_{i,j}}{\sum_{j} GEN_{j,2006}} \therefore EF_{OM,simple\_adjusted,2006} = 0.4185 \ tCO_2/MWh$$

Finally, to determine the *ex-ante* $EF_{OM,simple\_adjusted}$, the mean average among the three years is calculated, finally determining the:

$$EF_{OM,simple\_adjusted2004\_2006} = \frac{EF_{OM,simple\_adjusted,2004} * \sum_{j} GEN_{j,2004} + EF_{OM,simple\_adjusted,2005} * \sum_{j} GEN_{j,2005} + EF_{OM,simple\_adjusted,2006} * \sum_{j} GEN_{j,2006}}{\sum_{j} GEN_{j,2004} + \sum_{j} GEN_{j,2005} + \sum_{j} GEN_{j,2006}} = 0.4749$$

STEP 2. Calculate the Build Margin emission factor (*$EF_{BM,y}$*) as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y}.COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

Option 1 was chosen to calculate the Build Margin emission factor $EF_{BM,y\ ex\text{-}ante}$ based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Then, the sample group comprises the second option.

$$EF_{BM,2006} = 0.0903 \ tCO_2/MWh$$

STEP 3. Calculate the baseline emission factor *EF_y* as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}$$

The default weights are as follows: w_{OM} = 0.25 and w_{BM} = 0.75. That gives:

$$EF_{S-SE-CO,2004-2006} = 0.25 * 0.4749 + 0.75 * 0.0903 = 0.1864\, tCO_2e/MWh$$

The calculation of the estimated emissions reductions is detailed in table below.

Jalles Machado Bagasse Cogeneration Project (JMBCP)

Emission reductions calculation	Item	Second Crediting period							Total CERs
		2008	2009	2010	2011	2012	2013	2014	
	Electricity generation - project plant (MWh)	114,000	122,000	122,000	122,000	122,000	122,000	122,000	
	Electricity for self consumption - reference plant (MWh)	50,350	53,200	53,200	53,200	53,200	53,200	53,200	
	Sugarcane crushed (t)	2,650,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	
	Efficiency of Electricity Production - reference plant ($MWh_{el}/MWh_{bagasse}$)	3.63%	3.63%	3.63%	3.63%	3.63%	3.63%	3.63%	
	Efficiency of Electricity Production - project plant ($MWh_{el}/MWh_{bagasse}$)	8.2%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	
	Net quantity of increased electricity generation (MWh)	63,650	68,800	68,800	68,800	68,800	68,800	68,800	
	Emission Factor 2004-2006 S-SE-CO (tCO_2e/MWh_{el})	0.1864	0.1864	0.1864	0.1864	0.1864	0.1864	0.1864	
	Emission reductions (tCO2e)	**11,864**	**12,824**	**12,824**	**12,824**	**12,824**	**12,824**	**12,824**	**88,808**

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

Year	Estimation of project activity emission (tonnes of CO_2e)	Estimation of the baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of emission reductions (tonnes of CO_2e)
2008	0	11,864	0	11,864
2009	0	12,824	0	12,824
2010	0	12,824	0	12,824
2011	0	12,824	0	12,824
2012	0	12,824	0	12,824
2013	0	12,824	0	12,824
2014	0	12,824	0	12,824
Total (tonnes of CO_2e)	**0**	**88,808**	**0**	**88,808**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$BF_{k,y}$
Data unit:	tons of dry matter
Description:	Quantity of bagasse combusted in the project plant during the year *y*
Source of data to be	On-site measurements

<table>
<tr><td>used:</td><td></td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions in section B.5</td><td>

2008	2009	2010	2011	2012	2013	2014
191,793	219,834	218,767	218,767	218,767	218,767	218,767

2008-2010 are based in real measured information; the next years are only an estimative.</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>Adjust for the moisture content in order to determine the quantity of dry biomass. The project dry bagasse ($BF_{k,y}$) is determined considering following steps:

1. The steam required for the Turbo-generator G3 ($Steam\_used\_G3$) is measured hourly for the complete monitoring period. Also the total steam produced ($Tons\_of\_steam$) is measured hourly in order to determine the boilers production efficiency. The accumulated steam value will be presented for each crop day in the reports.

2. Additionally, the total moist bagasse($Tons\_of\_bagasse$) is calculated considering the weight of crushed sugar cane, by means of the following relations:

$$Tons\_of\_Bagasse = \frac{\%Bagasse\_in\_cane \times Crushed\_cane}{100}$$

$$\%Bagasse\_in\_cane = 100 \times \frac{\%Fiber\_in\_cane}{\%Fiber\_in\_bagasse}$$

<u>Note:</u> The total moist bagasse represents the sum of used and not used bagasse for the project activity, due to the fact that the project excludes the generation of Turbo-generator G4 (PROINFA).

3. The real boiler efficiency is calculated dividing the quantity of steam generated in all monitoring period with the quantity of combusted bagasse. The boiler efficiency equation is calculated as follow:

$$R\_Boiler\_efficiency = \frac{Tons\_of\_steam}{Tons\_of\_bagasse}$$

4. The combusted moist bagasse used in the project activity is calculated by means of the measured value of required steam for the G3 and divided with the boilers efficiency.</td></tr>
</table>

	$$C\_tons\_bagasse = \frac{Steam\_used\_G3}{R\_Boiler\_efficiency}$$ 5. To obtain the dry mass of bagasse the moist bagasse was multiplied by 52% (as the estimated percentage of moisture in the bagasse is 52%). $$\mathrm{BFk,y} = C\_tons\_bagasse \times (1 - moisture)$$
QA/QC procedures to be applied:	An annual energy balance.
Any comment:	-

