CLEAN DEVELOPMENT MECHANISM
MONITORING REPORT

Fundão-Santa Clara Energetic Complex Project (FSCECP)

(CDM Registration Reference Number 1279)

Monitored Period: 25 May 2008 to 30 April 2009
Crediting Period: 25 May 2008 to 24 May 2015

-- TABLE OF CONTENTS –

Prepared by Ecopart Assessoria Ltda.

Section A. General description of project activity

A.1. Title of the project activity

Title of the project: Fundão-Santa Clara Energetic Complex Project (FSCECP)

Document version number: 01, 02 June 2009.

Monitoring Report based on the PDD registered version: 3a, 05 May 2008.

A.2. Description of the project activity

The primary objective of the FSCECP is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to the environmental, social and economic sustainability by increasing renewable energy's share of the total Brazilian (and the Latin America and the Caribbean region's) electricity consumption.

The FSCECP consists of a hydroelectric complex, composed by Fundão and Santa Clara hydroelectric power plants, both located in Jordão River, state of Paraná. Fundão and Santa Clara hydroelectric power plants are composed of one small scale and other large scale power plant each. Therefore, there are four power plants in this project activity, two of large scale and other two of small scale. FSCECP is connected to the interconnected S-SE-CO subsystem through three 138 KV transmission lines.

ELEJOR is a partnership established between COPEL - Companhia Paranaense de Energia (Energy Company of Parana State) and Paineira Participações S.A. with the objective to implement and operate the FSCECP.

On October 2nd, 2000, COPEL, issued an internal memorandum (Circular – 056/2000), which clearly states the intention of the company for collecting information about the Kyoto Protocol and the CDM through the creation of a working group. This group prospected opportunities inside the entire company for developing CDM projects. As ELEJOR was officially incorporated to COPEL on July 9th, 2001, the CDM initiative was mutually considered and applied by ELEJOR and COPEL.

This indigenous and cleaner source of electricity has an important contribution to environmental sustainability by reducing carbon dioxide emissions that otherwise would have occurred in the absence of the project. The project activity reduces emissions of greenhouse gas (GHG) by avoiding electricity generation by fossil fuel sources (and CO_2 emissions), which would be generating (and emitting) in the absence of the project.

A.3. FSCECP Monitoring Report

The GHG emissions reduction during the period from May 2008 to April 2009 was achieved through the dispatched electricity generated by Fundão and Santa Clara hydro power plants

complex, which displaced a mix of electricity generation in the Brazilian South-Southeast-Midwest interconnected grid.

The amount of energy delivered is monitored by the energy producer (seller) meters, the local power utility (COPEL – Companhia Paranaense de Energia) and CCEE – *Câmara de Comercialização de Energia Elétrica*. Each large hydro power plant has six meters (three principal and three backup) and each small hydro power plant has two meters (one principal and one backup). Then, the project has sixteen meters in the total that are calibrated each two years.

Calculation of the emissions reduction is based on validated and registered parameters fixed in the PDD and justified during the validation. The baseline emission factor for FSCECP for the Brazilian South-Southeast-Midwest grid is 0.2611 tCO_2/MWh.

A.4. Period of the monitoring report and amount of monitored emissions reductions

Period of the monitoring report: 25 May 2008 – 30 April 2009

Amount of monitored emissions reductions: **234,580 tCO_2e**

Total crediting period of the project: 25 May 2008 – 24 May 2015

A.6. Personnel responsible for the information

Project Manager – Emerson L. Alberti (ELEJOR - Centrais Elétricas do Rio Jordão S/A)

Monitoring Report – Karen M. Nagai (Ecopart Assessoria Ltda.)

Section B. Monitoring methodology and plan

B.1. Name and reference of approved monitoring methodology applied to the project activity

Approved consolidated baseline methodology ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", May 19th 2006, Version 06.

