MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	Monte Rosa Bagasse Cogeneration Project (MRBCP)
Reference number of the project activity	0191
Version number of the monitoring report	Version 01
Completion date of the monitoring report	05/07/2012
Registration date of the project activity	22/06/2006 (Renewal date 22/11/2010)
Monitoring period number and duration of this monitoring period	2nd monitoring period of the second crediting period (01/07/2010 – 29/05/2011)
Project participant(s)	• Monte Rosa S.A. • Econergy Brasil Ltda.
Host Party(ies)	Nicaragua
Sectoral scope(s) and applied methodology(ies)	• Scope 1 : Energy industries (renewable / non-renewable sources) • ACM0006 - "Consolidated methodology electricity generation from biomass residues"), version 09.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	**101,307 tCO_2**
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	**74,678 tCO_2**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

1. This project consists of increasing the efficiency in the Bagasse cogeneration facility at Monte Rosa, a Nicaraguan sugar Mill and thereby reducing GHG emissions by displacing the fossil fuel consumption for electricity generation.
2. The equipments installed at MRBCP, prior and after the start of the project activity, are presented in table 1, below:

Table 1 - Equipments installed in the cogeneration plant prior and after the start of the Monte Rosa bagasse cogeneration project activity

Chronogram	Active / In Operation			Deactivated	Stand-By
Before the Expansion Plan	One 3 MW Backpressure **turbo generator 2** (TG)	One 2.5 MW backpressure turbo generator (TG)	One 1.5 MW backpressure turbo generator (TG)		
	One 13.78 bar **boiler 1** (36 t/h)	One 13.78 bar **boiler 2** (22.67 t/h)	One 13.78 bar boiler (11.33 t/h)		
Phase 1 2001-2002	One 15 MW backpressure extraction turbo generator (TG) May - Dec 2001	One 3 MW Backpressure **turbo generator 2** (TG)		One 2.5 MW backpressure turbo generator (TG) May – Jun 2002	Two 4 MW backpressure turbo generator (1,6) (TG) Jun – Dec 2002
	One 62 bar **boiler 3** (120 t/h) Jan - Dec 2001			One 1.5 MW backpressure turbo generator (TG) May – Jun 2002	
	One 13.78 bar **boiler 1** (36 t/h)	One 13.78 bar **boiler 2** (22.67 t/h)	One 13.78 bar boiler (11.33 t/h)		
Phase 2 2004	One 16.5 MW condensing **turbo generator 4**. Jun-Dec 2004	One 20 MW extraction **turbo generator 3** TG (backpressure). Jun-Nov 2004	One 20 MW extraction **turbo generator 5** TG (backpressure) Jun-Nov 2005	One 15 MW backpressure extraction turbo generator (TG) May - 2005	Two 4 MW backpressure **turbo generator (1,6)** (TG)
	One 62 **boiler 3** (120 t/h)	One 62 **boiler 4** (150 t/h) Oct 2003 - Nov 2004		One 13.78 bar boiler (11.33 t/h)	One 3 MW Backpressure **turbo generator 2** (TG)
					One 13.78 bar **boiler 1** (36 t/h)
					One 13.78 bar **boiler 2** (22.67 t/h)

Phase 3 (validation Period)	One 16.5 MW condensing **turbo generator 4**.	One 20 MW extraction **turbo generator 3** TG (backpressure).	One 20 MW extraction **turbo generator 5** TG (backpressure).	One 15 MW backpressure extraction turbo generator (TG) May - 2005	Two 4 MW backpressure **turbo generator (1,6)** (TG)
	One 62 bar **boiler 3** (120 t/h)	One 62 bar **boiler 4** (150 t/h)		One 13.78 bar boiler (11.33 t/h)	One 3 MW Backpressure **turbo generator 2** (TG)
					One 13.78 bar **boiler 1** (36 t/h)
					One 13.78 bar **boiler 2** (22.67 t/h)

3. The project has the following relevant dates for just active equipments:

Table 2 - Equipment list with commissioning and operation start data

Equipment	Capacity	Commissioning	Operation Start	Operational during the monitoring period
Boiler 1	13.78 bar – 36 t/h	-	-	NO
Boiler 2	13.78 bar – 22.67 t/h	-	-	NO
Boiler 3	62 Bar - 120 t/h	11/2001	12/2001	YES
Boiler 4	62 bar - 150 t/h	11/2004	12/2004	YES
Turbo generator 1	4 MW	09/2002	11/2002	NO
Turbo generator 2	3 MW	09/1999	11/1999	NO
Turbo generator 3	20 MW	06/2004	11/2004	YES
Turbo generator 4	16.5 MW	06/2004	12/2004	YES
Turbo generator 5	20 MW	06/2005	11/2005	YES
Turbo generator 6	4 MW	09/2002	11/2002	NO

Total emission reductions achieved in this monitoring period is **74,678 tCO_2.**

A.2. Location of project activity

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 12.700003°, Longitude -87.233336°) [1]

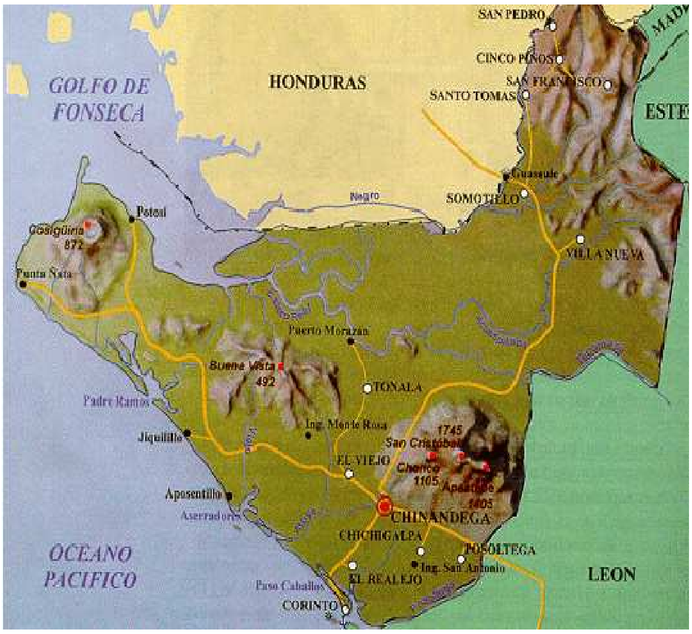


Figure 1 - Monte Rosa Sugar Mill site overview Geographical position of the city of El Viejo

A.3. Parties and project participant(s)

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. (Private entity)	No
Brazil	Econergy Brasil Ltda. (Private entity)	No

A.4. Reference of applied methodology

- 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.