Data / Parameter:	$BF_{T,k,y}$
Data unit:	tons of dry matter
Description:	Quantity of biomass residue type k that has been transported to the project site during the year y
Source of data:	On-site measurements
Measurement procedures (if any):	Adjust for the moisture content in order to determine the quantity of dry biomass. Weighted at the reception of the bagasse.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Various: Bagasse: Dry tons (Only Purchased bagasse) (see table below) 2008-2010 are based in real measured information; the next years are only an estimative.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emissions
Monitoring frequency:	Continuously
QA/QC procedures applied:	Crosschecked with purchase invoices or freight transport orders.
Any comment	To obtain the dry mass of bagasse, the moist bagasse was multiplied by moisture content in the bagasse (average value of 52%)

2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
14,784	10,649	12,700	12,700	12,700	12,700	12,700

Data / Parameter:	NCV_k
Data unit:	GJ/ton of dry matter
Description:	Net calorific value of bagasse
Source of data to be used:	Reputed external laboratory
Measurement procedures (if any):	Shall be carried out at reputed laboratory based on dry biomass

Value of data applied for the purpose of calculating expected emission reductions in section B.5	17.69 GJ/ton
Monitoring frequency:	Measure the NCV based on dry biomass. Monitoring at least every six months, taking at least three samples for each measurement.
QA/QC procedures to be applied:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass.
Any comment:	-

Data / Parameter:	$EG_{project\ plant,y}$
Data unit:	MWh/yr
Description:	Net quantity of electricity generated in the project plant during the year y
Source of data to be used:	Jalles Machado
Value of data applied for the purpose of calculating expected emission reductions in section B.5	**2008**: 111,375; **2009**: 107,060; **2010**: 109,579; **2011**: 109,579; **2012**: 109,579; **2013**: 109,579; **2014**: 109,579 2008-2010 are based in real measured information; the next years are only an estimative.
Description of measurement methods and procedures to be applied:	Continuously monitored.
QA/QC procedures to be applied:	The consistency of metered net electricity generation should be cross-checked with receipts from electricity sales (if available) and internal consumption measurements, and the quantity of fuels fired (check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years).
Any comment:	Internal Consumption embrace: Boilers, Process and auxiliary services.

2008	2009	2010	2011	2012	2013	2014
111,375	107,060	109,579	109,579	109,579	109,579	109,579

Data / Parameter:	AVD_y
Data unit:	km
Description:	Average round trip distance (from and to) between biomass fuel supply sites and the project site
Measured /Calculated /Default:	Measured
Source of data:	Records by project participants on the origin of the biomass
Value of data applied for the purpose of calculating expected	Sugar mill Name: Usina goianesia; AVD_y (km): 30

Sugar mill Name	AVD_y (km)
Usina goianesia	30

<table>
<tr><td>emission reductions in section B.5</td><td><table><tr><td>Coop. Agroindustrial Rubiataba LTDA</td><td>134</td></tr><tr><td>Avicuns S/A Alcool e Derivados</td><td>193</td></tr></table></td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Project emissions</td></tr>
<tr><td>Measuring procedures (if any):</td><td>Freight transport orders or invoices</td></tr>
<tr><td>QA/QC procedures applied:</td><td>Check consistency comparing with maps</td></tr>
</table>

<table>
<tr><td>Data / Parameter:</td><td>N_y</td></tr>
<tr><td>Data unit:</td><td>-</td></tr>
<tr><td>Description:</td><td>Number of truck trips for the transportation of biomass</td></tr>
<tr><td>Measured /Calculated /Default:</td><td>-</td></tr>
<tr><td>Source of data:</td><td>Jalles Machado</td></tr>
<tr><td>Value of data applied for the purpose of calculating expected emission reductions in section B.5</td><td><table><tr><th>Provider name</th><th>Trips (N_y)</th></tr><tr><td>Usina goianesia</td><td>806</td></tr><tr><td>Coop. Agroindustrial Rubiataba LTDA</td><td>862</td></tr><tr><td>Avicuns S/A Alcool e Derivados</td><td>124</td></tr></table></td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Project emissions</td></tr>
<tr><td>Measuring procedures (if any):</td><td>-</td></tr>
<tr><td>QA/QC procedures applied:</td><td>Check consistency with freight transport orders or invoices. It could be checked with the number of trips that the truck made from the project activity location to the supplier mill (without charge), plus its return to the project activity loaded.</td></tr>
</table>

Data / Parameter:	$EF_{km, CO2,y}$
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for the trucks during the year *y*
Measured /Calculated /Default:	Default
Source of data:	IPCC (Intergovernmental Panel on Climate Change)
Value of data applied	The value is: 0.0000497 tCO_2/km[9]

9 http://www.cetesb.sp.gov.br/userfiles/file/mudancasclimaticas/proclima/file/cursos_seminarios/seminario_ipcc/textosdeapoio/texto_apoio_01.pdf

for the purpose of calculating expected emission reductions in section B.5	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions
Measuring procedures (if any):	At least annually
QA/QC procedures applied:	Check consistency with technical literature.

