PROJECT DESIGN DOCUMENT FORM FOR CDM PROJECT ACTIVITIES (F-CDM-PDD) Version 04.1

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Monte Rosa Bagasse Cogeneration Project (MRBCP)
Version number of the PDD	Version 4.1
Completion date of the PDD	10/07/2014
Project participant(s)	• Monte Rosa S.A.(Nicaraguan private entity); • Econergy Brasil Ltda. (Brazilian private entity).
Host Party(ies)	Nicaragua
Sectoral scope and selected methodology(ies)	• Sectorial Scope: 1-Energy industries (renewable -/non-renewable sources). • ACM0006 -“Consolidated methodology electricity generation from biomass residues”, version 09
Estimated amount of annual average GHG emission reductions	115,509 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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This Project Design Document is presented for the second crediting period of Project 0191: Monte Rosa Bagasse Cogeneration Project (MRBCP), which was registered on 22/06/06. The first crediting period comprised the period from 01/03/2002 to 28/02/2009 and the second crediting period comprises the period from 01/03/2009 to 29/02/2016.

The project involves the improvement of energy efficiency by retrofitting an existing biomass residue fired power plant by retrofit. The retrofit increases the power generation capacity at the sugar and ethanol production mill, Monte Rosa. In the absence of the project activity, the existing plant would also be retrofitted, but resulting in a lower efficiency of electricity generation than in the project case.

The existing power plant consisted of three turbo-generators (1.5 MW, 2.5 MW and 3 MW) and three boilers (13.78 bar each).

The MRBCP consisted of the installation and operation of two 62 bar boilers and one 16.5 MW, two 20 MW and two 4 MW turbo-generators. The existing 2.5 MW and 1.5 MW backpressure turbo-generators were disabled.

In the baseline scenario the sugar mill would use less efficient equipments to supply only internal consumption, defining a reference plant. A possible reference plant would consist of a 20 MW turbo-generator and 4 boilers of 13.78 bar each.

The bagasse generated during the crop season at the mill (from November to April/May) is continuously used by the project activity. Bagasse is considered a biomass residue of the sugarcane. Biomass residue is a by-product, residue or waste stream from agriculture, forestry and related industries.

Through the implementation of this project, Monte Rosa increases the amount of electricity generated and is able to sell electricity to the Nicaraguan grid, avoiding the dispatch 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.

The Monte Rosa is concerned that cogeneration using biomass residue is a sustainable source of energy that brings not only advantages for mitigating global warming, but also creates a sustainable competitive advantage for the agricultural production in the sugarcane industry in Nicaragua. Monte Rosa also believes that cogeneration using biomass residue is very important for the energy strategy of the country and is an alternative to postpone the installation and dispatch of thermal energy generation. The sale of the CER generated by the project will boost the attractiveness of bagasse cogeneration projects, helping to increase the production of this energy and to decrease dependency on fossil fuel.

In the beginning of its operation, Monte Rosa commercialized its surplus electricity in the spot market, known in Nicaragua as “mercado de ocasión”. In October 2006, Monte Rosa signed a PPA (Power Purchase Agreement) with the Electricity Distribution Companies, *Distribuidora de Electricidad del Sur* and *Distribuidora de Electricidad del Norte*, with a lower price than the market’s price. It was extended until May, 2011.

In 2005, the Nicaraguan National Assembly approved the Law 532, which fixed the maximum and minimum prices of the renewable electricity generation, between 55 and 65 USD/MWh. In 2008, the law was reformed and the limits changed to 75 and 85 USD/MWh.

Monte Rosa is owned by Pantaleón Group, an agro-industrial company dedicated to the processing of sugar cane for the production of sugar. Currently, Pantaleón is the largest sugar producer in the Central American region, and is positioned among the top sugar producing groups in Latin America

The Vision of the Pantaleón Group is to promote the development, to impel the progress and the improvement of the organization and his shareholders, clients, suppliers, collaborators and workers. The main aim is to convert or transform natural elements into products required by the clients, satisfying their needs under the concept of sustainable development.

Every since the acquisition by the Pantaleón Group, Monte Rosa has maintained a program of sustained increase of investments in different productive and social areas, with the primordial objective of improving its financial profitability, allowing the company to promote its own economic development and that of its environment. Monte Rosa works with IFC´s Environmental & Social Guidelines because Pantaleón is the recipient of an IFC (International Finance Corporation) loan.

Monte Rosa has achieved the following certifications: ISO 9001, HACCP and ISO 22000.

Besides reducing the GHG emissions by implementing its expansion projects, Monte Rosa has implemented, in August of 2004, an Environmental Management System (*Plan de Gestión Ambiental*). The system controls the environmental impacts of the plant: residual water; gas emissions; solid waste; noise; dust; air quality. Other advances in Monte Rosa's Environmental Administration Program are listed below:

Use of water reduction: reduction of the mill's residual water index from 1.72 m^3/ton of milled cane (2004-2005) to 1.38 m^3/ton of milled cane (2006-2007).
In the 2008/2009 crop season, a double table will be installed in order to clean the sugarcane, reducing the quantity of land on it, without using water. This will reduce 3,568 m^3 of water per day.

Solid waste handling: The project improves the structure and quantity of organic matter of the mill's agricultural floors. It is also important to mention that the separation of the "cachaza" means the reduction in 80% of the organic load that used to be spilled into the sedimentation lagoons of residual waters.
The Environmental Management Departament of Monte Rosa developed awareness programs of solid waste handling, environmental protection and optimization of the natural resources. In 2007-2008, Monte Rosa disposed 17,231 agrochemical packs to ANIFODA.

Emissions handling: A new 900 PSI and 300,000 pounds boiler has been installed. This boiler is equipped with a gas and ash washer in order to maintain an acceptable level of emissions.

Liquid residuals handling: Two Parshall grooves have been installed with the objective of measuring the amount of water that is discarted as residual water for its analysis and control. The grooves' measurements make it possible to use data modeling for future water reduction and clean production projects.

Reforestation: The objective is to reforest the mills surroundings and all those areas where the sugar cane cultivation is not possible.

Consciousness and support to the community: Monte Rosa assists 12 communities directly in topics of health, education, sports and cultural recreation. Since October 2002, Pantaleón Fundation has started its operation with the mission to support education, health and environmental projects to the Nicaraguan citizens and improve their life's quality and country's productivity. Some of them are: Mother Home,

"refugio Belén", intensive care La Mascota Hospital, "Arco Iris del Futuro" Children Development Center, improvement of the water quality at the Everth Mendoza community and others.

The annual GHG emission reductions are: **115,509 tCO_2/year**
The total GHG emission reductions are: **808,563 tCO_2/year**

A.2. Location of project activity
A.2.1. Host Party(ies)
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Nicaragua

A.2.2. Region/State/Province etc.
>>
Chinandega

A.2.3. City/Town/Community etc.
>>
El Viejo

A.2.4. Physical/Geographical location
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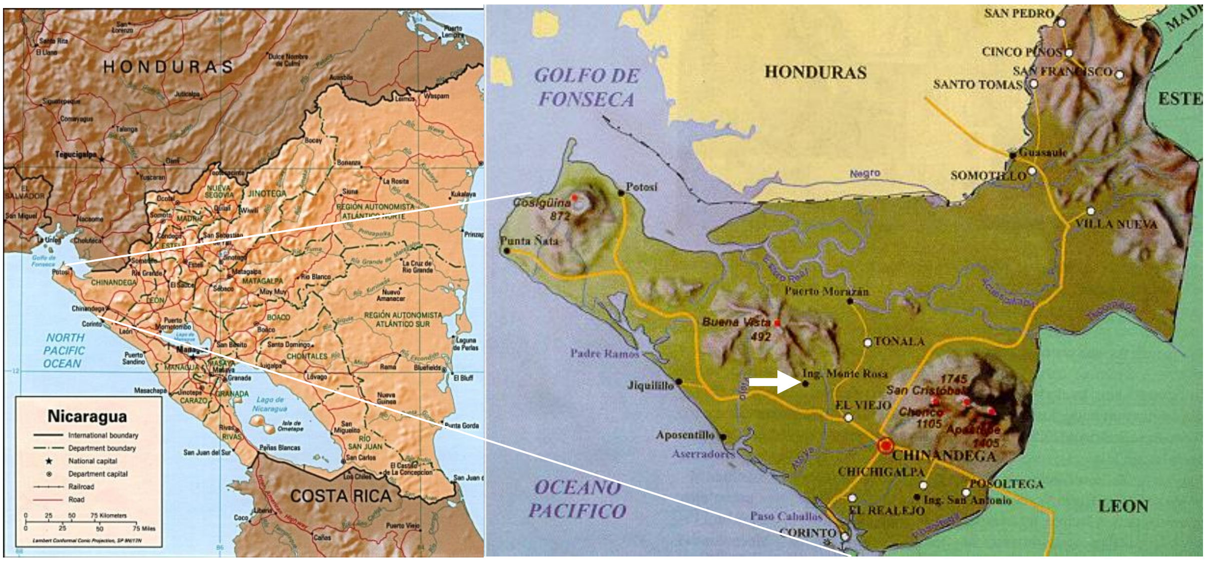
El Viejo City is located in the northwest of the country. The MRBCP is located in the site of the Monte Rosa Sugar mill, five km away from El Viejo City.

Geographical coordinates: (Latitude 12.7000, Longitude -87.2333).