[1] Geographical coordinates were changed from degrees, minutes and seconds (as was indicated in the PDD) to decimal degrees. (12º 42' 00"; -87º 14' 00")

A.5. Crediting period of project activity

The crediting period chosen was seven years, renewable for one more 7 years periods.

The crediting period of MRBCP started on 01/03/2002. The first crediting period finished on 28/02/2009. The crediting period was renewed for more 7 years, and the currently (second) crediting period started 01/03/2009 and will finish 29/02/2016.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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.

Table 3 – Operational boilers' list

Quantity	Boiler Details	Steam Generation Capacity	Manufacturer	Model	Commissioning	Operation start
1	62 bar	120 t/h	CALDEMA	AUP-405GI-PSE	11/2001	12/2001
1	62 bar	150 t/h	SERMATEC	VS-5150/2	11/2004	12/2004

Table 4 – Operational turbines' list

Quantity	Nominal Capacity	Manufacturer	Model	Commissioning	Operation start
1	20 MW - backpressure	TGM	TME 25000	06/2004	11/2004
1	20 MW -	TGM	TME 25000	06/2005	11/2005

	backpressure				
1	16.5 MW - condensing	TGM	TMC 25000	06/2004	12/2004

Table 5 – Operational generators' list

Quantity	Generator Details	Manufacturer	Model	Commissioning	Operation start
1	20 MW	WEG	SSW1120	06/2004	11/2004
1	16.5 MW	WEG	SSW1000	06/2004	12/2004
1	20 MW	GEVISA	271R560G1	06/2005	11/2005

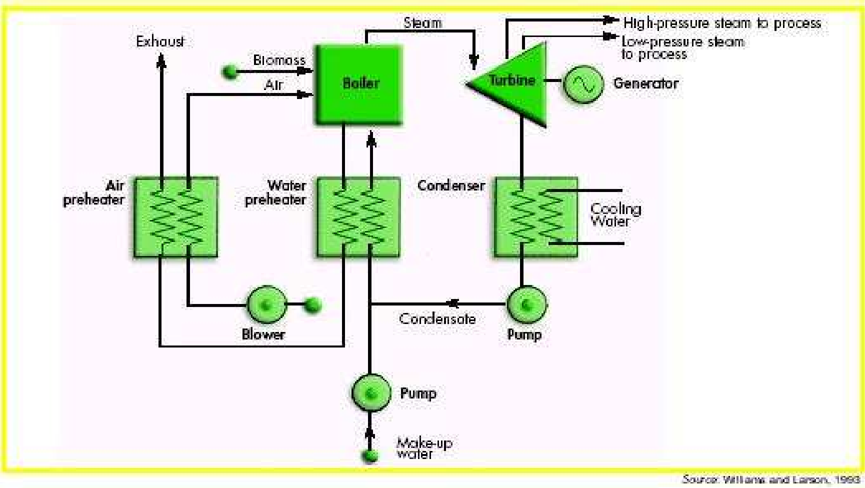


Figure 2 - Schematic diagram of a biomass-fired steam-Rankine cycle for cogeneration using a condensing-extraction steam turbine

Figure 3 - MRBCP panoramic photo

Figure 4 - MRBCP Cogeneration sector

The project has not significant shutdowns during the monitoring period, but among them, project participant presented the more relevant events ordered by data of occurrence.These reasons led to the stop of the complete power plant.

The plant has generated energy for 187 days along the crop season, and some downtimes were observed during this time interval as presented in Table 6 and Table 7 below. Besides these events, during 01/07/2010 to 23/11/2010 the plant was not operational due to the non-crop season.

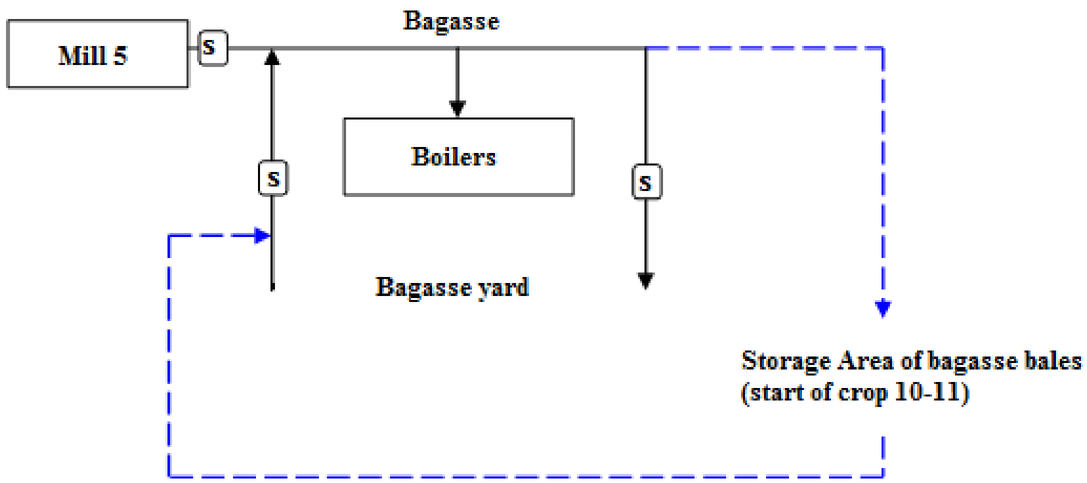
Table 6 - Events during monitoring period in 2010