B.7.2 Description of the monitoring plan:

1. <u>Data Collection</u>

1.1. <u>Net quantity of electricity generation</u>

The project involves one 12 MW condensing turbo generator, named as “G4”which produces for ELETROBRAS, and other one of 28 MW backpressure turbo generator, name as “G3” which produces for CPFL, hereinafter *“exp_CPFL”*. The 12 MW do not belong to the CDM project, for that reason the energy generated is not considered as project energy generation. This G3 generation value is named as cogeneration plant. Currently, there is a continuous monitoring of the total exported energy by the two generation units performed by *“Centrais Elétricas de Goiás S.A”* (CELG) through its own energy meter. However, this is only the part that was exported to the grid, so with the intention to determine the Net generated energy, is necessary to add to *exp_CPFL*, the internal consumption of the sugar cane process. The energy measurement process is showed in Figure 5, this figure was based in *“esquema unifilar 2010_rev_01(2).dwg”*. This approaching was adopted due to the fact that there was not an energy meter for direct measuring of generated electricity in G3, so PP is using this method only with the intention to overcome the lack of this meter in the past years. An energy meter has already been installed for G3, in April 2012, when the sugar mill has started the crop season. This measure allows the project activity to be in accordance with the ACM0006 methodology. This calculation procedure is made as it follows:

$$EG_{projectplant,y} = \exp\_CPFL + (BOILERS + PROCESS + AUX.SERVICES)$$

$$G3 = EG_{projectplant,y} + Cog.Aux.Consumption$$

The circuits “BOILERS”, “PROCESS” and “AUX.SERVICES” are referred to the internal consumption of Jalles Machado Mill for sugar and alcohol production, they are different to auxiliary consumption of cogeneration plant. These circuits are continuously monitored by calibrated relays.

Jalles Machado, has a concessionary electrical meter named as *“Fronteira”* (Border in Portuguese) or Total Energy exported (TEE). This is the point of connection with the electrical grid. This electrical meter has a redundant meter and both are calibrated every two years, according to sector regulations. The parameter “exp_CPFL” is calculated by means of the subtraction between TEE and G4, that is also calibrated. See the following equation explaining the procedure:

$$\exp\_CPFL = TEE(Border) - G4(PROINFA)$$

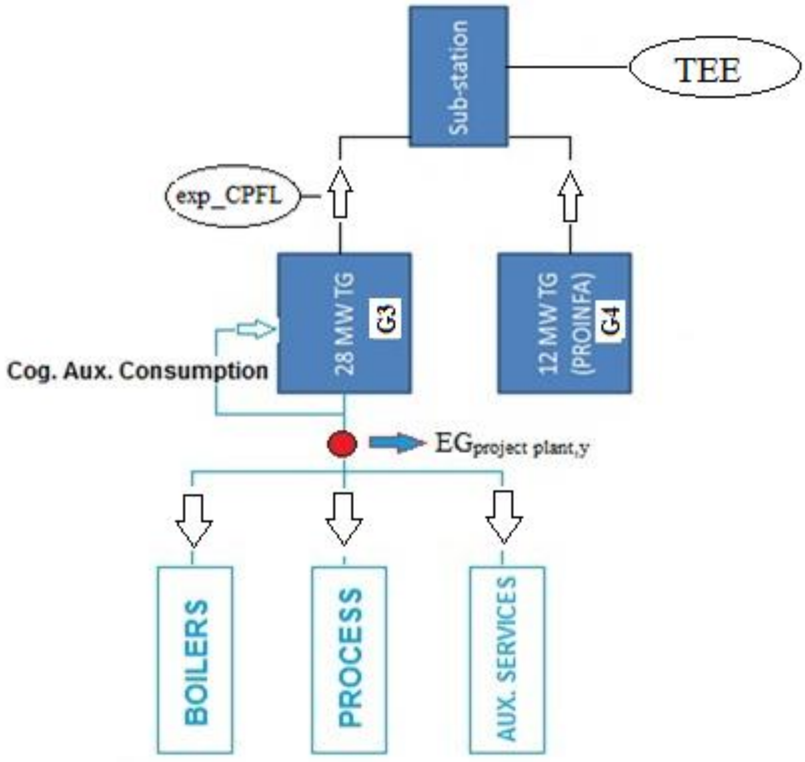

Figure 4 - Energy measurement system (based in the Jalles Machado electric single line plane)

After April 2012, the net quantity of electricity generated in the project plant will be monitored through the energy meters installed at the generators, that measures gross generation and the software that controls the operation of the power plant. The metering equipment shall be periodically calibrated according to the manufacturer procedures.

The measurement of the electricity exported to the connected grid will made using one metering equipment to each turbo generator (G3 and G4) and one metering equipment connected to the transmission line, which indicates the total energy amount exported (TEE). In order to ensure data consistency, the readings of the calibrated meter equipment must be recorded in an electronic spreadsheet and the sales receipt must be archived for double checking the data.

Additionally, the net quantity of electricity generation in the project plant ($EG_{projectplant,y}$) is calculated by means of the power generation in the cogeneration plant (28 MW) minus the auxiliary electricity required for the operation of the cogeneration plant.

The auxiliary electricity required covers several equipments such as vans, blowers, pumps. The mill does not have electricity meters to measure the auxiliary electricity required. Thus, in order to adopt a conservative approach the PPs considered the maximum electricity consumed by the auxiliary equipments as follows:

Auxiliary electricity required = {<u>Installed capacity of the all auxiliary equipments</u>} x {<u>hours in crop season</u>}

- The installed capacity will be justified by the presentation of a list of equipments used for this purpose in an Excel spreadsheet showing their capacities. This list it will be available to the validation team.
- The crop season hours are taken from the crop season reports or crop registered information.

In other words, it was considered as the equipments will operate full time at full capacity. This is conservative.

The figure below shows how the net quantity of electricity generation is measured and the location of the electricity meter.