Figure 1: Location map of MRBCP



A.3. Technologies and/or measures
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The project uses the steam-Rankine cycle, a world-wide spread technology for generating megawatt (MW) levels of electricity from biomass. 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

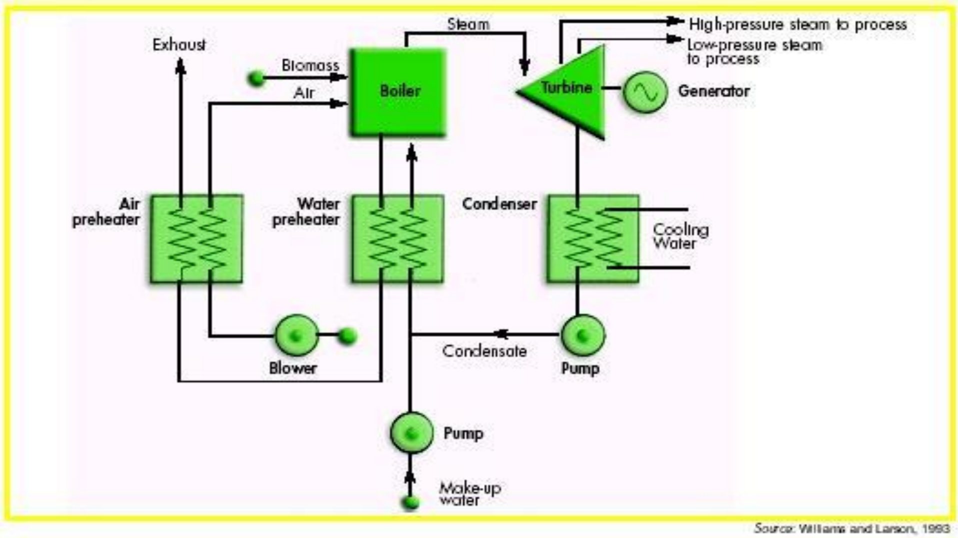
process heat needs. Such combined heat and power (CHP), or cogeneration systems provide greater levels of energy services per unit of biomass consumed than systems that generate electric power only.

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 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. 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



Cogeneration overview:

Before project activity (existing equipments):

Turbo-Generators

Capacity (MW)	Type	Date of Manufacturing	Manufacturer

1.5	Backpressure	1988	-
2.5	Backpressure	1988	-
3	Backpressure	1988	Westinghouse USA

Boilers

Operating Pressure (bar)	ton steam /h	ton steam/ton biomass residue	Date of Manufacturing
13.78	11.33	-	Before 1997
13.78	22.67	1.4	Before 1997
13.78	36	1.5	Before 1997

Project activity:

Phase I (2002):

The main investments were the installation of three turbo-generators, a high pressure boiler and a substation:

Turbo-Generators

Capacity (MW)	Type	Date of Manufacturing	Type
15	Backpressure	2001	TME 15000A
4	Backpressure	1982	VEB BB/GMB Germany
4	Backpressure	1982	VEB BB/GMB Germany

The 4 MW backpressure turbo-generators were installed as a backup for the 15 MW turbo-generator. The existing 2.5 MW and 1.5 MW backpressure turbo-generators were disabled.

Boiler

Operating Pressure (bar)	ºC	ton steam/h	ton steam/ton biomass residue	Date of Manufacturing	Manufacturer	Type
62	510	120	2.15	2000	Caldema (Brazil)	AZ 200

Phase II (2004-2005):

The main investments were the installation of three turbo-generators and a high pressure boiler:

Turbo-Generators

Capacity (MW)	Type	Date of Manufacturing	Manufacturer	Type
16.5	Condensing	2004	WEG / TGM (Brazil)	TMC 25000
20	Backpressure	2004	WEG / TGM (Brazil)	TME 25000A
20	Backpressure	2005	Gevisa / TGM (Brazil)	TME 25000A

The 15 MW backpressure turbo-generator was disabled.
The existing 3 MW backpressure turbo-generator can continue to operate.

Boiler

Operating Pressure (bar)	ºC	ton steam/h	Made in	Manufacturer	Type
62	510	150	2003	Sermatec (Brazil)	HPB AZ 200

The three existing 13.78 bar boilers can continue to operate.

The lifetime of the equipments, 20-25 years, may vary depending on the operating and maintenance conditions.

These project´s equipments will supply energy for internal consumption and for export.

Baseline scenario (possible reference plant):

In the baseline scenario other equipments would be installed in order to supply energy for internal consumption only, defining a reference plant.

It is expected that Monte Rosa mill will require for the 2014 crop season 16 MW for internal consumption and 230 ton steam/h and will consume 622,773 ton biomass residue in moist mass during 174 days.

Then, a possible reference plant would consist of the operation of the following equipments:

Turbo-Generator

Capacity (MW)	Type
20	Backpressure

The 2.5 MW and 1.5 MW backpressure turbo-generators (existing equipments) would be disabled.

Boilers

Operating Pressure (bar)	ton steam/h	ton steam/ ton biomass residue
13.78	55	1.5
13.78	55	1.5
13.78	55	1.5
13.78	55	1.5

The three existing 13.78 bar boilers can continue to operate.

The 4 boilers of 13.78 bar, 1.5 ton steam/ton biomass residue and 55 ton steam/h would be able to operate in the 2014 crop season during 174 days and consume 622,773 ton biomass residue in moist mass: (1.5 ton steam/ton biomass residue * 622,773 ton biomass residue) / (174 days * 24 h * 55 ton steam/h) = 4 boilers.

So, the total capacity of the reference plant to combust 622,773 ton biomass residue in moist mass/y and to consume 20 MW complies with the required by the mill.

The average net energy efficiency of electricity generation in the reference plant ($\varepsilon_{el,reference\ plant}$) was estimated using the formula below. For the reference plant it was considered the average of net electric generation only for internal consumption from 2010 to 2015.

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

Where:

$\varepsilon_{el,referenceplant,y}$ = Average net energy efficiency of electricity generation in the reference plant;
$EG_{reference\ plant,y}$ = Net quantity of electricity generated in the reference plant during the year *y* (MWh);
$BF_{k,y}$ = Quantity of biomass residue combusted in the reference plant during the year *y* (tons of dry matter);
NCV_k = Net calorific value of the biomass residue (MWh/ton of dry matter).

Table 1: Calculation of the $\varepsilon_{el,referenceplant,y}$

Year	$BF_{bagasse,y}$	$BF_{straw,y}$	$EG_{reference\ plant,y}$	$\varepsilon_{el,referenceplant,y}$
2010	236,568	5,488	51,701	4.3%
2011	248,404	5,763	55,518	4.4%
2012	269,340	6,051	58,720	4.3%
2013	310,227	6,531	61,923	3.9%
2014	336,952	7,093	67,258	3.9%
2015	326,301	6,869	65,132	3.9%
Average				4.1%

$NCV_{bagasse}$	4.96
NCV_{straw}	4.83

Changes in the registered CDM project activity

The baling system was implemented on December 10th, 2010, mainly due to the fact that there is not enough free space in the courtyard to store the produced bagasse that has been growing yearly as Monte Rosa mill is increasing the sugar cane processing and baling is the cheaper process to fix this without causing any change in the bagasse quality. This fact is described in the technical literature. One paragraph from a well reputed publication is presented in the text below:

"Because loose bagasse has such a low bulk density, numerous investigations have been made into baling bagasse to reduce the volume of stored bagasse. Baling has generally been proven to be better than pelletizing, which requires costly equipment that is expensive to maintain"[1]

The baling process embraces two sub-processes. The first of them is the own baling process and the second one is the shredding of bagasse bales before its combustion. Both systems require electricity consumption. This electricity consumption has been discounted from the energy generation, because PP includes it inside the auxiliary consumption as conservative approach. The baling machine and fraying machine are included in Boiler 3 and Boiler 4 electrical circuits as was presented to DOE during the onsite visit through single line planes. The bagasse that is converted into bales must be 100% weighted through the scale#4.

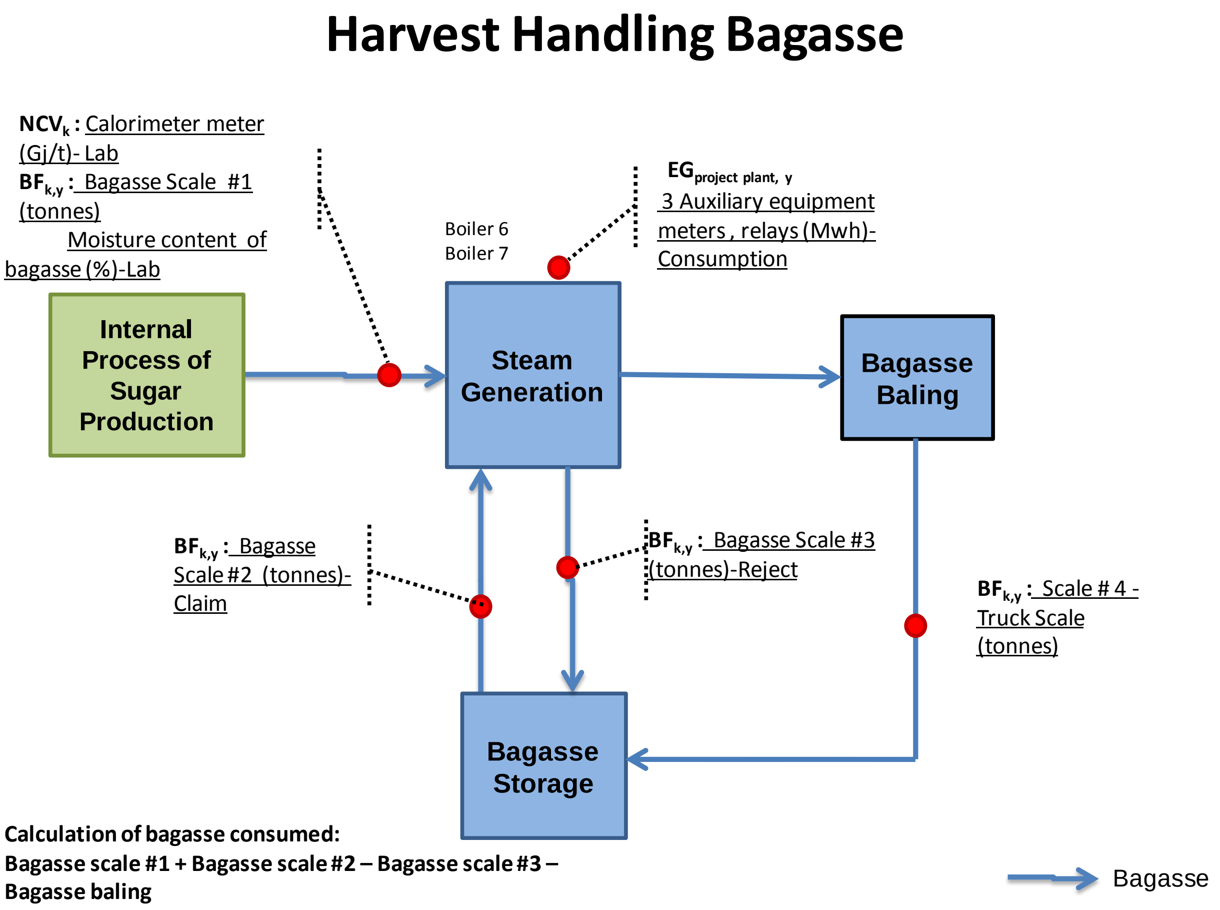
This baling process does not affect the CDM project or the CERs calculation, because the

[1] Rein Peter, Cane Sugar Engineering. Berlin, Verlag Dr. Albert Bartens KG, 2007, page 606.

implementation is part of the reference plant as it would took place only for improving space management independently of the implementation or not of CDM project.