2010 Downtimes			
Data	**Event**	**Reason**	**Duration**
25/11/2010	Stop of Turbo-generator #5	Low quantity of bagasse	01:41:00
04/12/2010	Stop of condensing Turbo-generator #4	Axial displaicement of the turbine	00:20:00
05/12/2010	Stop of condensing Turbo-generator #4	Inverse potence	04:28:00
09/12/2010	Stop of condensing Turbo-generator #4	Preventive scheduled maintenance	09:05:00
10/12/2010	Stop of Turbo-generator #5	Boiler #3 controls failure	00:17:00
16/12/2010	Stop of Turbo-generator #5	Low steam temperature	00:11:00
21/12/2010	Stop of Turbo-generator #5	Preventive scheduled maintenance	05:18:00
		Total	**21:20:00**

Table 7 - Events during monitoring period in 2011

2011 Downtimes			
Data	**Event**	**Reason**	**Duration**
07/01/2011	Stop of Turbo-generator #5	Problems with the bagasse feeder	00:22:00
23/01/2011	Stop of Turbo-generator #5	Electrical Grid disturbance	00:20:00
02/02/2011	Stop of Turbo-generator #5	Rupture of the steam head gasket	04:19:00
02/02/2011	Stop of condensing Turbo-generator #4	High vibration of boiler #4	01:41:00
15/02/2011	Stop of Turbo-generator #6	main drive spinning out correct parameters	01:09:00
22/02/2011	Stop of Turbo-generator #5	Preventive scheduled maintenance (Boiler #3 stop)	03:02:00
11/03/2011	Stop of Turbo-generator #6	Preventive scheduled maintenance	04:42:00
22/03/2011	Stop of Turbo-generator #5	High pressure in the extraction steam	00:47:00
22/03/2011	Stop of Turbo-generator #6	Low quantity of bagasse	00:31:00
30/03/2011	Stop of condensing Turbo-generator #4	Rupture of the main drive	01:38:00
18/04/2011	Stop of Turbo-generator #5	Substation cutout activated	02:43:00
19/04/2011	Stop of Turbo-generator #3	Electrical Grid disturbance	00:36:00
20/04/2011	Stop of Turbo-generator #3	Maintenance in main driver	04:46:00
20/04/2011	Stop of Turbo-generator #3	Low steam temperature	00:59:00
10/05/2011	Stop of condensing Turbo-generator #4	Boiler at reduced capacity	00:25:00
10/05/2011	Stop of condensing Turbo-generator #4	Electrical Grid disturbance	00:33:00
11/05/2011	Stop of condensing Turbo-generator #4	Low steam temperature	00:11:00
12/05/2011	Stop of condensing Turbo-generator #4	Cleaning of steam trap	01:43:00
18/05/2011	Stop of condensing Turbo-generator #4	Cleaning of main driver transmission	00:37:00
		Total	**31:04:00**

Bagasse obtained in the milling process is used to feed the boilers and the excess is stored in the yard to take advantage according to the requirements of energy production. This dynamic operation has been maintained throughout the life of the project activity up to crop 10-11, since this moment the storage of the 7.99% of produced bagasse is made in the form of bales, as this allows a better use storage space. In Figure 5 and Figure 6 show diagrams of operation of this practice, this is done exclusively during the crop season.