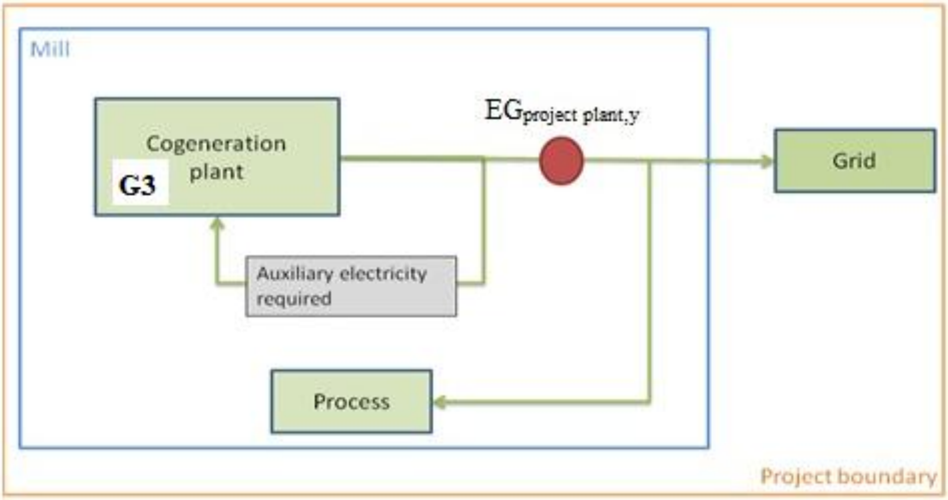

Figure 5 - Diagram of the net electricity generation

The electricity measurement is hourly recorded and daily consolidated through internal reports. The calculation of the net electricity generation has been made in CERs spreadsheet which was sent to DOE.

1.2. <u>Bagasse combusted</u>

The bagasse combusted in the mill came from two sources: bagasse generated in the mill (Refer to B.7.1) and purchased from others mills which are known.

The figure below shows the sources of the bagasse combusted in the project activity.

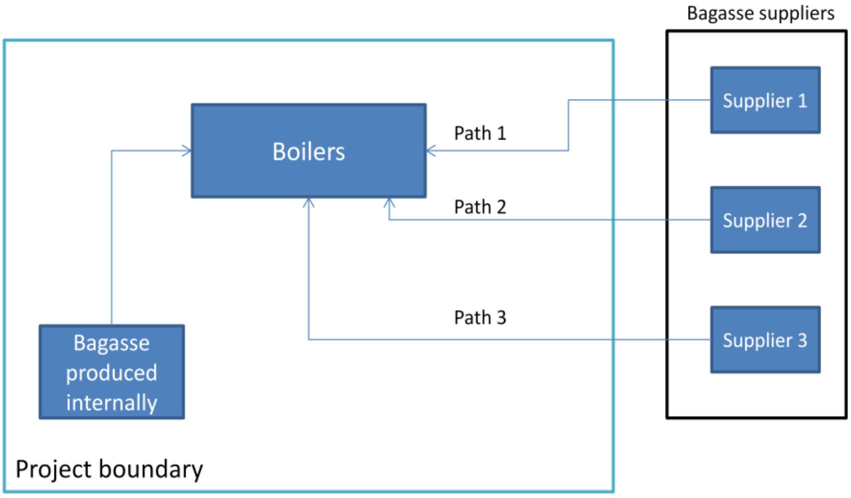

Figure 6 - Bagasse combusted in the project activity

The bagasse generated in the mill was calculated as explained in section B.7.1. The measured quantities will be adjusted for moisture content for calculating tons of dry matter.

The quantity of purchased bagasse was monitored by invoices in the entrance of the mill. The project emissions from transportation of the bagasse were calculated according to ACM0006 Version 06 and consist of the following rationale:

$$PET_y = N_y \text{ x } AVD_y \text{ x } EF_{km,CO2,y}$$

Where:

PET_y	=	CO_2 emissions during the year y due to transport of the biomass residues to the project plant (tCO_2/yr)
N_y	=	Number of truck trips during the year y
AVD_y	=	Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year y (km)
$EF_{km,CO2,y}$		Average CO_2 emission factor for the trucks measured during the year y (tCO_2/km)

1.3. <u>The moisture content of biomass residue</u>

The moisture content of biomass residue (%) was continuously monitored by Jalles Machado laboratory and used to determine the quantity of dry biomass.

1.4. <u>The Net Calorific Value – NCV</u>

The Net Calorific Value – NCV was collected at last every six months, taking at least three samples for each measurement. All measurements are performed by a reputed laboratory.

The monitoring data was registered in a spreadsheet, which is instrument for this Verification. The archiving occurred up to two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later.

Environmental Impacts will be monitored by the reports requested by the time of the issuance of the Operational License, but concerning that the project must be in accordance with the current state environmental legislation

2. Equipment Calibration

The metering equipments were periodically calibrated according to the manufacturer specification and in some cases according to the sector regulation. All measures were documented and archived in soft and hard copies.

2.1. Sugar-cane scales calibration

The scale calibration is made every year. This parameter is measured carefully because it is used to estimate the bagasse production.

2.2. Energy meters calibration

All energy meters are calibrated every two years owing to sector regulations.

2.3. Moisture meter calibration

The moisture meter calibration is requested for Jalles Machado annually.

2.4. Steam flow meters

The calibration of these equipments is requested for Jalles Machado, following the frequency manufacturer recommendation. These meters are located on the boilers output and generator G1 input.

3. Data Recording

Data collected was recorded into an electronic spreadsheet administered by the Environment and Quality head of Jalles Machado CDM project and stored at Jalles Machado server electronically.

4. Data Archives

Data reports have been archived and kept at least for two years after the end of the crediting period or the last issuance of CERs for this proposed project activity, whatever occurs later. There are two types of reports in Jalles Machado. One of them is made for the laboratory head and other one for the Power Plant Head as seem in the picture 2 structure.

In order to guaranty quality assurance, the monitoring staff assessed the appropriateness of the monitoring processes, including:

- Data collection procedures;
- Quality of metering / calibration method;
- General quality and accuracy of the collected data.

All people that participate in the monitoring process is suitably qualified and trained in the operation and maintenance of the plant, due to the fact that JMBCP has ISO9001 accreditation. They also received instructions of the monitoring plan of JMBCP.