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

The ACM0002 – version 6 applies to the project activity for the following reasons:

- The FSCECP comprises the construction of the new Santa Clara Hydroelectric power plant and the new Fundão Hydroelectric power plant;
- Both reservoirs (Santa Clara's reservoir and Fundão's reservoir) have power densities (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m^2. The power density of Fundão Complex is higher than 10 W/m^2 (122,5 MW of installed capacity and a flooded area of 2,15 km^2 = 56,97 W/m^2) and the power density of Santa Clara Complex is between 4 and 10 (123,6 MW of installed capacity and a flooded area of 20,14 km^2 = 6,13 W/m^2);
- It's not a fossil fuel switching project;
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

B.3. Data to be monitored:

According to the PDD registered, the only parameter monitored is the electricity generated by the project activity:

Data / Parameter:	**Electricity generation (EGy)**
Data unit:	MWh/year
Description:	Electricity supplied to the grid by the project
Source of data to be used:	ELEJOR
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,229,000
Description of	This data will be archived electronically and according to

measurement methods and procedures to be applied:	internal procedures, until 2 years after the end of the crediting period.
QA/QC procedures to be applied:	These data will be directly used for calculation of emission reductions. Sales record to the grid and other records are used to ensure the consistency.
Any comment:	

Section C. Monitored data

The emissions reduction is reached by applying an emissions factor through the electricity dispatched to the grid, which is verified and monitored by a double checked verification: by ELEJOR – Centrais Elétricas do Rio Jordão that monitors its energy generated and by COPEL – Companhia Paranaense de Energia, the local power utility. Also, CCEE – Câmara de Comercialização de Energia Elétrica (National Chamber of Electric Energy Commercialization) checks and writes up the electricity delivered to the grid. CCEE makes feasible and regulates the electricity energy commercialization.

COPEL operates the hydroelectric complexes and monitors the quantity of energy exported to the grid. COPEL registers these measurements remotely from its headquarters in Curitiba. The person responsible for reading remotely the energy despatched to the grid is Mr. João Miyaoka (engineer of COPEL).

The amount of energy produced and fed into the grid will also be registered in a spreadsheet by ELEJOR. Mr. Emerson Luís Alberti (Electric Engineer) is responsible for checking the quantity of energy sold to COPEL and Mr. Hélio Zen (accountant of ELEJOR) responsible for issuing the invoice. The invoices will be issued by ELEJOR to COPEL, which buys the energy generated by the large scale power plants of Santa Clara and Fundão. The invoices of the energy generated by the small scale power plants of Santa Clara and Fundão and sold to final consumers will also be monitored.

The energy sold to COPEL is previously fixed in the PPA. When the amount of energy generated by ELEJOR exceeds the contracted amount agreed in the PPA, CCEEI5 , the entity responsible for the accounting process of the energy market, issues a credit receipt (ELEJOR therefore has a credit with CCEE). When the amount of energy generated doesn't achieve the expected, CCEE issues a debt receipt (ELEJOR is therefore in debt with CCEE). These receipts (credit and debt) will be used for cross-check the energy sold to the grid and for verification.

The archiving will occur up to two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later. The amount of energy dispatched to the grid will be registered in the spreadsheet "FSCECP.xls", which shall be the instrument for the further Verification. ELEJOR has two measurement points at the Large Hydros: one at the output of generator (Gross generation) and one at the exit of transformer/substation (Net generation). For the emissions reductions calculation will be used the Net generation amount.

The calibration is under responsibility of COPEL and will be every two years. The procedures for calibration are determined by ONS – Operador Nacional do Sistema, the National Operator of the System, which controls the dispatch of the energy to the S-SE-CO electric grid.

Environmental Impacts will be monitored by the reports requested by the Operational Licenses of Santa Clara Complex and Fundão Complex. As mentioned in the PDD registered of the project, the main Social Impact resulted from the FSCECP is the creation of jobs during the construction of the complexes. After the construction, ELEJOR will have to train engineers and operators to ensure the efficient operation of the complex and also workers in order to monitor the environmental programs. Any new request for employment will be monitored by ELEJOR's personnel department, including the necessity of training.

C.2. Data collected in order to monitor baseline emissions

As the project is neither associated with leakage effects nor with new emissions of pollutants and all other pertinent data are necessary to be analysed and presented only at the validation phase of the project, the only data that has to be monitored going forward during the life of the project is the electricity supplied to the grid by the project (EG_y).