S: Scale

Figure 5 - Simplified diagram of bagasse management

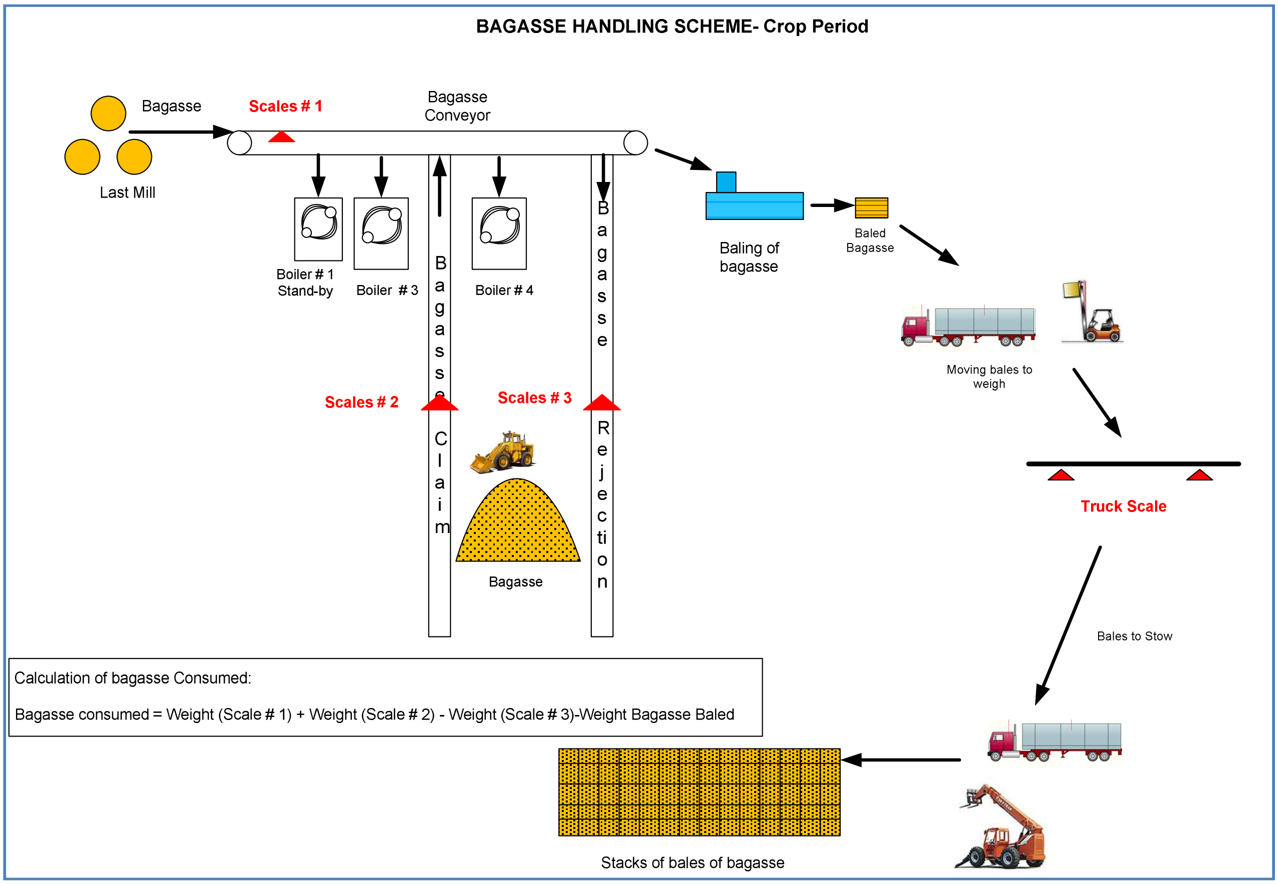


Figure 6 - Diagram of the management of bagasse during the crop season

The only event that was not considered in the monitoring plan is the fact that the bagasse would be stored in bagasse bales. During the current monitoring period, not all the bales were weighted, because project participants considered that all them has almost the same weight value, being possible to extrapolate the total bagasse weight value of the bagasse by means of a sampling weight method of the bales.

During the monitoring period the project participant used and statistical method in order to extrapolate the total weight of produced bagasse since a population sample. This procedure and statistical support is explained below.

When there is a finite population size, the following equation to calculate sample size "n" is used:

$$n = \frac{k^2 * p * q * N}{(e^2 * (N-1)) + k^2 * p * q}$$

Where:
N: is the size of the population or universe.
k: is a constant that depends on the level of confidence assigned.

k	1.15	1.28	1.44	1.65	1.96	2	2.58
Confidence level (%)	75	80	85	90	95	95.5	99

e: is sampling error is expected to commit
p: is the proportion of bales which have the property of estimated weight. As is known, apply the worst option (p = 0.5), which becomes larger the sample size.
q: the ratio of bales that do not have the property mentioned above, ie, is 1-p.
n: is the sample size (number of bales to be weighed).

Considering the mentioned equation, the following inputs were used:

N =	**1000**
k =	**1.96**
p = q =	**0.5**
e =	**0.05**
n =	**278**

N =	**1200**
k =	**1.96**
p = q =	**0.5**
e =	**0.05**
n =	**291**

So the sample size was between 278 and 291, but project participants considered the minimum value of 300 as a conservative approach, it means that the average weight of a bale is a representative value in order to extrapolate the total weight of bagasse. Project participants decided to weight the 100% of bagasse bales for next periods. The average weight of one bagasse bale is 0.756 tonnes (moist base).

After the crop season all the bagasse consumed is weighted with the scales installed in the bagasse belts, as described in figure 7.