5. Organizational structure

The following organization chart details the responsibilities of different professionals which have CDM associate rolls in order to keep well organized all the data collection, archiving of complete reliable data and fully comply with the provisions of ACM0006.

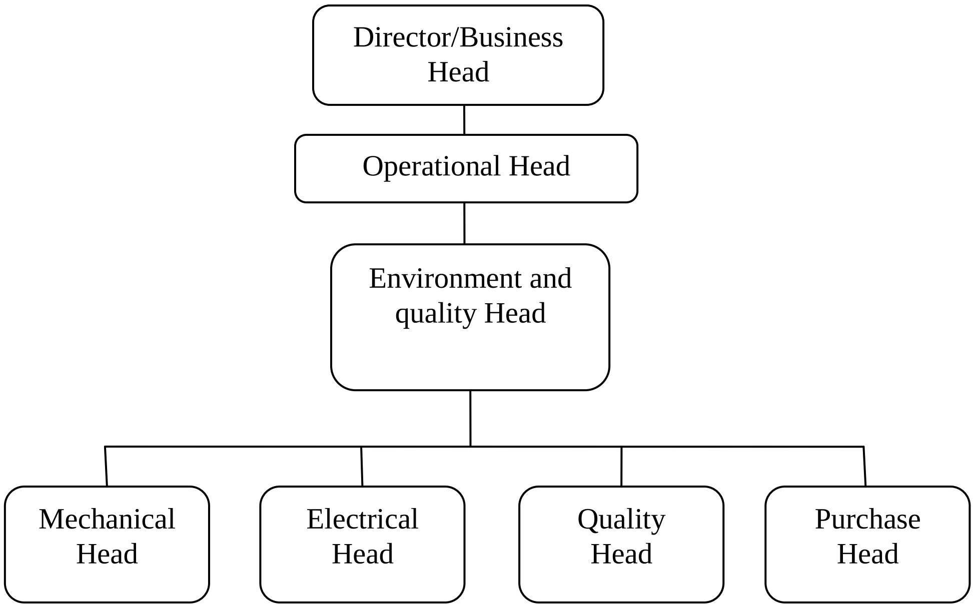

Figure 7 - Diagram of CDM structure

6. Roles and responsibilities

Table 1 - Roles and responsibilities

Designation	Responsibility
Director/Business Head	Overall responsibility of the CDM project.
Operational Head	Monitoring of various operations at the power plant. Taking readings of power generation.
Environment and quality Head	Responsible of CDM project. Co-ordination of CDM activities. Responsible to check the validity of calibrating certificates for laboratory, electrical and mechanical measure equipment.
Mechanical Head	Monitoring of various instruments used in mechanical measurements
Electrical Head	Monitoring of various instruments used in electrical measurements.
Quality Head	Responsible of the correct functioning of the power plant and correct measurements.
Purchase Head	Coordination of day to day CDM activities.

7. Emergency procedures

The plant maintains the data in both hard and soft copy formats.
The data is saved in a storage device found in the power meter. The system is online, for that reason, there is no way to lose measured data. The system is redundant, i.e., when a power meter fails, the other, which is in "standby", will come into operation immediately to avoid data loss.

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

The date of completion the application of the methodology to the project activity study is 21/11/2011.

The person/entity determining the baseline is as follows:
Econergy Brasil Ltda, São Paulo, Brazil
Telephone: +55 (11) 3555-5700
Contact people:
Mr. Gustavo Dorregaray Portilla
gustavo.dorregaray@econergy.com.br

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

23/04/2001

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

25y-0m. [10]

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

C.2.1. Renewable crediting period

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

23/04/2008

C.2.1.2. Length of the second crediting period:

7y-0m

[10] Specialists from the Brazilian National Agency of Electric Power (ANEEL - *Agência Nacional de Energia Elétrica*) suggested using 25 years of lifetime for steam turbines, combustion turbines, combined cycle turbines and nuclear power plants, according to Bosi, 2000, p. 29.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Left blank on purpose.

C.2.2.2. Length:

Left blank on purpose.

SECTION D. Environmental impacts

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

The activity of electricity generation in Brazil is open to private enterprises via authorization issues by the National Agency of Electric Power, (ANEEL), or via concession auctions sponsored by the agency, depending on the energy source and particular circumstances. In the case of construction and operation of stations for generation of energy from alternative sources (solar, wind power, biomass, etc), as well as of thermoelectric and small hydro power stations, ANEEL requires simple authorization. Jalles Machado has an ANEEL authorization for operating as "Independent Power Producer" (PIE – Produtor Independente de Energia Elétrica), which is "a firm or consortium of firms that may receive a concession or authorization to produce and retail all or part of the power, to its own account and at its own risk", as defined by the Federal Decree Nº 2003 of January 10, 1996. The PIE is subject to its own operating and commercial rules, provided that they comply with specifications prescribed in the prevailing law, concession contract or authorization act.

Award of authorization by ANEEL, however, does not substitute or otherwise alter the requirement for the company to fully comply with other relevant legislation, in particular environmental requirements. The possible environmental impacts of JMBCP project activity were analyzed by the State Secretary of Environment (SMA - Secretaria de Estado do Meio Ambiente, dos Recursos Hídricos e da Habitação) through a report called "Simplified Environmental Report" (RAS - Relatório Ambiental Simplificado) elaborated by the company and sent to the state environmental agency (Agência Goiana de Meio Ambiente - AGMA).

Regarding the out-of-boundary impacts, the JMBCP project activity does not affect the expansion of the national electricity grid supply due to its small size in power generation capacity. Since Jalles Machado has always cared also about other environmental issues, including preservation of local environment, in a constant improvement of preservation areas, adequate treatment of effluents and other residues, and is therefore in compliance with any applicable environmental regulation in Brazil, no other environmental impact assessment or documentation should be necessary for JMBCP project activity.