See a process diagram below, showing the baling system included in the weighting process of the bagasse during harvest seasons and between harvest seasons:

Figure 3: Schematic diagram of the biomass weighting process during harvest season

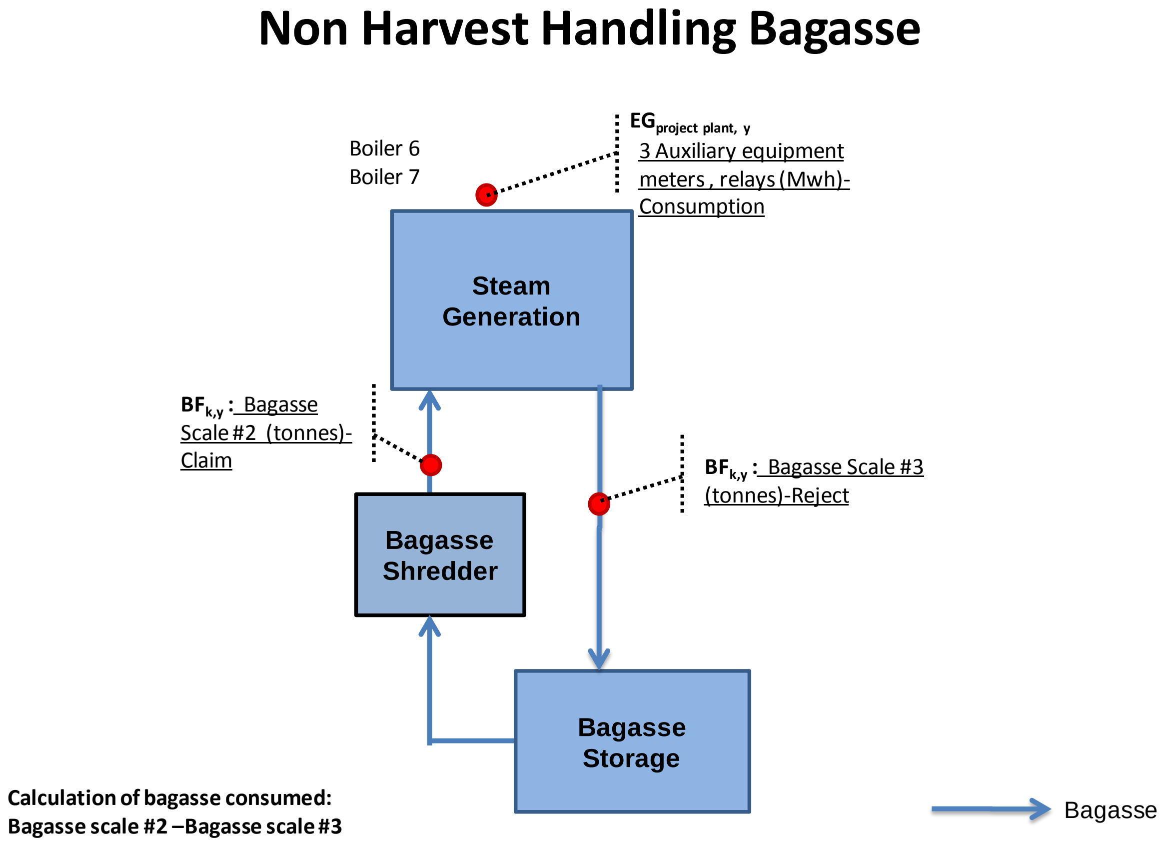


The weight balance for $BF_{k,y}$ during crop seasons is:

$$BF_{k,y} = Scale\#1 + Scale\#2 – Scale\#3 – Scale\#4.$$

Where:
Scale#1 = Total weight of bagasse produced by sugar mill;
Scale#2 = Weight of the bagasse that returns to the courtyard (claim bagasse);
Scale#3 = Weight of the bagasse that is rejected and not burned in the boilers (Rejected bagasse);
Scale#4 = Weight of bagasse that is storage as bales.

Figure 4: Schematic diagram of the biomass weighting process between harvest seasons



The weight balance for $BF_{k,y}$ between crop seasons is:

$$BF_{k,y} = Scale\#2 - Scale\#3.$$

Where:
Scale#2 = Weight of the bagasse that returns to the courtyard (claim bagasse);
Scale#3 = Weight of the bagasse that is rejected and not burned in the boilers (Rejected bagasse).

Referring to Project Standard Versio 4.0 paragrah 225, with the changes in the registered CDM project activity, project participants are requested to report in the revised PDD the impacts of the actual changes to the registered CDM project activity, as following::

Condition	Do the changes have any impact in the registered CDM project activity?
a) The applicability and application of the applied methodology under which the project activity has been registered;	NO. The change detailed above refers to the modernization of bagasse storage system (baling system) which was stored in outdoor piles in the time of the register of the PDD and now it is stored in bales. This change does not affect the bagasse volume, storage time of bagasse or any other parameter or applicability condition regarding to the methodology used in the registered CDM project activity because the change only optimizes the bagasse storage system.

(b) Compliance of the monitoring plan with the applied methodology;	NO. The change detailed above does not affect the compliance of the monitoring plan with the applied methodology, because the monitoring plan in the registered CDM project activity is the same that the monitoring plan in the revised PDD.
(c) The level of accuracy and completeness in the monitoring of the project activity;	NO. The change detailed above does not affect the level of accuracy and completeness in the monitoring of the project activity, because the monitoring plan in the registered CDM project activity is the same that the monitoring plan in the revised PDD.
(d) The additionality of the project activity;	NO. The change detailed above refers to the modernization of bagasse storage system (baling system) which was stored in outdoor piles in the time of the register of the PDD and now it is stored in bales. This change does not affect the bagasse volume, storage time of bagasse or any other parameter or applicability condition that may affect the additionality of the project activity because the change only optimizes the bagasse storage system.
(e) The scale of the project activity.	NO. The change detailed above does not affect the bagasse volume, storage time of bagasse or any other parameter or applicability condition that may affect the emission reductions (scale of the project activity) because the change only optimizes the bagasse storage system.

Conclusion: The changes do not have any impact in the registered CDM project activity.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Nicaragua (host)	Monte Rosa S.A. (Nicaraguan private entity)	No
Brazil	Econergy Brasil Ltda. (Brazilian private entity)	No

A.5. Public funding of project activity

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SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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- ACM0006 (“Consolidated methodology electricity generation from biomass residues”) version 09;
    - ACM0002 (“Consolidated baseline methodology for grid-connected electricity generation from renewable sources”) version 10;

- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" version 04;
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" version 02;
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" version 01;
- "Combined tool to identify the baseline scenario and demonstrate additionality" version 02.2;
- "Tool for the demonstration and assessment of additionality" version 05.2;

"Tool to calculate the emission factor for an electricity system" version 02.

B.2. Applicability of methodology

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The "AM0015 - Bagasse-based cogeneration connected to an electricity grid (Version 01)" was the approved methodology used for the 1st Crediting period of the project activity. However, for this second crediting period the approved consolidated methodology "ACM0006 - Consolidated methodology for electricity generation from biomass residues (Version 09)" was used in order to meet the requirements of the Annex 43 of the EB 36 Report, "Procedures for renewal of a crediting period of a registered CDM project activity (Version 05)", 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 MRBCP, 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.

The project activity is based on the operation of a grid-connected and biomass residue fired electricity cogeneration power plant located in an agro-industrial plant generating the biomass residues.