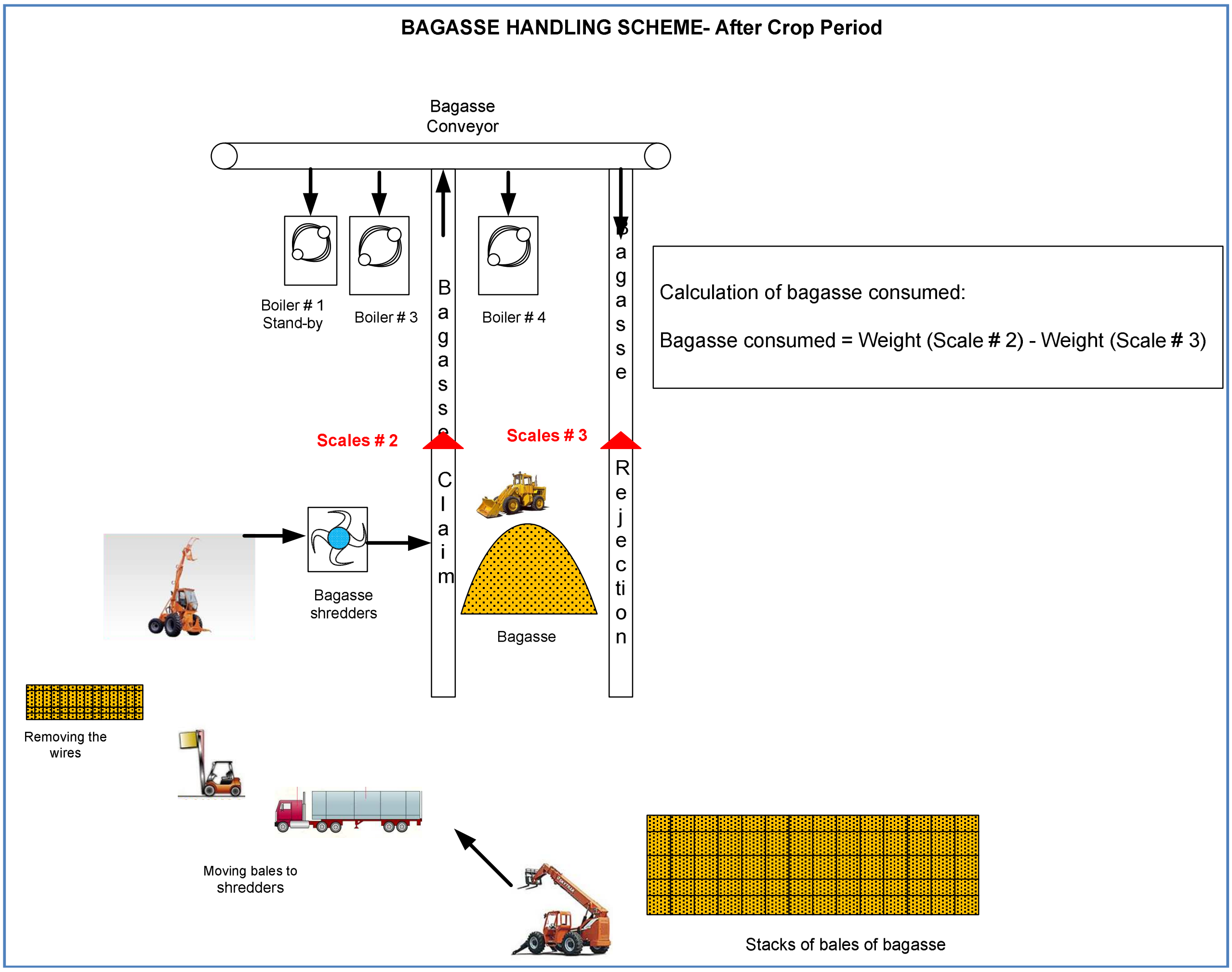


Figure 7 - Diagram of the management of bagasse after the crop season

In conclusion, the events or situations occurred during the monitoring period have no impact on the applicability of the methodology.

B.2. Post registration changes
B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There was not any deviation from the monitoring plan during this monitoring period.

B.2.2. Corrections

No corrections were considered

B.2.3. Permanent changes from registered monitoring plan or applied methodology

No permanent changes were considered

B.2.4. Changes to project design of registered project activity

No modifications in the project design have occurred.

B.2.5. Changes to start date of crediting period

No changes to start date of crediting period have occurred.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

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 was calculated by means of the subtraction of the energy consumed by auxiliary equipments to the monitored energy in the generators. 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. During this monitoring period there was no use of straw, but the possibility is still available for future monitoring periods.

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

$$\%bagasseinsugarcane = \frac{\%\,fiberinsugarcane}{(100 - \left(moistureofbagasse + \left(\frac{sacaroseinbagasse}{purityoftheresidualjuice}\right)*100\right))*100}$$ [2]

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

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

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

The Net Calorific Value (NCV) of biomass residues was monitored by Monte Rosa laboratory, at least every six months, taking at least three samples for each measurement. Actually this parameter is monitored weekly and presented in the harvest bulletins.

Monte Rosa has an environmental license N° 06-2005.

- **Equipment Calibration:**

The metering equipments are periodically calibrated according to the manufacturer specification and/or sector regulation. All records were documented and archived in soft and hard copies, as is showed in table 7.

[2] 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.

Nicaragua does not have any national regulation or law regarding the frequency of calibration of the weight scales of bagasse, but in case of the of energy meter's calibration, there are electrical sector regulations which establish that this calibration must be performed every two years.

Bascules calibration
The Bascule calibration is been made for Monte Rosa every 15 days through weight patterns. These weight patterns are calibrated annually by LANAMET, which is a qualified laboratory in metrology. Regarding the scales used for weighing bales, the calibration is carried out annually by the provider or sales representative of manufacturer.

Energy meters calibration
All energy meters are calibrated each two years owing to sector regulations of the public entity ENATREL.

Moisture meter calibration
The moisture meter calibration (scales) is requested for Monte Rosa annually. This calibration was made by IPROCEM, theirweight patterns are calibrated annually by LANAMET..

Monte Rosa has evidence of all equipments calibrations, which are available for whom concern.

- **Data Recording:**

Data collected was recorded into an electronic spreadsheet administered by the manager of Monte Rosa CDM project and stored at Monte Rosa server.

- **Data Archives:**

Data reports were archived and kept at least for two years after the end of the crediting period or the last issuance of CERs for this proposed project activity, whatever occurs later. There are two types of reports in Monte Rosa. One of them is made for the laboratory head and other one for the Power Plant Head as seem in the Figure 8 structure. These reports are made for each crop day.

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

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

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

Organizational structure

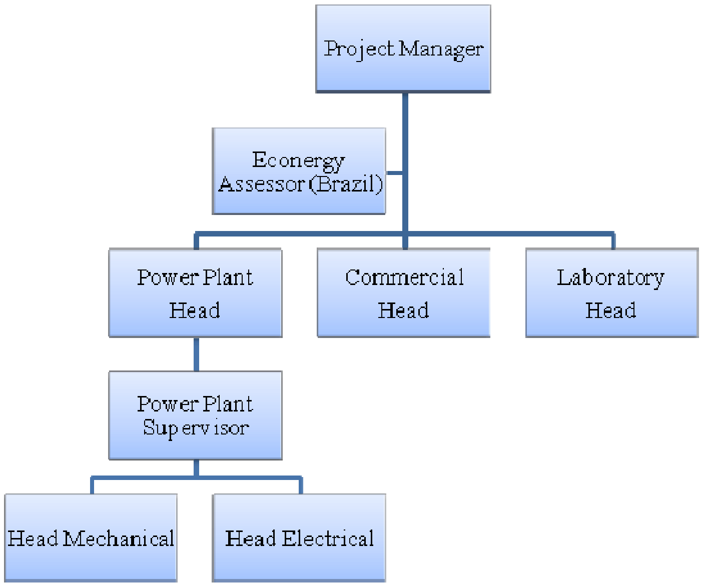


Figure 8 - Organizational structure of CDM projects in MRBCP

Roles and Responsibilities

Table 8 - Roles and professionals

Designation	Responsibility
Project Manager	Overall responsibility of CDM Project. 1. Ensure the adequate resources for the operation of the project. 2. Take decision of hiring an external consultancy to assist MRBCP during the project. 3. Communicate to everyone involved with the project the goals, objectives and results of the project operation. 4. Establish process necessary objectives of the project to achieve planned results. 5. Review results of conducted internal and external audits. 6. Continuous assessment of process efficiency and correct functioning. 7. Taking decisions to ensure the correct decisions in order to improve the project efficiency.
Econergy Consultancy	Support in elaboration of CDM projects (Project design document, monitoring report and CERs calculation) and verification process. • Facilitator for the efforts of the CDM Project. • Monte Rosa adviser on methodology updates for meet UNFCCC requirements. • Keeping Monte Rosa informed on CDM developments.