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:

According to Brazilian laws, the possible environmental impacts were analyzed by the State Secretary of Environment (SMA) through AGMA. Jalles Machado has applied for and been granted the installation license and the operation license for the project. However, Jalles Machado must comply with some demands from the environmental agency in order to proceed with the operation of the project, being significant for the project:

- Pollution control equipments must be maintained and operated accordingly to their specifications, so their efficiency is kept in order.
- Particulate emissions, noise and vibration levels must be kept within the parameters established by the Environmental Law.
- Noise and pollutant emissions readings must be sent to AGMA each semester, including pollutant dispersion assessment.
- The Local Environmental Agency must be contacted in case of Environmental accidents and incidents.
- The performance of the project activity shall not deteriorate the environment nor harm people outside the plant.
- Areas of Permanent Preservation must be kept preserved, and no soil waterproofing is allowed.
- The License renovation must be required at least 120 days before it expiration date.
- Adequate disposal of solid waste must be practiced.

SECTION E. Stakeholders' comments

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

Jalles Machado published in two newspapers the requirement of renewal of its Operating Licence: on September 12th, 2002 edition of the local one "Diário da Manhã" – from the state of Goiás – and on September 13th, 2002 edition of the D.O. / GO (state of Goiás official newspaper).

Also, as a requirement of the Brazilian Interministral Commission on Global Climate Change, the Brazilian DNA, Jalles Machado has invited several organizations and institutions to comment the CDM project being developed. Letters[11] were sent to the following recipients:

- Prefeitura do Município de Goianésia – GO / Municipal Administration of Goianésia – GO;
- Câmara dos Vereadores de Goianésia – GO / Municipal Legislation Chamber of Goianésia – GO;
- Fórum de Goianésia / Goianésia Fórum;
- Fórum Brasileiro de ONGs / Brazilian NGO Fórum;
- Agência Ambiental de Goiás / Environmental Agency of Goiás;
- Sindicato Rural de Goianésia / Rural Syndicate of Goianésia;
- CDEAL – Centro de Desenvolvimento de Empresários e Administradores Líderes /
- Businessmen and Leader Managers Development Center

E.2. Summary of the comments received:

Due to the invitations for comments sent by Jalles Machado, according to item G.1 above, as a request of the Brazilian DNA, 3 (three) comments were received out of the 7 (seven) invitations sent, as described below:

- Comment 1. Letter received from Prefeitura Municipal de Goianésia – GO / Municipal Administration of Goianésia – GO;
- Comment 2. Letter received from Sindicato Rural de Goianésia / Rural Syndicate of Goianésia;

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[11] The copies of these invitations, as well as the answers, are available in hold by Project participants.

- Comment 3. Letter received from Câmara dos Vereadores de Goianésia – GO / Municipal Legislation Chamber of Goianésia –GO.

No suggestion or questioning was made in those letters, however, the contribution with relevant economic, social and pioneering aspects of the project were commented and recognized by the institutions, as well as the importance of renewable energy generation and the benefits for the Brazilian industry that CERs commercialisation could bring.

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

For the comments received, the project participants understood that the consultation process could be closed without further considerations.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Direct tel:	+55 (11) 3555-5729
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Project Participant 2:

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Represented by:	
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Salutation:	
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Middle Name:	César
First Name:	Ivan
Department:	Administrative

Mobile:	
Direct FAX:	
Direct tel:	+55 (62) 3389 - 9075
Personal E-Mail:	

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State/Region:	Distrito Federal
Postfix/ZIP:	69011
Country:	Venezuela
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FAX:	58 212 2092406
E-Mail:	mtorres@caf.com
URL:	www.caf.com
Represented by:	
Title:	Head of the PLAC
Salutation:	Ms
Last Name:	Torres
Middle Name:	
First Name:	Mary
Department:	Environment Direction
Mobile:	
Direct FAX:	(571) 313 27 21/87
Direct tel:	(571) 313 23 11
Personal E-Mail:	mtorres@caf.com

Project Participant 4:

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State/Region:	
Postfix/ZIP:	2500 GX
Country:	The Netherlands
Telephone:	+ 31 70 3394693
FAX:	+ 31 70 3391306
E-Mail:	
URL:	www.minvrom.nl
Represented by:	
Title:	Head of Clean Development Mechanism Division
Salutation:	Mr
Last Name:	De Jonge
Middle Name:	
First Name:	Lex
Department:	Directorate General for Environmental Protection
Mobile:	

Direct FAX:	+ 31 70 3391306
Direct tel:	+ 31 70 3394693
Personal E-Mail:	Lex.dejonge@minvrom.nl

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no Annex I public funding involved in Jalles Machado Bagasse Cogeneration Project (JMBCP).

Annex 3

BASELINE INFORMATION

The Brazilian electricity system has been historically divided into two subsystems: the North-Northeast (N-NE) and the South-Southeast-Midwest (S-SE-CO). This is due mainly to the historical evolution of the physical system, which was naturally developed nearby the biggest consuming centers of the country.

The natural evolution of both systems continues to demonstrate that integration will happen in the future. In 1998, the Brazilian government announced the first leg of the interconnection line between S-SE-CO and N-NE. With investments of around US$700 million, the connection had the main purpose, in the government's view, at least, to help solve energy imbalances in the country: the S-SE-CO region could supply the N-NE in case it was necessary and vice-versa.