The methodology is applicable under the following conditions:

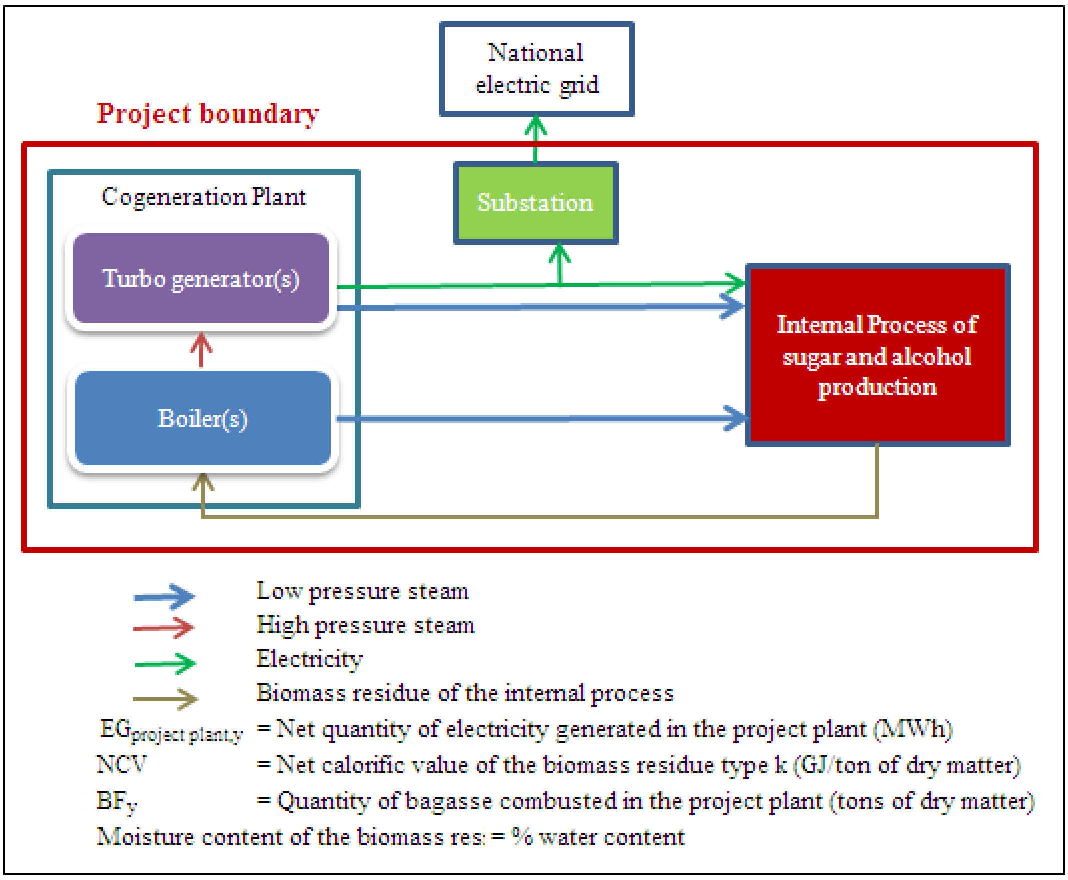
- No other biomass types than biomass residues are used in the project plant and these biomass residues are the only fuel used in the project plant. The biomass residues come from a production process (production of sugar) and the implementation of the project does not result in an increase of the processing capacity of raw input (sugar) etc.) or in other substantial changes in this process. Monte Rosa is expanding the sugar production, the core business of the company, because of the increase of demand of sugar in the Nicaraguan market in the last years;
- The biomass residues used by the project facility are not stored for more than one year;
- No significant energy quantities are required to prepare the biomass residues for fuel combustion. All the biomass residue utilized by Monte Rosa 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. Project boundary

	Source	GHGs	Included?	Justification/Explanation
Baseline scenario	Electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Heat generation	CO_2	No	The thermal efficiency of the project plant is larger or similar compared with the thermal efficiency of the reference plant considered in baseline scenario.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	No	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	No	The applicable scenario for this project activity is B4.
		N_2O	No	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 scenario	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO_2	No	There is no on-site fossil fuel and electricity consumption
		CH_4	No	There is no on-site fossil fuel and electricity consumption
		N_2O	No	There is no on-site fossil fuel and electricity consumption
	Off-site transportation of biomass residues	CO_2	No	There is no off-site transportation of biomass residues
		CH_4	No	There is no off-site transportation of biomass residues
		N_2O	No	There is no off-site transportation of biomass residues
	Combustion of biomass residues for electricity and / or heat generation	CO_2	No	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	The CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario are not included.
		N_2O	No	Excluded for simplification. This emission source is assumed to be small.
	Storage of biomass residues	CO_2	No	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	No	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.
		N_2O	No	Excluded for simplification. This emissions source is assumed to be very small.
	Waste water	CO_2	No	There is no waste water from the treatment of

	from the treatment of biomass residues			biomass residue.
		CH_4	No	There is no waste water from the treatment of biomass residue.
		N_2O	No	There is no waste water from the treatment of biomass residue.

Figure 5: Project boundary diagram



The project cogeneration plant indicated in the flow diagram consists of the following equipments:

- 16.5 MW condensing-extracting turbo-generator;
- 3 MW backpressure turbo-generator;
- Two 20 MW backpressure turbo-generators;
- Two 4 MW backpressure turbo-generators;
- 13.78 bar boiler (22.67 ton steam/h);
- 13.78 bar boiler (36 ton steam/h);
-
- 62 bar boiler (120 ton steam/h);
- 62 bar boiler (150 ton steam/h).

B.4. Establishment and description of baseline scenario

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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.

Table 2: Power generation alternatives

P1	The proposed project activity not undertaken as a CDM project activity.	P1 is not a credible baseline scenario. Without the registration of the project as a CDM project, it would not occur, as demonstrated in section B.5.
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.	P2 is not a credible baseline scenario. The configuration of power plant in the baseline scenario (reference plant) would be different from the existing power plant at the project site.
P3	The generation of power in an existing captive power plant, using only fossil fuels.	P3 is not a credible baseline scenario. In the power plant only biomass residues are fired.
P4	The generation of power in the grid.	P4 is a plausible scenario.
P5	The installation of a new biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.	P5 is not applicable. The baseline plant does not involve the installation of a new biomass residue fired power plant, but is rather the retrofit of the existing biomass residue fired power plant.
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.	P6 is not applicable. The baseline plant does not involve the installation of a new biomass residue fired power plant, but is rather the retrofit of the existing biomass residue fired power plant.
P7	The retrofitting of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.	P7 is a plausible scenario.

P8	The retrofitting of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.	P8 is not a credible scenario since the amount of biomass residues fired will be the same as in the project activity. The applicable baseline scenario would be the retrofitting of an existing biomass residue fired power that is fired with the same type and same 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.	P9 is not a credible baseline scenario. In the power plant only biomass residues are fired.
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.	P10 is not a credible baseline scenario. The annual amount and type of biomass residue used in the baseline scenario is the same as that used in the project activity.
P11	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	P11 is not a credible baseline scenario. The existing cogeneration plant consumes only biomass residues.

Table 3: Heat generation alternatives

H1	The proposed project activity not undertaken as a CDM project activity.	H1 is not a credible baseline scenario. Without the registration of the project as a CDM project, it would not occur, as demonstrated in section B.5.
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)	H2 is a plausible scenario.
H3	The generation of heat in an existing captive cogeneration plant, using only fossil fuels	H3 is not applicable. In the power plant only biomass residues are fired.

H4	The generation of heat in boilers using the same type of biomass residues	H4 is a plausible scenario.
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	H5 is not applicable. The baseline plant involves the retrofit of the existing biomass residue fired power plant.
H6	The generation of heat in boilers using fossil fuels	H6 is not applicable. In the power plant only biomass residues are fired.
H7	The use of heat from external sources, such as district heat	H7 is not applicable. There is no use of heat from external sources and no district heat available.
H8	Other heat generation technologies (e.g. heat pumps or solar energy)	H8 is not applicable. There are no other heat generation technologies currently adopted by the sugar/ethanol sector in Nicaragua.
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.	H9 is not a credible baseline scenario. The annual amount and type of biomass residue used in the baseline scenario is the same as that used in the project activity.
H10	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	H10 is not a credible baseline scenario. The existing cogeneration plant consumes only biomass residues.

Table 4: Biomass generation alternatives

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.	B1 is not applicable. In the absence of the project activity, the biomass residues would not be dumped or left to decay but used for energy purposes.
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields.	B2 is not applicable. In the absence of the project activity, the biomass residues would not be dumped or left to decay but used for energy purposes.

B3	The biomass residues are burnt in an uncontrolled manner without utilizing them for energy purposes.	B3 is not applicable. In the absence of project activity, the biomass residues would be used for energy purposes.
B4	The biomass residues are used for heat and/or electricity generation at the project site.	B4 is a plausible scenario.
B5	The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants.	B5 is not applicable. In the absence of the project activity the biomass residues would not be used in power plants at other sites but fully utilised to generate power on site.
B6	The biomass residues are used for heat generation in other existing or new boilers at other sites.	B6 is not applicable. In the absence of the project activity the biomass residues would not be used in boilers at other sites but fully utilised to generate heat on site.
B7	The biomass residues are used for other energy purposes, such as the generation of biofuels.	B7 is not applicable. The biomass residues are not used for other energy purposes, such as the generation of biofuels.
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).	B8 is not applicable. The biomass residues are not used for non-energy purposes, such as fertilizer or as feedstock in processes.

The combination of the above alternatives (P4, P7, B4 and H2) defines scenario 19 of ACM0006 version 09, which is considered the only baseline scenario applicable for MRBCP, which states:

"The project activity involves the improvement of energy efficiency by retrofitting an existing biomass residue fired power plant by retrofit. The retrofit increases the power generation capacity. In the absence of the project activity, the existing plant would also be retrofitted, but resulting in a lower efficiency of electricity generation than in the project case (e.g. by using a low-pressure boiler instead of a high-pressure boiler). The retrofitted plant in the baseline is referred to as "reference plant". In the reference plant, the same type and quantity of biomass residues would be used as in the project plant. Consequently, the power generated by the project plant would in the absence of the project activity be generated (a) in the retrofitted baseline plant and – since power generation is larger in the project plant than in the baseline plant – (b) partly in power plants in the grid. The remaining technical lifetime of the project plant and the baseline plant is the same, i.e. the retrofit in the project case and in the baseline case do not affect the remaining lifetime of the plant or affect it similarly. 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."

B.5. Demonstration of additionality
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According to the 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". However, as described in the same tool, in cases where one or more alternatives are not available options to 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 calculation). The Meth Panel is considering whether expanding this tool to cover all cases would be appropriate. In the meantime, methodologies that typically involve alternatives are 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.

So the additionality was 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 alternative scenarios available to the project participants and that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity are:

a) The proposed project activity undertaken without being registered as a CDM project activity;
b) Continuation, of the current situation (no project activity or other alternatives undertaken).

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

The alternative scenarios are in compliance with all mandatory applicable legal and regulatory requirements of Nicaragua.