Power Plant Head	Monitoring of various operations at the power plant and keeping all generation records. 1. Responsible for electric energy generations to satisfy the domestic demand during crop season and sell of the energy surplus to the market energy agents. 2. Elaborate and execute maintenance plants during no crop season and guaranteed the correct functioning of the generation power plant. 3. Planning system records (evidence) needed to demonstrate the results of the operation of the process. 4. Ensure that they are recovering and archiving all the reading of the power meters.
Commercial Head	Monitoring of CERs obtained within monitoring period
Laboratory Head	Monitoring of various chemical properties readings of sugar cane and bagasse and keeping all laboratory records. Responsible to check the validity of calibrating certificates for laboratory equipments.
Power Plant Supervisor	Taking readings of Power generations. Responsible to check the validity of calibrating certificates for electrical and mechanical measure equipment.
Head-Electrical	Monitoring of various instruments used in measurements of electrical variables.
Head-Mechanical	Monitoring of various instruments used in measurements of energy variables.

Emergency procedures

The plant maintains the laboratory reports in both hard and soft copy formats at Monte Rosa´s server. The reports could be generated again whether they are required from the laboratory system. The Monte Rosa server receives a daily revision for avoid malfunctions or information losses.

Table 9 - Emergency procedures for measured information and calibration certificates

Process	Variable	Documentation	Type of registry	Disponibility of the information	Notes
Laboratory	Sugar cane fiber	1LA-R026	Hard copy	Hard and Soft copies	Three times per day
	Bagasse moisture	7LA-R047	Hard copy	Hard and Soft copies	
	Bagasse Pol	7LA-R006	Hard copy	Hard and Soft copies	
	Residual juice POL	1LA-R011	Hard copy	Hard and Soft copies	
	% brix Residual juice	1LA-R011	Hard copy	Hard and Soft copies	
	Residual juice purity	1LA-R011	Hard copy	Hard and Soft copies	
	NCV	1LA-R027	Hard copy	Hard and Soft copies	The NCV is determined in laboratory with the simple
	GCV	1LA-R027	Hard copy	Hard and Soft copies	

					taken at mill 5 output
	Weight measurement for bagasse at mill 5 output (A)	1LA-R054	Hard copy	Hard and Soft copies	
	Weight measurement for claimed bagasse (B)	1LA-R054	Hard copy	Hard and Soft copies	
	Weight measurement for refused bagasse (C)	1LA-R054	Hard copy	Hard and Soft copies	
	% Bagasse obtained from sugar cane vs Weight measurement for bagasse at mill 5 output		Excel Spreadsheet	Soft copy	The daily values reported by automation area are compared with the values determined by the laboratory
Energy	Meter calibration	Calibrated and certificated by ENATREL	Hard copy	Hard copy	Each two years
	Electric generation for each turbine	6EN-R004	Hard Copy	Hard and Soft copies	These values are avaliable in the daily energy report
Automation	Bagasse weight control	Excel spreadsheets	Soft copy	Soft copy	All information is reported to the laboratory each day at 6 am, indicating the bagasse weight for different conditions (Generated, claimed, refused and fired)
	Calibration of bagasse scales	Register 6AU-R025	Hard Copy	Hard Copy	Calibrations are performed every 15 days, through the plant stops
	Calibration of patterns for scale calibration	Calibrated and certified by LANAMET (National Laboratory of Metrology)	Hard copy	Hard and Soft copies	The pattern´s calibration take place annually

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

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
Purpose of data	Baseline emissions
Additional comment	-

Data/Parameter	$\varepsilon_{el,reference\ retrofit\ plant}$
Unit	%
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	4.1%
Purpose of data	Baseline emissions
Additional comment	Applicable to scenario 19