Nevertheless, even after the interconnection was established, technical papers divide the Brazilian system in three (Bosi, 2000)[12]:

"... where the Brazilian Electricity System is divided into three separate subsystems:

(i) The South/Southeast/Midwest Interconnected System;

(ii) The North/Northeast Interconnected System; and

(iii) The Isolated Systems (which represent 300 locations that are electrically isolated from the interconnected systems)"

Moreover, the ACM0002 suggests using the regional grid definition, in large countries with layered dispatch systems (e.g. state/provincial/regional/national), where DNA guidance is not available. A state/provincial grid definition may indeed in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity.

Finally, one has to take into account that even though the systems today are connected, the energy flow between N-NE and S-SE-CO is heavily limited by the transmission lines capacity. Therefore, only a fraction of the total energy generated in both subsystems is sent one way or another. It is natural that this fraction may change its direction and magnitude (up to the transmission line's capacity) depending on the hydrological patterns, climate and other uncontrolled factors. But it is not supposed to represent a significant amount of each subsystem's electricity demand.

The Brazilian electricity system nowadays comprises of around 108 GW of installed capacity, in a total of 1,645 electricity generation enterprises. From those, nearly 71.06% is hydropower plants, around 10.36% is gas-fired power plants, 4.02% is diesel and fuel oil plants, 3.62% is biomass sources (sugar cane bagasse, black liquor, wood, rice straw and biogas), 1.86% is nuclear plants, 1.31% is coal plants, 0.22% is wind farms. The other 8.17 GW of installed capacity (7.89%) corresponds to the imports of electricity from neighboring countries (Argentina, Uruguay, Venezuela and Paraguay), that may dispatch electricity to the Brazilian grid[13]. This capacity is in fact comprised by mainly 5.65 GW of the Paraguayan part of *Itaipu Bi-national*, a hydropower plant operated by both Brazil and Paraguay, but whose energy almost entirely is sent to the Brazilian grid.

The approved methodology ACM0002 asks project proponents to account for "all generating sources serving the system". In that way, project proponents in Brazil should search for, and research, all power plants serving the Brazilian system, excluding CDM projects.

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[12] Bosi, M. *An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study*. International Energy Agency. Paris, 2000.

[13] www.aneel.gov.br

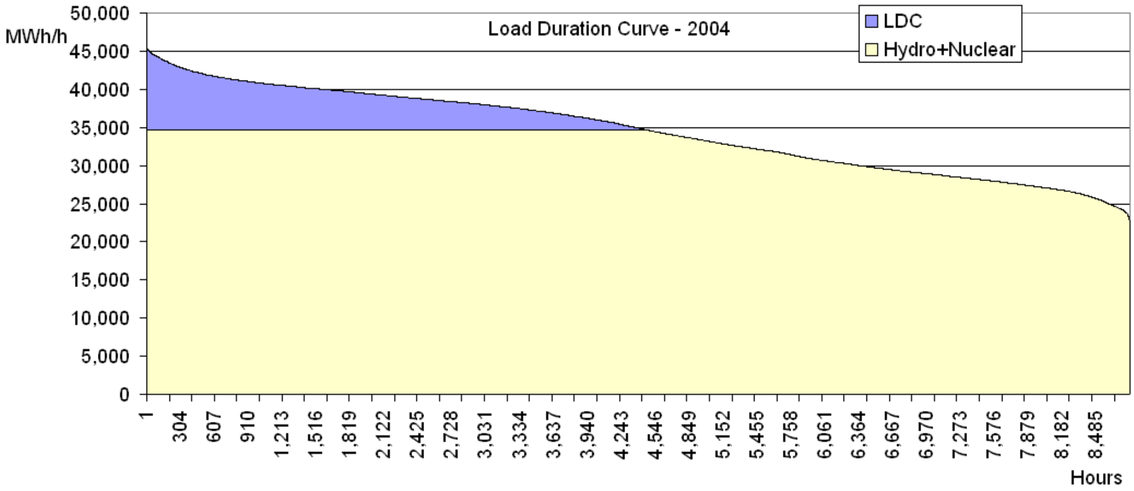
The fossil fueled plants efficiencies were taken according to Executive Board recommendation. "In absence of power plant specific fuel data, use the following values for fuel the efficiency level in Brazil, as a conservative proxy for plant efficiencies, to calculate the build margin emission factor for grid electricity:
Combined cycle gas turbine power plants – 50%;
Open cycle gas turbine power plants – 32%;
Sub-critical coal power plants – 33%;
Oil based power plant sub-critical oil boiler – 33%.

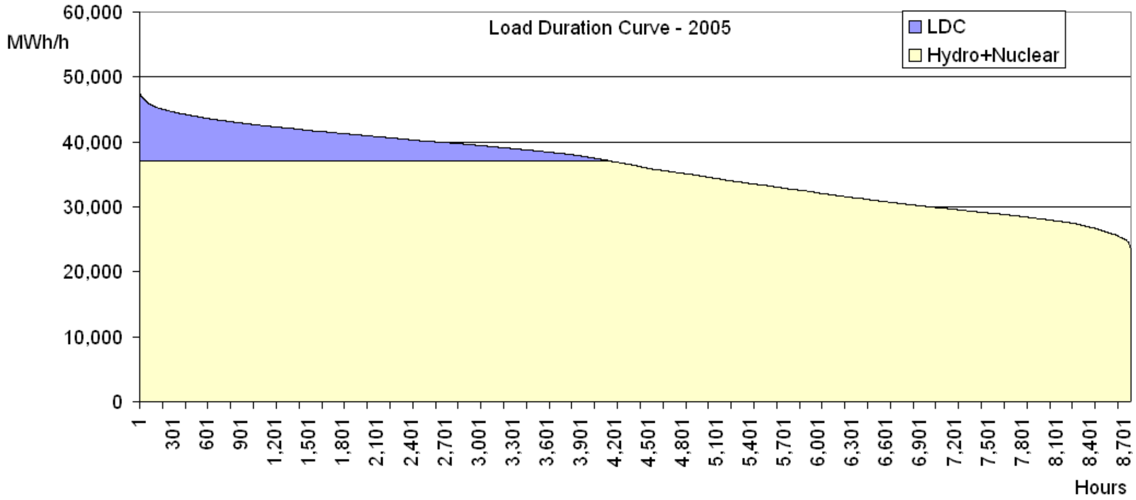
The aggregated hourly dispatch data received from ONS was used to determine the lambda factor for each of the years with available data (2004, 2005 and 2006). The Low-cost/Must-run generation was determined as the total generation minus the generation from fossil-fuelled thermal plants generation.