As stated before, more than 70% of electricity generation in the country comes from fuel oil generation, which means the country has supportive legislation towards this source of energy. On the other hand, bagasse cogeneration has been practiced without legal hurdles, meaning year-round generation would face no legislative problems as well. Purchase of electricity is a normal procedure in industrial facilities and no legal barriers would be imposed under this scenario. Finally, the continuation of the situation without the project would also be in compliance with the Nicaraguan law.

STEP 3. Barrier analysis

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

Technological Barriers:

Technological barriers represent a very important issue for increasing bagasse cogeneration in Nicaragua and Central America, for despite of the fact that Rankine-cycle is a well known technology, the cogeneration units still operate in a low-efficient manner and are not competitive comparing to other generation options. In this way there is a tricky issue about technology and economic value for such technology.

The great majority of the sugar mills in Central America still rely on inefficient technology, such as on 22 bar pressure boilers. Moreover, when there is a necessity to change equipments, it is usual to not consider purchasing high-efficiency boilers due to conservativeness, lack of knowledge or even lack of interest to generate surplus steam for electricity sales purposes. Furthermore, the fact that there are only four sugar mills in Nicaragua does not create a very competitive environment, which reduces even more the incentives to invest in more efficient technology.

Another common barrier, which is discussed by the Nicaraguan National Energy Commission - CNE (2003)[2], relates to the long time period it takes to develop a cogeneration plant compared to the time period required to develop a thermal plant.

Institutional and Political Barriers:

From the electric sector point of view, acquiring seasonal electricity – which is the case of MRBCP because it only uses bagasse as fuel and therefore generates electricity only during the harvest season – would not be a priority because the electricity is generated only during the harvest season and therefore no firm energy can be offered. That creates a barrier for projects like MRBCP to sign long-term contracts (PPAs) with local electricity distributors, which leaves those projects with no option but to sell their surplus electricity in the spot market; increasing considerably the risk associated with project activity and therefore reducing the motivation to develop this type of project activity. RODRIGUEZ (2004)[3] mentions the limited availability of commercial energy contracts as a relevant barrier to entry for projects like MRBCP. According to Quiroz & Asociados (2004)[4], the lack of interest from Nicaraguan utilities to sign new energy contracts with energy generators makes even more difficult for developers of renewable energy projects to finance their projects.

From the Nicaraguan and Central American sugar mill point of view, save rare exceptions, the great majority of sugar mills do not consider investments in cogeneration (for electricity sale) as a priority. The sector does not seem to have motivation to invest in a process that it sees, especially because of the political and regulatory uncertainty (another barrier mentioned by RODRIGUEZ 2004), with mistrust and no guarantees that the product will have a safe market in the future. According to Quiroz & Asociados (2004), the risk-return relationship of a renewable energy project is probably the biggest obstacle to more investments in that type of projects. From MRBCP point of view, especially, the fact that there was no benchmark available at the time of the development phase of the expansion project in that MRBCP would be first sugar mill in Nicaragua to sell electricity in the spot market, created another uncertainty and consequently barrier to the implementation of the project activity. In addition, the sugar mill sector overall has not developed yet the capabilities required to manage the risks associated with a cogeneration project focused on electricity sales, which definitely creates a barrier to the development of cogeneration projects with that focus.

Although the government, through the Designated National Authority (Oficina Nacional de Desarrollo Limpio y Cambio Climatico), provides institutional support to the development of renewable energy projects, this support is still not considered reliable by executives of the private sector to support cogeneration expansion in the sugar mills. CNE (2003) contends that Nicaragua, in order to incentive the development of renewable energy projects, needs a law that promotes renewable energy generation in the country; Quiroz & Asociados (2004) consider the lack of such law as a barrier to the development of projects like MRBCP in Nicaragua. The Law discussed in the CNE (2003) document (reference number 4 of this PDD) has not entered into force yet. According to Quiroz & Asociados (2004), the Nicaraguan Legislation only provides specific fiscal incentives to thermal, hydroelectric and geothermal generators. It does not provide any specific fiscal incentive to wind and biomass generators, which is considered a barrier to the development of wind and biomass projects in Nicaragua. Quiroz & Asociados (2004) mention that Renewable Energy projects in Nicaragua, except for geothermal and hydroelectric projects, are not eligible to any tax benefit that could attract investments to this segment.

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[2] Comision Nacional de Energia – Direccion de Politicas Energetica ‘’Anteproyecto - Ley Para La Promocion de Generacion Electrica con Fuentes Renovables‘’. Septiembre, 2003.
[3] Rodriguez, P.‘’Matriz de Barreras Identificadas dentro de un Marco Legal Vigente‘’. 2004
[4] Quiroz & Asociados, R.V. ‘’Análisis de las Barreras Fiscales Y Tributarias para el Desarrollo de Proyectos de Energia Renovable‘’. November, 2004

Another barrier to the development of bagasse cogeneration projects in Nicaragua is related to the fact that there are only four sugar mills in Nicaragua, which creates a hurdle to the fully utilization of the biomass potential of the country, and consequently of the emission reductions potential associated with that, if the owners of the four sugar mills do not take the initiative to develop bagasse cogeneration projects. Because of the high investments (also mentioned by RODRIGUEZ 2004) required to develop a project like MRBCP and the uncertainties this type of project faces (already mentioned above), the owners of the four sugar mills in Nicaragua have no natural incentives to develop this type of project activity. Under the current regulatory and fiscal framework, only the potential revenues associated with the CERs sales could work as an incentive for the sugar mill owners to develop this type of project activity; which in turn could allow Nicaragua, as a country, to be as efficient as it could be, in terms of reducing its anthropogenic emissions of GHG.

From the point of view of the economic agents, the excessive level of guarantees required to financing this type of projects, especially because of all uncertainties and risks associated with them (also mentioned by RODRIGUEZ 2004), is commonly a barrier to achieve a financial feasibility stage. Another relevant barrier has to do with the fact that not having a PPA with a local distributor makes more difficult to obtain a long-term financing from any bank.

Some other financing barriers occur simply due to prohibitively high transaction costs, which include the bureaucracy to secure the environmental license.

From the point of view of the public sector, because the annual average growth rate in electricity demand is expected to be 6% per year for the next 10 years, Nicaragua's public sector energy investments are not focusing on renewable energy but on ready to use technology. Moreover, the Nicaraguan government is not owner of sugar mills and therefore any project like MRBCP could only be privately initiated.

Economic and Investment Barriers:

CNE (2003) contends that Renewable Energy projects (like the MRBCP) require fiscal and economic incentives, especially in the first years of operation, to overcome some of the barriers to the development of this type of projects. CNE (2003) mentions that the higher investments required by Renewable Energy projects (compared to conventional energy projects) lead to longer debt financing periods which in turn makes more difficult to obtain financing from any bank. CNE (2003) also mentions that the economic value paid to the renewable energy generators should be enhanced by fiscal and economic incentives.

Therefore, one of the major problems of selling surplus energy in the spot market is the economic value paid to the generators which is not enough to remunerate the capital invested in the expansion of a sugar mill cogeneration project. It simply does not make a bagasse cogeneration project feasible. Furthermore, the fee for accessing the grid does not contribute for making feasible the sale of the surplus energy in the spot market.

Quiroz & Asociados (2004) consider, as another barrier to the development of this type of project activity, the high costs associated with the studies required to define the viability of a renewable energy project. Quiroz & Asociados (2004) also state that the priority for the renewable energy industry is to become a competitive source of energy but that will be a very hard task in the short-term. The reason, according to Quiroz & Asociados (2004), is that the only two comparison factors between conventional energy projects and renewable energy projects are the investment cost and operational costs of those types of projects.

Moreover, the recently published energy stability and emergency law – *Ley de Emergencia y Estabilidad Energética* – from the 20th of July 2005, added additional barriers to projects like MRBCP, and can

therefore consolidate the view that the uncertainty of the regulatory scheme in Nicaragua are a major barrier to projects like MRBCP. The law capped the price of the electricity to paid by the two distributors to no more than 10% of the generators variable costs, plus transportation fees. This is no doubt a considerable barrier to MRBCP.

Cultural Barrier:

The sponsors' culture in the sugar industry is very much influenced by the commodity – sugar – market. Therefore, they need an extra incentive to invest in electricity production due to the fact that it is a product that can never be stored in order to speculate in price.

Another cultural barrier to the development of cogeneration plants has to do with the fact that the Nicaraguan approach to develop power plants is narrowed focused on thermal plants using fossil fuels, as showed in the graphic below. Therefore, a cogeneration project like MRBCP would only be undertaken by the private sector if it represented an attractive investment opportunity from the economic perspective, which is not the case with this type of project activity in Nicaragua.

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The alternative of generating electricity with fossil fuel, for instance, would not be prevented by the barriers considered. It would be able to generate year-round, therefore capable to establish a PPA with the local distributors; it would face no scale effect problems; it would not be susceptible to regulatory effects in the spot market regulation; and even the cultural effect would be surpassed, as the approach in Nicaragua to energy generation is through fossil-fuelled thermal power plants.

STEP 4. Common practice analysis

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

The sugar sector in Nicaragua and Central America, historically, exploited the biomass residue in an inefficient manner by making use of low-pressure boilers.

Only two biomass power plants were implemented by other sugar mills in Nicaragua: San Antonio sugar mill and Victoria de Julio sugar mill. The last one went bankruptcy in 2000. Therefore, currently, there is only one similar project activity under operation, Santo Antonio.

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

Due to the fact that currently there are only four sugar mills in Nicaragua and that two have operated similar project activities, one may argue that the project activity in question is a widely spread activity in Nicaragua. But there are three major distinctions between MRBCP and the other similar activity, San Antonio sugar mill, developed by Nicaragua Sugar State, an international public company:

1. Santo Antonio sugar mill cogeneration project uses eucalyptus as fuel to generate electricity during the off-season. MRBCP uses only bagasse as fuel and does not generate electricity during the off-season.
2. The use of eucalyptus, as fuel during the off-season by Santo Antonio mill, enables it to generate electricity year-round.
3. Being able to generate electricity year-round allowed Santo Antonio cogeneration project to sign a PPA with a local electricity distributor. At the time of decision to start MRBCP, Monte Rosa was not able to sign a PPA.

