MONITORING REPORT

Version 1

SAN CARLOS BAGASSE COGENERATION PROJECT (SCBCP)

(CDM Registration Reference Number 0210)

Monitoring Periods:

05 July, 2005 to 31 December, 2006

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1. Introduction

This document reports the Emission Reductions (ERs) generated by the San Carlos Bagasse Cogeneration Project (hereinafter SCCP), CDM Registration Reference Number 0210, in the Monitoring Periods from 05 July 2005 to 31 August 2006.

This project activity consists of increasing efficiency in the bagasse (a renewable fuel source, residue from sugarcane processing) cogeneration facility of **Sociedad Agrícola e Industrial San Carlos S.A.**, an Ecuadorian sugar mill. With the implementation of this project, the mill has been able to sell electricity to the national grid, avoiding that fossil-fuelled thermal plants dispatch the same amount of energy to that grid. By that, the initiative avoids CO_2 emissions, also contributing to the regional and national sustainable development.

Bagasse cogeneration is important for the energy strategy of the country. Cogeneration is an alternative that allows postponing the installation and/or dispatch of electricity produced by fossil-fuelled generation utilities. 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 decrease dependency on fossil fuel.

By investing to increase in steam efficiency in the sugar and alcohol production and increase in the efficiency of burning the bagasse (more efficient boilers), San Carlos generates surplus steam and uses it exclusively for electricity production (through turbo-generators).

Moreover, using the available natural resources in a more efficient way, the San Carlos project activity helps to enhance the consumption of renewable energy. Besides that, it is used to demonstrate the feasibility of electricity generation as a side-business source of revenue for the sugar industry.

San Carlos also believes that sustainable development will be achieved not only through the implementation of a renewable energy production facility, but also through carrying out activities which correspond to the company's social and environmental responsibilities, as described below.

Sustainable development will be achieved not only by the implementation of a renewable energy production facility, but also by carrying out activities which are linked to the company's performance and therefore also linked to the cogeneration project.

Using steam-Rankine cycle as the basic technology of its cogeneration system, for achieving an increasing amount of surplus electricity to be generated, San Carlos, in mid-2005, implemented this project activity (SCBCP) consisting of the installation of 16 MW and 12 MW backpressure turbo-generator and refurbishment of one 220 psi to 600 psi boiler. No turbo-generator was deactivated, reaching a total capacity of 35 MW. San Carlos also has plans to install new boilers or refubrish an existing one in order to use all turbo-generators capacity.

Table 1 shows project activity implementation schedule for bagasse cogeneration project. Despite the mentioned equipments had been installed in 2004, the new upgraded facility become officially operational only in the middle of 2005.

Table 1: San Carlos Bagasse Cogeneration Project Technical Data

	Active	
Before Expansion Plan	One 3 MW and one 4 MW turbo- generators	
Until 2003	Three 220 psi boilers	
After Expansion Plan	One 16 MW and one 12 MW turbo-generators	One 3 MW and one 4 MW turbo- generator
Mid-2005	One refurbished 600 psi boiler	Two 220 psi boilers

2. Emission Reductions Calculation Formula

The formulae used to calculate the emission reductions is:

$$\mathbf{ER_y = BE_{thermal,\,y} + BE_{electricity,\,y} - PE_y - L_y}$$

$$\mathbf{BE_{thermal,\,y} = 0}$$

$$\mathbf{PE_y = 0}$$

$$\mathbf{L_y = 0}$$

$$\mathbf{BE_{electricity,\,y} = EF_{electricity} \cdot EG_y}$$

The emission factor is calculates as:

$EF_{electricity} = w_{OM}\,EF_{OM} + w_{BM}\,EF_{BM}$ (tCO_2e/GWh), where:

- w_{OM}, w_{BM} Are the weights given to the operating margin (OM) and the build margin (BM) in the emission factor calculation.

The project activity follows the steps provided by the methodology taking into account the (b) Simple Adjusted OM calculation for the STEP 1, since the would be no available data for applying to the preferred option – *(c) Dispatch Data Analysis OM.* For STEP 2, the option 1 was chosen.