D.2. Data and parameters monitored

<table>
<tr><td>Data/Parameter</td><td>$EG_{project\ plant,y}$</td></tr>
<tr><td>Unit</td><td>MWh/yr</td></tr>
<tr><td>Description</td><td>Net quantity of electricity generated in the project plant during the year y</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured and Calculated</td></tr>
<tr><td>Source of data</td><td>Values in MWh
<table>
<tr><th>2010</th><th>2011</th></tr>
<tr><td>34,303.94</td><td>119,308.35</td></tr>
</table></td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Baseline emissions</td></tr>
<tr><td>Monitoring equipment</td><td>Type: Energy meter, Calibration frequency: once in 2 years
<table>
<tr><th>Manufacturer</th><th>Model</th><th>Serial No.</th><th>Accuracy Class</th><th>Calibration date (*)</th><th>Valid until</th></tr>
<tr><td rowspan="3">Schneider Electric</td><td>ION-8300</td><td>PS-0407A141-01</td><td>0.2%</td><td>24/02/2009</td><td>23/02/2011</td></tr>
<tr><td>ION-8500</td><td>PQ-0406A208-03</td><td>0.2%</td><td>25/02/2009</td><td>24/02/2011</td></tr>
<tr><td>ION-8500</td><td>PQ-0409A042-03</td><td>0.2%</td><td>25/02/2009</td><td>24/02/2011</td></tr>
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<table>
<tr><th>Manufacturer</th><th>Model</th><th>Serial No.</th><th>Accuracy Class</th><th>Calibration date (*)</th><th>Valid until</th></tr>
<tr><td rowspan="3">Schneider Electric</td><td>ION-8300</td><td>PS-0407A141-01</td><td>0.2%</td><td>07/10/2011</td><td>06/10/2013</td></tr>
<tr><td>ION-8500</td><td>PQ-0406A208-03</td><td>0.2%</td><td>07/10/2011</td><td>06/10/2013</td></tr>
<tr><td>ION-8500</td><td>PQ-0409A042-03</td><td>0.2%</td><td>07/10/2011</td><td>06/10/2013</td></tr>
</table>
Auxiliary equipments meters (Relays):
<table>
<tr><th>Serial No.</th><th>Accuracy Class</th><th>Calibration date (*)</th><th>Valid until</th></tr>
<tr><td>A2712443</td><td>2%</td><td>18/06/2011</td><td>18/06/2013</td></tr>
<tr><td>A2721893</td><td>2%</td><td>18/06/2011</td><td>18/06/2013</td></tr>
<tr><td>B2773072</td><td>2%</td><td>18/06/2011</td><td>18/06/2013</td></tr>
</table>
(*): The certificates of generated energy and auxiliary consumption meters are not covering the entire monitoring period, for this reason PP is using the “GUIDELINES FOR ASSESSING COMPLIANCE WITH THE CALIBRATION FREQUENCY REQUIREMENTS”, version 01 in order to discount or add the maximum error in order to be conservative.</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>The total of generated energy and auxiliary consumption are recorded by the energy meters and the total values were presented in every daily crop bulletin.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>Net quantity of electricity generated in the project plant is the subtraction of the auxiliary consumption energy to the total generated energy.</td></tr>
<tr><td>QA/QC procedures</td><td>This is crosschecked with the period energy balance based on the NCV and quantity of biomass utilised in the project activity.</td></tr>
<tr><td>Purpose of data</td><td>Baseline emissions</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

Data/Parameter	$BF_{k,y}$
Unit	tonnes of dry matter
Description	Quantity of biomass residue type k combusted in the project plant during the year *y*
Measured/Calculated /Default	Measured and calculated
Source of data	On-site measurements
Value(s) of monitored parameter	Various: Bagasse: Dry tonnes **2010**: 52,597; **2011**: 181,609 Straw: Along the conducted monitoring period there was not straw combustion

<table>
<tr><td>Monitoring equipment</td><td>Type: Bascule, Verification frequency with calibrated weight standards: 15 days.

<table>
<tr><th>Manufacturer</th><th>Serial No.</th><th>Accuracy Class</th><th>Internal verification</th></tr>
<tr><td rowspan="3">Schenk</td><td>131246-01A-BEMPII H/D</td><td>0.5%</td><td>15 days</td></tr>
<tr><td>131106-01B-BXO</td><td>0.25%</td><td>15 days</td></tr>
<tr><td>131106-01A-BXO</td><td>0.25%</td><td>15 days</td></tr>
</table>

Specifications of the truck scale used for weighing bales of bagasse

<table>
<tr><th>Manufacturer</th><th>Serial No.</th><th>Accuracy Class</th><th>Calibration frequency</th></tr>
<tr><td>Revuelta (Scale of income)</td><td>67815C.1408LE</td><td>0 Kg
Note: This error applies in the range of 400 to 38,300 kg rated load was used to corroborate the accuracy during calibration. The minimum scale division is 20 kg</td><td>Annual</td></tr>
<tr><td>Revuelta (Scale of tare)</td><td>67816C.1408LE</td><td>0 Kg
Note: This error applies in the range of 200 to 38.280 kg, which was rated load used to corroborate the accuracy during calibration. The minimum scale division is 10 kg</td><td>Annual</td></tr>
</table>
</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Continuously along the production process. The day accumulated is recorded in the crop bulletin.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>The quantity of biomass residue consumed was directly measured in moist base, using weigh meters. The moisture content is used to determine the quantity of water contained in this bagasse, and subtracted in order to calculate the dry bagasse weight.</td></tr>
<tr><td>QA/QC procedures</td><td>Crosschecked with the quantity of processed sugar cane.</td></tr>
<tr><td>Purpose of data</td><td>Baseline emissions</td></tr>
<tr><td>Additional comment</td><td>-</td></tr>
</table>

<table>
<tr><td>Data/Parameter</td><td>NCV_k</td></tr>
<tr><td>Unit</td><td>GJ/tonnes of dry matter</td></tr>
<tr><td>Description</td><td>Net calorific value of biomass residue type k</td></tr>
<tr><td>Measured/Calculated /Default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>On-site measurements</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Bagasse NCV:
<table>
<tr><td>Year</td><td>NCV (GJ/ton)</td></tr>
<tr><td>2010</td><td>18.72</td></tr>
<tr><td>2011</td><td>18.11</td></tr>
</table>
<table>
<tr><th>Equipment</th><th>Periods of use of equipment to measure NCV</th></tr>
<tr><td>Parr Plain Jacket bomb</td><td>Since 24/11/2010 to 15/12/2010</td></tr>
<tr><td>LECO</td><td>Since16/12/2010 to 31/05/2011</td></tr>
</table>
</td></tr>
</table>

<table>
<tr>
<td>Monitoring equipment</td>
<td>
Type: 1) Parr Plain Jacket bomb Calorimeter Model 1341 EB.
Calibration: The calibration of a calorimeter (calorimetric system) is performed by means of standardized Benzoic Acid combustion burned in certain quantity. In order to do that, PP performs and measures 5 procedures using this standard benzoic acid, determining the calorific capacity of the system as the arithmetic average of the 5 last measurements. After that the standard deviation is calculated for the obtained values and divided by the previous arithmetic average obtaining the % of deviation. As is stated in the UNE 164001 norm; whether this % of deviation is over the 0.2% value, the data series is disposed and the procedure needs to be performed again till obtain acceptable values (below 0.2%) or dispose the calorimeter bomb.

Type: 2) LECO AC500

Calibration: The calibration was carried out by "Inbox Technology and Services SA", Which is the official representative of LECO Corporation in Central America.