The three distinctions above creates a fundamental change between the two projects in that one has not faced what should probably be considered the major barrier faced by the other, which was the unavailability of a long-term contract (PPA) to sell the electricity produced by MRBCP.

Finally, MRBCP is not considered as a widely spread activity in Nicaragua, then the proposed project activity is additional.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
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Emission reductions

The project activity mainly reduces CO_2 emissions through substitution of power generation with fossil fuels by energy generation with biomass residues. A general formula of the emission reduction calculation is shown below:

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

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

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, $PE_y = 0$.

Baseline emissions

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 19, EG_y is determined based on the average efficiency of electricity generation in the reference plant (after retrofit) with a lower efficiency of electricity generation than with the retrofit in the project activity ($\varepsilon_{el,baseline\ plant} = \varepsilon_{el,reference\ retrofit\ plant}$) 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 biomass residue, 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 biomass residue combusted in the project plant during the year *y* (tons of dry matter or liter);

NCV_k = Net calorific value of the biomass residue (MWh/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 version 09, 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.

Leakage

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

Emission factor

The emission factor for the displacement of electricity ($EF_{electricity}$) corresponds to the grid emission factor ($EF_{electricity,y} = EF_{grid,y}$). The baseline emission factor ($EF_{grid,CM,y}$) is calculated as a combined margin (CM), consisting of the operating margin (OM) and build margin (BM) factors, as per the procedures established in the "Tool to calculate the emission factor for an electricity system" version 2. Calculations for this combined margin were based on public data from an official source.

Step 1. Identify the relevant electricity 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 signification transmission constraints.

The national inter-connected system (NIS) of Nicaragua covers more than 90% of its territory and is the grid to which the project is connected. The other regions are covered by small isolated generation systems. Therefore the NIS is the relevant electric power system for this project.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
Not applied as there is no off-grid power plant to be included in the project electricity system.

Step 3. Select a method to determine the operating margin (OM)

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

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch data analysis OM, or
d) Average OM.

The simple OM method (option a) can only be used if low-cost/must-run resources[5] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

As the low-cost/must run resources constitute less than 50% of the Nicaraguan Power Grid, the simple OM method was used.

The Simple OM can be calculated using either of the two following data vintages for years(s) y:

- Ex ante option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, or;

- Ex post option: The emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only

[5] Low operating cost and must run resources typically include hydro, geothermal, wind low-cost biomass, nuclear and solar generation (ACM0002, v.7).

available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the proposed project, Ex ante option was chosen, and $EF_{grid,OM\text{-}simple,y}$ is fixed during the crediting period. It was chosen ex ante because it is expected that the OM will not have a wide range of variation during the second crediting period.

Power plants registered as CDM project activities were included in the sample group that is used to calculate the operating margin.

Step 4. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor ($EF_{grid,OMsimple,y}$) is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost-must-run power plants/units.

It was calculated based on net electricity generation and a CO_2 emission factor of each power unit (Option A), as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating margin CO2 emission factor in year *y* (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m = All power units serving the grid in year *y* except low-cost / must-run power units
y = The relevant year as per the data vintage chosen in step 3.

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

Determination of $EF_{EL,m,y}$

The emission factor of each power unit *m* was determined as follows:

• **Option A1:**
:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NCV_{i,y} . EF_{CO2,m,y}}{EG_{m,y}}$$

Where:
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m = All power units serving the grid in year *y* except low-cost/must-run power units

i = All fossil fuel types combusted in power unit *m* in year *y*
y = The relevant year as per the data vintage chosen in Step 3.

Determination of EGm,y

For grid power plants, EGm,y should be determined as per the provisions in the monitoring tables.

The provided information comprised years 2005, 2006 and 2007, and these are the most recent information available at this stage. The INE (*Instituto Nicaragüense de Energía*) data as well as the calculation spreadsheet were provided to the DOE (Designed Operational Entity) and are presented in Annex 3.

Step 5. Identify the group of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise the set of five power units that have been built most recently.

Power plant registered as CDM project activities were excluded from the sample group m, as the group of power units, not registered as CDM project activity, identified for estimating the build margin emission factor includes power unit(s) that is (are) built not more than 10 years ago.

In terms of vintage of data, project participants chose the option 1. It was chosen ex ante because it is expected that the BM will not have a wide range of variation during the second crediting period.

Option 1: 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, 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.

Step 6. 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:

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

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh);
$EG_{m,y}$ = Net electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
m = Power units included in the build margin;
y = Most recent historical year for which power generation data is available.

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) was determined as per the guidance in step 3 (a) for the simple OM, using option B1, for 2007, the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

Option A1. If for a power unit *m* data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined, as follows:

$$EF_{EL,m,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
$FC_{i,m,y}$	=	Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit);
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO2,I,y}$	=	CO_2 emission factor of fossil fuel type *i* in year y (tCO_2/GJ);
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year y (MWh);
m	=	Power units included in the build margin;
i	=	All fossil fuel types combusted in power unit *m* in year y;
y	=	the most recent year for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option).

Step 7. Calculate the combined margin emissions factor

The baseline emission factor was calculated as the weighted average of the OM emission factor and the BM emission factor, as follows:

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

Where:

$EF_{grid,CM,y}$	= Combined margin CO_2 emission factor in year y (tCO_2/MWh);
$EF_{grid,OM,y}$	= Operating margin CO_2 emission factor in year y (tCO_2/MWh);
$EF_{grid,BM,y}$	= Build margin CO_2 emission factor in year y (tCO_2/MWh);
w_{OM}	= Weighting of operating margin emission factor (%);
w_{BM}	= Weighting of build margin emission factor (%).

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{grid,2005-2007}$
Unit	tCO_2 / MWh
Description	CO_2 emission factor for the Nicaraguan grid electricity
Source of data	Calculated
Value(s) applied	0.7124
Choice of data or Measurement methods and procedures	This data will be archived electronically and according to internal procedures, until 2 years after the end of the crediting period.
Purpose of data	Baseline emissions
Additional comment	Calculated as weighted sum of the OM and BM emission factors, as explained in section B.6.3. and fixed for the second crediting period.

Data / Parameter	$\varepsilon_{el,reference\ retrofit\ plant}$
Unit	MWh_{el}/MWh_t
Description	Average net energy efficiency of electricity generation in the reference power plant after the retrofit that would take place in the absence of the project activity.
Source of data	Calculated
Value(s) applied	0.041
Choice of data or Measurement methods and procedures	The efficiency was calculated as described in section B.4, as the efficiency that would apply for the Monte Rosa mill in the baseline scenario. There is no available source of information in the respective industry sector.
Purpose of data	Baseline emissions
Additional comment	Applicable to scenario 19

B.6.3. Ex ante calculation of emission reductions
>>
As indicated in section B.6.1, the formula used to calculate the emission reductions are:

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

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

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

The results of the calculations are indicated below:

$EF_{grid,OMsimple,2005-2007} = 0.7790$ tCO_2/MWh (detailed calculation in Annex 3)

$EF_{grid,BM,2007} = 0.6902$ tCO_2/MWh (detailed calculation in Annex 3)

The default weights are as follows: $w_{OM} = 0.25$ and $w_{BM} = 0.75$, for the second crediting period:

$EF_{grid, CM,2005,2006,2007} = 0.25 * 0.7790 + 0.75 * 0.6902 = 0.7124\ tCO_2/MWh$

Therefore, for the second crediting period, the emission reductions will be calculated as follows:

$ER_y = 0.7124 * EG_y$

Table 5: Estimated data for the crop seasons

crop season	Days	Sugarcane (ton)	Bagasse in moist mass (ton)	Bagasse in dry mass (ton)	Straw in moist mass (ton)	Straw in dry mass (ton)	Total biomass residue (in moist mass)	Net Electric generation (MWh)	Electricity for consumption (MWh)	Electricity for export (MWh)
01/03/2009 - 28/04/2009 (2008 crop season)	59	607,640	150,046	75,023	-	-	150,046	65,346	19,778	45,568
11/2009 - 04/2010 (2009 crop season)	142	1,702,654	464,888	232,444	7,712	5,398	472,600	170,462	50,526	119,937
11/2010 - 04/2011 (2010 crop season)	149	1,787,786	489,634	244,817	8,098	5,668	497,732	183,695	54,051	129,644
11/2011 - 04/2012 (2011 crop season)	157	1,877,176	511,156	255,578	8,503	5,952	519,659	228,521	58,452	170,069
11/2012 - 04/2013 (2012 crop season)	153	1,971,035	539,753	296,864	8,928	6,249	548,680	227,519	59,256	168,264
11/2013 - 04/2014 (2013 crop season)	174	2,237,200	612,640	336,952	10,133	7,093	622,773	250,530	67,258	183,272
11/2014 - 04/2015 (2014 crop season)	174	2,237,200	612,640	336,952	10,133	7,093	622,773	250,530	67,258	183,272
17/11/2015 - 29/02/2016 (2015 crop season)	105	1,350,034	369,697	203,333	6,115	4,280	375,811	173,833	40,587	133,246

Table 6: Estimated emission reductions

Monte Rosa Bagasse Cogeneration Project									
Item	Second Crediting Period								CERs
	2009*	2010	2011	2012	2013	2014	2015	2016*	
Net quantity of electricity generated in the project plant (MWh)	122,167	174,873	198,637	228,187	235,190	250,530	253,936	86,916	
Bagasse combusted (tons of dry matter)	152,504	236,568	248,404	269,340	310,227	336,952	326,301	101,667	
Straw combusted (tons of dry matter)	1,799	5,488	5,763	6,051	6,531	7,093	6,869	2,140	
Net quantity of increased electricity generation (MWh)	90,482	125,184	146,461	171,654	170,162	179,900	185,539	65,606	
Ex-ante emission factor of the Nicaraguan grid (tCO_2/MWh)	0.7124	0.7124	0.7124	0.7124	0.7124	0.7124	0.7124	0.7124	
Emissions reductions (tCO_2)	64,459	89,180	104,339	122,286	121,223	128,161	132,178	46,737	808,563

*The second crediting period comprises the period from 01/03/2009 to 29/02/2016.