According to the methodology, the project is to determine the Simple Adjusted OM Emission Factor ($EF_{OM,\ simple\ adjusted,\ y}$) . Therefore, the following equation is to be solved:

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

- *Fi,j(or m),y* Is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y;
- *j,m* Refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports from the grid;

- *COEFi,j(or m) y* Is the CO2 emission coefficient of fuel i (tCO2 / mass or volume unit of the fuel), taking intoaccount the carbon content of the fuels used by relevant power sources j (or m) and the percent oxidation of the fuel in year(s) y;
- *GENj(or m),y* Is the electricity (MWh) delivered to the grid by source j (or m); and

$$\lambda_y\,(\%) = \frac{\text{Number of hours per year for which low - cost/must - run sources are on the margin}}{8760 \text{ hours per year}}$$

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

$$\frac{\sum_{i,k} F_{i,k,y} . COEF_{i,k}}{\sum_{k} GEN_{k,y}} = 0 \ \ (tCO_2e/GWh)$$

Using therefore appropriate information for $F_{i,j,y}$ and $COEF_{i,j}$, OM emission factors for each year can be determined. To determine the baseline *ex-ante*, the mean average among the three years is calculated, finally determining the $EF_{OM,simple\_adjusted}$.

According to the methodology used, a Build Margin emission factor also needs to be determined.

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

Electricity generation in this case means 20% of total generation in the most recent year (2004), as the 5 most recent plants built generate less than such 20%.

The following table presents the key information and data used to determine the baseline scenario.

ID number	Data type	Value	Unit	Data Source
1. EG_y	Electricity supplied to the grid by the Project.	Obtained throughout project activity lifetime.	MWh	Serra
2. EF_y	CO_2 emission factor of the Grid.	0,7194	tCO_2e/MWh	Calculated
3. $EF_{OM,y}$	CO_2 Operating Margin emission factor of the grid.	0,868	tCO_2e/MWh	This value uses data from the statistics available on the web-site of CONELEC, the Electricity National Board of Ecuador (Consejo Nacional de Electrificación).
4. $EF_{BM,y}$	CO_2 Build Margin emission factor of the grid.	0,571	tCO_2e/MWh	This value uses data from the statistics available on the web-site of CONELEC, the Electricity National Board of Ecuador (Consejo Nacional de Electrificación).

10. λ_y	Fraction of time during which low-cost/must-run sources are on the margin.	λ_{2002} =0,00171 λ_{2003} =0,00856 λ_{2004} =0,01378	-	This value uses data from the statistics available on the web-site of CONELEC, the Electricity National Board of Ecuador (Consejo Nacional de Electrificación).

3. Dispatched energy to the grid in the Monitoring Periods

Date (DD/MM/AA)		Amount of energy sold to the grid (MWh)	CENACE Report Number
From	To		
01/07/2005	31/07/2005	2.024,41	**Cenace 3206**
01/08/2005	31/08/2005	2.939,81	**Cenace 3544**
01/09/2005	30/09/2005	3.720,29	**Cenace 4062**
01/10/2005	31/10/2005	5.038,72	**Cenace 4583**
01/11/2005	30/11/2005	3.127,10	**Cenace 4929**
01/12/2005	31/12/2005	1.417,38	**Cenace 0177**
01/01/2006	31/01/2006	Non-crop season	Non-crop season
01/02/2006	28/02/2006		
01/03/2006	31/03/2006		
01/04/2006	30/04/2006		
01/05/2006	31/05/2006		
01/06/2006	30/06/2006	3,86	**Cenace 2666**
01/07/2006	30/07/2006	1.304,95	**Cenace 3193**
01/08/2006	30/08/2006	2.439,81	**Cenace 3667**
01/09/2006	30/09/2006	4.164,99	**Cenace 4017**
01/10/2006	30/10/2006	3.542,17	**Cenace 4453**
01/11/2006	30/11/2006	2.867,42	**Cenace 4817**
01/12/2006	30/12/2006	2.353,90	**Cenace 0144**

4. ERs Generated in the Monitoring Periods

Calculation of ERs				
Description	**Unit**	**From 01/07/2005 to 31/12/2005**	**From 01/01/2006 to 31/12/2006**	**TOTAL**
Metered Electricity Supply	**MWh**	18.267,71	16.677,10	**34.944,81**
Baseline Emission Factor	**tCO_2e/MWh**	0,7194	0,7194	**0,7194**
Emission Reductions (ERs)	**tCO_2e**	13.141	11.997	**25.139**

In accordance with the formula in section 2, the SCBCP has in the monitoring periods generated:

ERs = 34.944,81 MWh x 0,7194 tCO_2e/MWh = **25.139 tCO_2e**