2nd MONITORING REPORT

SAN CARLOS BAGASSE COGENERATION PROJECT (SCBCP)

(CDM Registration Reference Number 0210)

Monitoring Periods:
1 January, 2007 to 28 December, 2008

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Status of the Project

The project was registered with CDM Executive Board on 6 March, 2006 (Registration Reference Number 0210). During the first Monitoring Period (5 July 2005 to 31 December 2006) plant exported 34,942.84 MWh to the grid and issued 25,137 CERs.

1. Introduction

This document reports the Emission Reductions (ERs) generated by the San Carlos Bagasse Cogeneration Project (hereinafter SCBCP), CDM Registration Reference Number 0210, in the Monitoring Periods from 1 January, 2007 to 28 December, 2008 as described below.

Year	Monitoring Period Date (DD/MM/AA)	
	From	To
2007	01/01/07	12/12/07
2008	08/07/08	28/12/08
Total	01/01/07	28/12/08

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.

The San Carlos Bagasse Cogeneration Project operation has been monitored in accordance with the requirements of the applicable Monitoring Methodology AM0015: "Bagasse-bases cogeneration connected to an electricity grid" as described in its Project Design Document. Quality Assurance and Quality Control Mechanism Stipulated in the Monitoring Methodology have been applied. The meters of energy are calibrated directly by the organism of control, CENACE.

The Plant operate seasonally during the sugar cane crop. Bagasse is a fibrous biomass residue from sugarcane processing. All the bagasse utilized by SCBCP is produced internally and used in its cogeneration facility (boilers and steam turbines) for steam and power generation. Therefore, no bagasse was purchased.

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 turbogenerators).

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.

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 refurbish 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 Until 2003	One 3 Mw and one 4 Mw turbo-generators	
	Three 220 psi boilers	
After Expansion Plan Mid-2005	One 16 Mw and one 12 Mw turbo-generators	One 3 Mw and one 4 Mw turbo-generators
	One refurbished 600 psi boiler	Two 220 psi boilers
Verification Period	One 16 Mw and one 12 Mw turbo-generators One refurbished 600 psi boiler	One 3 Mw and one 4 Mw turbo-generators Two 220 psi boilers

2. Emission Reductions Calculation Formula

The ERs generated by the San Carlos Bagasse Cogeneration Project are calculated the net generation from project during the monitoring period times baseline emission factor detailed in the registered PDD. Then: ERs= EG_y (MWh) * EF_y (tCO_2e/MWh)

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

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

$PE_y = 0$

$L_y = 0$

$BE_{electricity,y} = EF_{electricity,y} \cdot Eg_y$

Where the baseline emission factor ($Ef_{electricity,y}$) of the Ecuadorian grid is 0.7194 tCO_2e/MWh.

The emission factor is calculates as:

$EF_{electricity} = w_{OM}\, EF_{OM} + w_{OM}\;\; EF_{BM}$ (tCO2e/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 lowoperating cost and must-run power plants, and including imports from the grid;
- *COEFi,j(or m) y* Is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account 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

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

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

$$\frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_k GEN_{k,y}} = 0 \text{ (tCO}_2\text{e/GWh)}$$

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.

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

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	San Carlos
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	CENACE Report date
From	To			
01/01/07	31/01/07	Maintenance season	--	--
01/02/07	28/02/07	Maintenance season	--	--
01/03/07	31/03/07	Maintenance season	--	--
01/04/07	30/04/07	Maintenance season	--	--
01/05/07	31/05/07	Maintenance season	--	--
01/06/07	30/06/07	656.17400	Cenace 2992	12/07/07
01/07/07	31/07/07	2,733.06520	Cenace 3403	12/08/07
01/08/07	31/08/07	3,288.34120	Cenace 4137	12/09/07
01/09/07	30/09/07	4,699.48360	Cenace 4507	12/10/07
01/10/07	31/10/07	6,272.77110	Cenace 4921	12/11/07
01/11/07	30/11/07	5,753.98510	Cenace 5569	12/12/07
01/12/07	12/12/07	2,030.68220	Cenace 0144	12/01/08
01/01/07	**12/12/07**	**25,434.50240**		
01/01/08	31/01/08	Maintenance season	--	--
01/02/08	29/02/08	Maintenance season	--	--
01/03/08	31/03/08	Maintenance season	--	--
01/04/08	30/04/08	Maintenance season	--	--
01/05/08	31/05/08	Maintenance season	--	--
01/06/08	30/06/08	Maintenance season	--	--
01/07/07	31/07/08	1,920.56070	Cenace 3648	12/08/08
01/08/07	31/08/08	4,627.91570	Cenace 4048	12/09/08
01/09/07	30/09/08	5,201.62250	Cenace 4541	12/10/08
01/10/07	31/10/08	4,285.38900	Cenace 4983	12/11/08
01/11/07	30/11/08	4,666.32570	Cenace 5406	12/12/08
01/12/07	28/12/08	4,057.90370	Cenace 0188	12/12/08
01/01/08	**28/12/08**	**24,759.71730**		
01/01/07	**28/12/08**	**50,194.21970**		

Invoices are available with the project participant.

The information presented in the table above was extracted from CENACE – Centro Nacional de Control de Energía, which is the utility responsible for measuring the energy generated and exported by San Carlos mill to the regional grid, through its official energy measurement report (“Reporte

Acumulado Mensual de Transacciones de Energía de Generadores"), sent by CENACE to San Carlos mill every month. The information related to the amount of energy sold to the grid by San Carlos is also available at www.cenace.org.ec, but the access is only allowed for registered entities. The meters of energy are calibrated directly by the organism of control, CENACE.

There are months where no sugar cane harvest is done. During these months, no energy is produced by the cogeneration system of the mill and, therefore, no electricity was sold to the grid. For these cases, the expression "Maintenance season" was used in the previous table.

4. ERs Generated in the Monitoring Periods

Calculation of ERs				
DESCRIPTION	**UNIT**	**2007** **From 01/01/07 to 12/12/07**	**2008** **From 08/07/08 to 28/12/08**	**TOTAL**
Metered Electricity Supply	MWh	25,434.5024	24,759.7173	50,194.2197
Baseline Emission Factor	tCO_{2e}/MWh	0.7194	0.7194	0.7194
Emission Reductions (ERs)	tCO_{2e}	18,297.5810	17,812.1406	36,109.7217

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

ERs = (50,194 MWh) (0.7194 tCO_2e/MWh) = **36,109 tCO_2e**