The net quantity of electricity generated was estimated considering the expected increase of sugarcane production in the mill in the second crediting period.

It was considered, $NCV_{bagasse}$ = 4.96 MWh/ton and NCV_{straw} = 4.83 MWh/ton.

The moisture content in bagasse was estimated as 50% from 2009 to 2011 crop seasons and 45% from 2012 to 2016 crop seasons.

It is expected to combust sugarcane straw (a biomass residue of the Monte Rosa sugarcane fields) together with bagasse in the boilers during the second crediting period, as indicated in table 6. This is the most probable scenario.

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
01/03/2009 to 31/12/2009	64,459	0	0	64,459
2010	89,180	0	0	89,180
2011	104,339	0	0	104,339
2012	122,286	0	0	122,286
2013	121,223	0	0	121,223
2014	128,161	0	0	128,161
2015	132,178	0	0	132,178
01/01/2016 to 29/02/2016	46,737	0	0	46,737
Total	**808,563**			**808,563**
Total number of crediting years	7 years			
Annual average over the crediting period	**115,509**	0	0	**115,509**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{project\ plant,y}$
Unit	MWh/yr
Description	Net quantity of electricity generated in the project plant during the year y
Source of data	Monte Rosa
Value(s) applied	Various: **2009***: 122,167; **2010**: 174,873; **2011**: 198,637; **2012**: 228,187; **2013**: 235,190; **2014**: 250,530; **2015**: 253,936; **2016***: 86,916
Measurement methods and procedures	Continuously monitored.
Monitoring frequency	At least monthly aggregate
QA/QC procedures	The consistency of metered net electricity generation should be cross-checked with 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).
Purpose of data	Baseline emissions
Additional comment	-

Values applied:

2009*	2010	2011	2012	2013	2014	2015	2016*
122,167	174,873	198,637	228,187	235,190	250,530	253,936	86,916

<table>
<tr><td>Data / Parameter</td><td>$BF_{k,y}$</td></tr>
<tr><td>Unit</td><td>tons of dry matter</td></tr>
<tr><td>Description</td><td>Quantity of biomass residue type k combusted in the project plant during the year y</td></tr>
<tr><td>Source of data</td><td>Monte Rosa</td></tr>
<tr><td>Value(s) applied</td><td>Various:
Bagasse:
<table>
<tr><th>2009*</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016*</th></tr>
<tr><td>152,504</td><td>236,568</td><td>248,404</td><td>269,340</td><td>310,227</td><td>336,952</td><td>326,301</td><td>101,667</td></tr>
</table>
Straw:
<table>
<tr><th>2009*</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016*</th></tr>
<tr><td>1,799</td><td>5,488</td><td>5,763</td><td>6,051</td><td>6,531</td><td>7,093</td><td>6,869</td><td>2,140</td></tr>
</table></td></tr>
<tr><td>Measurement methods and procedures</td><td>The quantity of biomass residue consumed will be directly measured, using weigh meters. The moisture content will be used to determine the quantity of dry biomass residue.</td></tr>
<tr><td>Monitoring frequency</td><td>At least monthly aggregate</td></tr>
<tr><td>QA/QC procedures</td><td>Crosscheck the measurements with an annual energy balance.</td></tr>
<tr><td>Purpose of data</td><td>Baseline emissions</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

Data / Parameter	NCV_k
Unit	GJ/ton of dry matter
Description	Net calorific value of biomass residue type k
Source of data	Monte Rosa
Value(s) applied	Bagasse: 17.85 Straw: 17.39
Measurement methods and procedures	Measure the NCV based on dry biomass..
Monitoring frequency	Monitoring at least every six months, taking at least three samples for each measurement
QA/QC procedures	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). 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.
Purpose of data	Baseline emissions
Additional comment	-

Data / Parameter	Moisture content of the biomass residues
Unit	% water content
Description	Moisture content of each biomass residue type k
Source of data	Monte Rosa
Value(s) applied	Bagasse: 50% (from 2009 to 2011 crop seasons); 45% (from 2012 to 2016 crop seasons) Straw: 30%
Measurement methods and procedures	Continuously monitored
Monitoring frequency	Mean values calculated at least annually.
QA/QC procedures	-
Purpose of data	Baseline emissions
Additional comment	-

<table>
<tr><td>Data / Parameter</td><td>$\varepsilon_{el,project\ plant,y}$</td></tr>
<tr><td>Unit</td><td>MWh_{el}/MWh_t</td></tr>
<tr><td>Description</td><td>Average net efficiency of electricity generation in the project plant in year y</td></tr>
<tr><td>Source of data</td><td>On-site measurements</td></tr>
<tr><td>Value(s) applied</td><td>Various:
<table>
<tr><th>2009*</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016*</th></tr>
<tr><td>0.16</td><td>0.146</td><td>0.158</td><td>0.167</td><td>0.15</td><td>0.147</td><td>0.154</td><td>0.169</td></tr>
</table></td></tr>
<tr><td>Measurement methods and procedures</td><td>Measure the quantity of fuels fired and the electricity generation during a representative time period and divide the quantity of electricity generated by the energy quantity of the fuels fired. Continuously monitored.</td></tr>
<tr><td>Monitoring frequency</td><td>Aggregated at least annually</td></tr>
<tr><td>QA/QC procedures</td><td>Check consistency with the previous years.</td></tr>
<tr><td>Purpose of data</td><td>Baseline emissions</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

B.7.2. Sampling plan
>>
Not applicable

B.7.3. Other elements of monitoring plan
>>
Monitoring processes must be implemented according to the monitoring plan in order to ensure that the real, measurable and long-term greenhouse gas (GHG) emission reduction for the proposed project is monitored and reported.

- **Data Collection**:

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 entrance and exit of surplus bagasse in the boilers are monitored using weigh meters. The straw will be weighed before entering in the conveyor belts to the boilers.

The bagasse produced in the mill can also be determined using the formula below (in order to cross-check the bagasse weighed):

$$\%bagasseinsugarcane = \frac{\%fiberinsugarcane}{(100 - \left(moistureofbagasse + \left(\frac{sacaroseinbagasse}{purityoftheresidualjuice} \right) * 100 \right)) * 100}$$ [6]

$$bagasse_{moistmass} = sugarcaneprocessed * \%bagasseinsugarcane$$

$$bagasse_{drymass} = bagasse_{moistmass} * (1 - moisturecontent_{bagasse})$$

The moisture content of biomass residue (%) will be continuously monitored by Monte Rosa laboratory and used to determine the quantity of dry biomass.

The Net Calorific Value (NCV) of biomass residues will be monitored by Monte Rosa laboratory, at least every six months, taking at least three samples for each measurement.

Environmental impacts will be monitored according to the requirements of the environmental license.

- **Equipment Calibration:** The metering equipments shall be periodically calibrated according to the manufacturer specification and/or sector regulation. All records will be documented and archived.

- **Data Recording:** Data collected will be recorded into an electronic spreadsheet administered by the manager of Monte Rosa CDM project.

- **Data Archives:** Data reports will be 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.

In order to guaranty quality assurance, the monitoring staff will assess 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 will be suitably qualified and trained in the operation and maintenance of the plant. They will also receive instructions of the monitoring plan of MRBCP.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity
>>
01/03/2002.

[6] Source: Manual de azúcar de caña: para fabricantes de azúcar de caña y químicos especializados; James C. P. Chen; Editorial Limusa, S.A. de C.V; 1999.

C.1.2. Expected operational lifetime of project activity
>>
25y-0m.

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>>
Renewable crediting period

C.2.2. Start date of the second crediting period
>>
01/03/2009

C.2.3. Length of the second crediting period

7y-0m.

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>
The activity of electricity generation in Nicaragua is open to private enterprises via authorization issues by the Nicaraguan Energy Institute (INE).

The environmental impact assessment (EIA) for MRBCP was submitted to MARENA (Ministry of Environment and Natural Resources) and was approved in April 2005. The MRBCP has already obtained the generation license for the expansion project from the INE. This license is for a maximum generation capacity of 60 MW. It is important to note that this value is not related to the installed capacity of 67.5MW.

D.2. Environmental impact assessment
>>
Regarding the out-of-boundary impacts, the MRBCP will not affect the expansion of the national electricity grid supply due to its small size in power generation capacity. Monte Rosa has always cared about other environmental issues, including preservation of local environment, constant improvement of preservation areas, adequate treatment of effluents and other residues, and is therefore in compliance with any applicable environmental regulation in Nicaragua.

Considering the installation and operation of the new equipment for electricity cogeneration related to procedures that are already in place at the industrial site, no major environmental impacts are expected. Moreover, this new equipment, being more efficient and modern, has more sophisticated control devices and is therefore even less likely to cause any environmental problems.

There will be no transboundary impacts resulting from this project activity. All the relevant impacts occur within Nicaraguan borders and have been mitigated to comply with the environmental requirements for project’s implementation.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders
>>
On 3rd August, 2005 a meeting was held to present the CDM initiative to local stakeholders. It tried to encompass the broad CDM perspective and bring related issues to the audience. Specific entities were

invited to treat the project under climate change, environmental and social perspectives. Such entities were known through the Nicaraguan DNA, and some of them are invited by the project developer. Attended the meeting:

- Club de Jóvenes Ambientalistas;
- Centro Humboldt;
- Comisión Ambiental Municipal del Municipio de El Viejo;
- Alcadía de El Viejo;
- Oficina Ambiental de la Alcadía de El Viejo.

E.2. Summary of comments received

>>

Some comments were received during the consultation. For instance, one comment was related to the plantation expansion plans of Monte Rosa, and its likely impacts on the environment. Other comments were related to the burning practice in sugar plantations. Some participants expressed the opinion that in the future certain areas must be delimited in order to create green harvesting areas. Finally, there was a very positive feedback towards the creation of the environmental department at Monte Rosa.