This calibration was performed using the ASTM D 5865 - 7a norm. From the combustion of a certain amount of benzoic acid standard, making 10 runs of measurements, determine the heat capacity of the system, the latter is calculated as the arithmetic mean of the 10 measurements. Then calculate the standard deviation, and this is divided by the arithmetic mean to obtain the% deviation, if this% is greater than 0.17%, the data set are discarded and the procedure must be performed again to obtain acceptable values.

The Standard benzoic acid properties:
<table>
<tr><th>Manufacturer</th><th>Lot number</th><th>Crop</th><th>Calorific value of the standard</th><th>Validity</th></tr>
<tr><td>Parr</td><td>PARR Lot # 102303 Benzoic acid CAS # 65-85-0</td><td>10-11</td><td>11,373 Btu/lb</td><td>The certificate indicates "indefinite expiration date"</td></tr>
<tr><td>Leco</td><td>LECO 774-208-150 Lot 1026 Benzoic acid CAS 65-85-0</td><td>10-11</td><td>11,374 ± 17 Btu/lb</td><td>The certificate indicates "indefinite expiration date"</td></tr>
</table>
</td>
</tr>
<tr>
<td>Measuring/Reading/ Recording frequency</td>
<td>Continuously along the production process. The day accumulated is recorded in the crop bulletin.</td>
</tr>
</table>

Calculation method (if applicable)	The quantity of biomass residue consumed was directly measured in moist base, using weigh meters. The moisture content is used to determine the quantity of water contained in this bagasse, and subtracted in order to calculate the dry bagasse weight.
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).
Purpose of data	Baseline emissions
Additional comment	-

Data/Parameter	Moisture content of the biomass residues
Unit	% water content
Description	Moisture content in the bagasse
Measured/Calculated /Default	Measured
Source of data	On-site measurements
Value(s) of monitored parameter	Bagasse: <table><tr><td>Year</td><td>Moisture (%)</td></tr><tr><td>2010</td><td>51.29</td></tr><tr><td>2011</td><td>45.70</td></tr></table>
Monitoring equipment	Type: Precision weight meter, Calibration frequency: Annual <table><tr><td>Manufacturer</td><td>Model</td><td>Serial No</td><td>Accuracy class</td><td>Calibration date</td><td>Valid until</td></tr><tr><td>Sartorius</td><td>TE3102S</td><td>19250259</td><td>0.006 g</td><td>30/08/2010</td><td>30/08/2011</td></tr></table>
Measuring/Reading/ Recording frequency	Monte Rosa performs 1 moisture analysis using 4 samplings, which were taken in constant intervals of an hour. The sampling process continues during the entire day (6 analyses per day), so totalizing 24 samplings per day. Hence, Monte Rosa is following international recommendations and this could be considered as continuous monitoring.
Calculation method (if applicable)	The quantity of biomass residue consumed was directly measured in moist base, using weigh meters. The moisture content is used to determine the quantity of water contained in this bagasse, and subtracted in order to calculate the dry bagasse weight.
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).
Purpose of data	Baseline emissions
Additional comment	-

Data/Parameter	$\varepsilon_{el,project\ plant,y}$
Unit	%
Description	Average net efficiency of electricity generation in the project plant in year y
Measured/Calculated /Default	Calculated
Source of data	On-site measurements
Value(s) of monitored parameter	This value was calculated for the monitoring period: Year — $\varepsilon_{el,project\ plant,y}$ (%) 2010 — 12.48% 2011 — 13.04%
Monitoring equipment	-
Measuring/Reading/ Recording frequency	-
Calculation method (if applicable)	This value is calculated using measured information ($EG_{project\ plant,y}$, NCV_k, $BF_{k,y}$), by means the following equation: $\varepsilon_{el,project\ plant,y} = \frac{EG_{project\ plant,y}}{\sum_k NCV_k \cdot BF_{k,y}}$
QA/QC procedures	Check consistency with the previous monitoring reports.
Purpose of data	Baseline emissions
Additional comment	-

D.3. Implementation of sampling plan

Not applicable

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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).

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.

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).

CER´s calculation			
Monitoring Report Period	01/07/2010 - 29/05/2011		
Parameters	Values for 2010	Values for 2011	Units
Period Energy Generation	37,060.87	129,049.50	MWh
Process Equipments consumption	2,756.92	9,741.14	MWh
Net Quantity of Electricity	34,303.94	119,308.35	MWh
Quantity of processed sugar cane	432,969.33	1,322,776.09	tons
Quantity of produced bagasse (wet base)	108,025.21	356,884.53	tons
Quantity of produced bagasse (dry base)	52,597.54	181,609.37	tons
Net Calorific Value (NCV)	18.72	18.11	GJ/ton
∑NCV x BFky	274,964.14	914,927.32	MWh
Average net energy efficiency of electricity generation in the project plant (εel, projectplant)	12.48%	13.04%	%
Average net energy efficiency of electricity generation in the baseline plant (εel, baselineplant)	4.10%	4.10%	%
EF2004-2006	0.7124	0.7124	tCO_2/MWh
EGy	23,030.41	81,796.33	MWh
EReletricity	16,406.87	58,271.71	tCO_2/period
PEy	0.00	0.00	tCO_2/period
ERy=ERelectricity - PE_y - L_y	16,406.87	58,271.71	tCO_2/Period
	Emissions Reductions	74,678.58	tCO_2/yr

E.2. Calculation of project emissions or actual net GHG removals by sinks

Project emissions were not considered, because there was 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, $PE_y=0$.

E.3. Calculation of 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).

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	74,678	0	0	74,678

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	**101,307 tCO_2**	**74,678 tCO_2**

E.6. Remarks on difference from estimated value in registered PDD

Not applicable since there is no increase in the actual emission reductions achieved during the current monitoring period compared to the estimated value in the PDD.

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History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Form **Business Function**: Issuance		