Below are displayed the summarized conclusions of the analysis of the emission factor calculation and load duration curves for the S-SE-CO subsystem.

Emission factors for the Brazilian South-Southeast-Midwest interconnected grid

Baseline	EF_{OM} [tCO_2/MWh]	λ_y	Generation [MWh]
2006	0.8071	0.4185	315,192,117
2005	0.9653	0.5275	315,511,628
2004	0.9886	0.4937	301,422,617
	$EF_{OM,simple\text{-}adjusted}$ 0.4749	$EF_{BM,2006}$ 0.0903	Default EF_y [tCO_2/MWh] 0.1864
	Alternative weights	Default weights	
	w_{OM} = 0.75	w_{OM} = 0.25	Alternative EF_y [tCO_2/MWh]
	w_{BM} = 0.25	w_{BM} = 0.75	0.3788


Load Duration Curve - 2004
LDC
Hydro+Nuclear
MWh/h
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1
304
607
910
1,213
1,516
1,819
2,122
2,425
2,728
3,031
3,334
3,637
3,940
4,243
4,546
4,849
5,152
5,455
5,758
6,061
6,364
6,667
6,970
7,273
7,576
7,879
8,182
8,485
Hours


Load Duration Curve - 2005
LDC
Hydro+Nuclear
MWh/h
60,000
50,000
40,000
30,000
20,000
10,000
0
1
301
601
901
1,201
1,501
1,801
2,101
2,401
2,701
3,001
3,301
3,601
3,901
4,201
4,501
4,801
5,101
5,401
5,701
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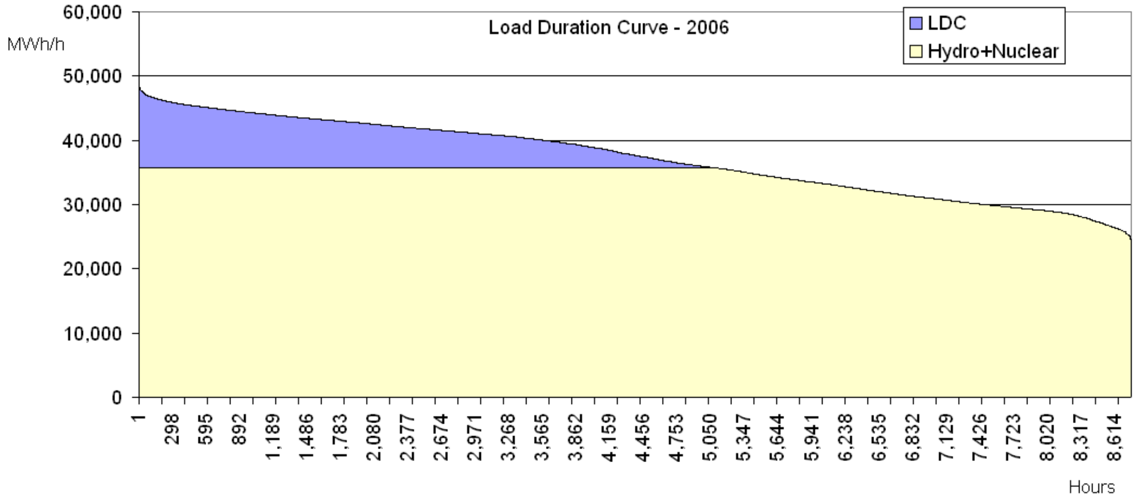
6,301
6,601
6,901
7,201
7,501
7,801
8,101
8,401
8,701
Hours


Load Duration Curve - 2006
LDC
Hydro+Nuclear
MWh/h
60,000
50,000
40,000
30,000
20,000
10,000
0
1
298
595
892
1,189
1,486
1,783
2,080
2,377
2,674
2,971
3,268
3,565
3,862
4,159
4,456
4,753
5,050
5,347
5,644
5,941
6,238
6,535
6,832
7,129
7,426
7,723
8,020
8,317
8,614
Hours

Annex 4

MONITORING INFORMATION

The net quantity of electricity generated in the project plant will be monitored through the energy meters installed at the generators and the software that controls the operation of the power plant. The metering equipment shall be periodically calibrated according to the manufacturer procedures.

The measurement of the electricity exported to the connected grid will made using one metering equipment to each turbo generator and one metering equipment connected to the transmission line, which indicates the total energy amount exported. In order to ensure data consistency, the readings of the calibrated meter equipment must be recorded in an electronic spreadsheet and the sales receipt must be archived for double checking the data.

The amount of sugar-cane crushed will be monitored by the LDP – daily productions register, a document requested by the Brazilian Agricultural Ministry. In addition, the quantity of bagasse combusted in the project plant during the years will be continuously monitored and an annual energy balance shall be prepared.

The Net Calorific Value – NCV of bagasse will be monitored at least every six months, taking at least three samples for each measurement.

The monitoring data will be registered in a spreadsheet, which shall be instrument for the further Verification. The archiving will occur up to two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later.

Environmental Impacts will be monitored by the reports requested by the time of the issuance of the Operational License, but concerning that the project must be in accordance with the current state environmental legislation.