E.3. Report on consideration of comments received

>>

Monte Rosa explained that the expansion of its sugarcane plantations are contemplated in the sugar mills environmental impact assessment, and that there is an environmental management plan where the mitigation measures for such impacts are detailed. Even so, Monte Rosa explained that it will maintain an annual program in order to recover the rivers' margins in the region with natural vegetation, in order to keep the water streams alive, working together with the municipality of El Viejo. Monte Rosa also explained that the expansion of the sugar cane plantation will reach former agricultural areas such as Tonala y Los Millonarios.

Regarding burning the sugar cane prior to harvesting, Monte Rosa explained that this is to allow a better harvesting condition for the workers, implying not only in better health conditions, but also increased productivity and therefore better income. Monte Rosa explained that burning the cane does not cause environmental problems, it is more disturbing due to the visual impacts and dirtiness caused. Such problems are being taken into account through increased green cane harvesting and wind maps. Despite of that, Monte Rosa has been making progress in decreasing the sugar cane burning.

SECTION F. Approval and authorization

>>

This is the second crediting period of the mentioned project activity, thus, the Letter of Approval is still valid.

- - - - -

Appendix 1: Contact information of project participants

Organization name	Monte Rosa S.A.
Street/P.O. Box	Sugar mill Monte Rosa, Km 148 Way to Potosí.
Building	-
City	El Viejo
State/Region	Chinandega
Postcode	N/A
Country	Nicaragua
Telephone	(505) 883 2651/52
Fax	(505) 882 5033
E-mail	fbaltodano@pantaleon.com
Website	www.pantaleon.com
Contact person	
Title	Manager
Salutation	Mr.
Last name	Baltodano
Middle name	
First name	Francisco
Department	General Management
Mobile	
Direct fax	(505) 882 5033
Direct tel.	(505) 883 2651/52
Personal e-mail	fbaltodano@pantaleon.com

Appendix 2: Affirmation regarding public funding

There is no Annex I public funding involved in Monte Rosa's project

Appendix 3: Applicability of selected methodology

All information is available in section B.2.

Appendix 4: Further background information on ex ante calculation of emission reductions

The date of completion the application of the methodology to the project activity study is 28/10/2009.

The person and entity determining the baseline, which is also a project participant, is as follows:
Econergy Brasil Ltda, São Paulo, Brazil
Telephone: +55 (11) 3555-5700
Contact person: Mr. Gustavo Dorregaray
e-mail: gustavo.dorregaray@econergy.com.br

Table 7. Summarized results of the emission factor calculation

Ex-ante emission factor for the Nicaraguan interconnected grid Second Crediting Period		
Baseline	EF_{OM} [tCO_2/MWh]	Total Generation [MWh]
2005	0.8136	2,763,551
2006	0.7603	2,882,028
2007	0.7648	2,926,695
	$EF_{OM\ simple,\ 2005\text{-}2007}$ 0.7790	$EF_{BM,2007}$ 0.6902
	Weights_wind and solar projects w_{OM} = 0.75 w_{BM} = 0.25	Weights_all other projects w_{OM} = 0.25 w_{BM} = 0.75
	$EF_{2005\text{-}2007}$ [tCO_2/MWh] 0.7568	$EF_{2005\text{-}2007}$ [tCO_2/MWh] **0.7124**

Table 8. Operating and Build margin calculation

2005				
Power Plants	**type**	**net GWh** [1]	**10^3 GIns fuel** [1]	**tCO_2**
. Nicaragua (GEOSA)	fuel oil	419.68	40,256.17	459,369
. Managua (GECSA)	fuel oil	179.17	18,482.38	210,905
. Censa - AMFELS	fuel oil	319.61	19,795.32	225,887
. Empresa Energética de Corinto	fuel oil	523.87	29,849.61	340,618
. Tipitapa Power Company	fuel oil	399.83	24,640.70	281,179
. Chinandega (GEOSA)	diesel	0.49	97.08	979
. Las Brisas (GECSA)	diesel	24.85	2,078.56	20,960
. Nic.Sugar Estate Ltd. (NSEL)	bagasse	113.60		
. Monte Rosa - *CDM*	bagasse	89.83		
. Centroamérica (HIDROGESA)	hydro	230.25		
. Santa Bárbara (HIDROGESA)	hydro	196.00		
. Ormat Momotombo Power Company	geo	223.17		
. Polaris Energy Nicaragua, S.A. (Pensa) - *CDM*	geo	18.05		
Imports to the grid		25.16		
Operating Margin$_{2005}$ (tCO_2/MWh)				**0.814**

2006				
Power Plants	**type**	**net GWh** [1]	**10^3 GIns fuel** [1]	**tCO_2**
. Nicaragua (GEOSA)	fuel oil	546.15	43,240.21	493,420
. Managua (GECSA)	fuel oil	180.02	16,283.07	185,808
. Censa - AMFELS	fuel oil	314.24	19,381.30	221,163
. Empresa Energética de Corinto	fuel oil	528.40	31,744.26	362,238
. Tipitapa Power Company	fuel oil	420.18	25,597.28	292,094
. Chinandega (GEOSA)	diesel	0.82	110.65	1,116
. Las Brisas (GECSA)	diesel	68.31	4,909.66	49,509
. Nic.Sugar Estate Ltd. (NSEL)	bagasse	100.42		
. Monte Rosa - *CDM*	bagasse	93.93		
. Centroamérica (HIDROGESA)	hydro	184.88		
. Santa Bárbara (HIDROGESA)	hydro	114.37		
. Ormat Momotombo Power Company	geo	225.58		
. Polaris Energy Nicaragua, S.A. (Pensa) - *CDM*	geo	51.39		
Imports to the grid		53.32		
Operating Margin$_{2006}$ (tCO_2/MWh)				**0.760**

2007				
Power Plants	**type**	**net GWh [1]**	**10^3 Glns fuel [1]**	**tCO_2**
. Nicaragua (GEOSA)	fuel oil	515.98	40,967.70	467,488
. Managua (GECSA)	fuel oil	211.42	17,522.80	199,955
. Censa - AMFELS	fuel oil	217.65	13,837.01	157,896
. Empresa Energética de Corinto	fuel oil	550.12	32,845.77	374,808
. Tipitapa Power Company	fuel oil	409.24	25,013.43	285,432
. Generadora San Rafael, S.A. (Gesarsa)	fuel oil/diesel	4.50	315.70	3,543
. Las Brisas (GECSA)	diesel	107.12	10,568.39	106,572
. Hugo Chavez (GECSA) - Motores Combustión Int.	diesel	99.81	7,084.57	71,441
. Nic.Sugar Estate Ltd. (NSEL)	bagasse	122.38		
. Monte Rosa - *CDM*	bagasse	112.90		
. Centroamérica (HIDROGESA)	hydro	168.17		
. Santa Bárbara (HIDROGESA)	hydro	131.41		
. Atder - BL El Bote	hydro	0.97		
. Ormat Momotombo Power Company	geo	146.45		
. Polaris Energy Nicaragua, S.A. (Pensa) - *CDM*	geo	64.62		
Imports to the grid		63.95		
Operating Margin$_{2007}$ (tCO_2/MWh)				**0.765**

2007					
Start operation	**Power Plants**	**type**	**net GWh [1]**	**10^3 Glns fuel [1]**	**tCO_2**
2007	. Atder - BL El Bote	hydro	0.97		
2007	. Hugo Chavez (GECSA) - Motores Combustión Int.	diesel	99.81	7,084.57	71,441
2004	. Generadora San Rafael, S.A. (Gesarsa)	fuel oil/diesel	4.50	315.70	3,093
1999	. Empresa Energética de Corinto	fuel oil	550.12	32,845.77	374,808
1999	. Tipitapa Power Company	fuel oil	409.24	25,013.43	285,432
Build Margin$_{2007}$ (tCO_2/MWh)					**0.690**

2007	GWh
total generation =	2,926.70
50% total generation =	1,463.35
20% total generation =	585.34
Low-cost-must-run =	810.86
2006	GWh
total generation =	2,882.03
50% total generation =	1,441.01
Low-cost-must-run =	823.90
2005	GWh
total generation =	2,763.55
50% total generation =	1,381.78
Low-cost-must-run =	896.05

	TEP/10^3 barriles [3]	**GJ/Glns fuel**	**tCO_2/GJ [2]**
fuel oil	148.2	0.15	0.08
diesel	136.8	0.14	0.07

Sources:
[1] Estadísticas Eléctricas 2005, 2006, 2007; Dpto. de Estadísticas, DEEyE - INE; http://www.ine.gob.ni.
[2] 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1.3: Default values of Carbon Content).
[3] Comisión Nacional de Energia - Nicaragua, Balance Energetico Nacional, 2003; p.11.

Appendix 5: Further background information on monitoring plan

The monitoring plan is described in B.7.1. and B.7.3.

Appendix 6: Summary of post registration changes

No significant corrections were considered. The PP corrected the data of start of implementation of baling system in the PDD, since it was a typo error at the moment of the last correction. The correct data is December 10th, 2010.

In addition, three minor changes were performed:

1. The geographical coordinates were changed into decimal degrees format;
2. The units and the value of the ex-ante parameter $\varepsilon_{el,reference\ retrofit\ plant}$ were updated since percentage value(%) to MWh_{el}/MWh_t and the value was corrected from 4.1% to 0.041 to be in accordance with ACM0006 methodology;
3. The units and the values of the ex-post parameter $\varepsilon_{el,project\ plant,y}$ were updated since percentage value(%) to MWh_{el}/MWh_t and the values were corrected from; 16% to 0.16, 14.6% to 0.146, 15.8% to 0.158, 16.7% to 0.167, 15% to 0.15, 14.7% to 0.147, 15.4% to 0.154 and 16.9% to 0.169 to be in accordance with ACM0006 methodology.

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		