Table 1 – Electricity generation delivered to grid by Santa Clara Complex

SANTA CLARA GENERATION COMPLEX				
Year	**Months**	**Large hydro power plant [MWh]**	**Small hydro power plant [MWh]**	**TOTAL [MWh]**
2008	May (from 25th)	8,866.8	522.5	9,389.2
	June	70,657.3	2,072.6	72,729.9
	July	64,786.2	2,476.6	67,262.8
	August	81,149.3	2,463.4	83,612.7
	September	68,603.1	2,237.2	70,840.2
	October	73,195.8	2,150.6	75,346.5
	November	83,788.6	2,312.3	86,100.8
	December	44,050.5	2,328.9	46,379.5
2009	January	28,760.3	2,242.8	31,003.1
	February	17,930.2	1,542.4	19,472.7
	March	18,592.9	2,000.8	20,593.7
	April	7,793.2	1,857.5	9,650.8
TOTAL		**568,174.2**	**24,207.6**	**592,381.8**

Source: ELEJOR – Centrais Elétricas do Rio Jordão

Table 2 – Electricity generation delivered to grid by Fundão Complex

FUNDÃO GENERATION COMPLEX				
Year	**Months**	**Large hydro power plant [MWh]**	**Small hydro power plant [MWh]**	**TOTAL [MWh]**
2008	May (from 25th)	9,243.4	350.4	9,593.8
	June	42,531.3	1,527.7	44,059.0
	July	54,429.5	1,593.3	56,022.8
	August	60,635.9	1,533.7	62,169.7
	September	70,853.4	1,557.3	72,410.7
	October	53,723.0	1,452.7	55,175.8
	November	66,433.6	512.2	66,945.8

	December	48,684.2	1,535.9	50,220.1
2009	January	34,136.8	1,594.8	35,731.6
	February	21,562.9	1,439.6	23,002.5
	March	22,032.9	1,550.7	23,583.6
	April	9,784.8	1,539.2	11,324.0
TOTAL		**494,051.8**	**16,187.5**	**510,239.3**

Source: ELEJOR – Centrais Elétricas do Rio Jordão

C.1. Data collected in order to monitor project emissions

According to ACM0002 methodology (version 6) and PDD registered, parameters utilized for the project emissions calculation are “electricity produced by the project activity in year y” and “surface area at full reservoir level”. The electricity produced by the project activity is presented in section C.I and the reservoir area of the plant is check once at the time of the validation.

Section D. Calculation of GHG emission by sources

D.1 Describe the formulae used to calculate emissions reductions

Emission reductions

According to methodology ACM0002 (version 6) the emission reductions by the project activity (ER_y) during a given period of year *y* is given by the equation below:

$$ER_y = BE_y - PE_y - L_y \qquad \textbf{Equation 1}$$

Where:

BE_y = Baseline emissions in year y (tCO_2e/yr);

PE_y = Project emissions in year y (tCO_2e/yr);

L_y = Leakage emissions in year y (tCO_2e/yr).

Baseline emissions

For the project activity, the baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y in MWh), as follows:

$$BE_y = EG_y \times EF_y \qquad \textbf{Equation 2}$$

Project emissions

Additionally, according to ACM0002, version 6, new hydro electric power projects with reservoirs, shall account for project emissions, estimated as follows:

a) if the power density (*PD*) of power plant is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_y = \frac{EF_{Res} * EG_y}{1000} \qquad \textbf{Equation 3}$$

Where:

EF_{Res} = is the default emission factor for emissions from reservoirs, and the default value as perEB23 is 90 Kg CO_2e/MWh.

EG_y = Electricity produced by the project activity in year y (MWh).

b) If power density (*PD*) of the project is greater than $10W/m^2$, PE_y = 0 tCO_2.

Leakage emissions

According to ACM0002 (version 6): "*The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation. Project participants do not need to consider these emission sources as leakage in applying this methodology. Project activities using this baseline methodology shall not claim any credit for the project on account of reducing these emissions below the level of the baseline scenario.*"

D.2 Tables providing values obtained when applying formulae above

Baseline emissions

The Monitoring Report applies the *ex ante* validated emission factor for project activities for the Brazilian South-Southeast-Midwest interconnected grid. Calculation of the emissions reduction is based on validated and registered parameters fixed in the PDD and justified during the validation. The CO_2 emission factor of the grid is 0.2611 tCO_2e/MWh, as presented in the table below:

Table 3 – CO_2 emission factor of the grid/ CO_2 Operating Margin emission factor of the grid/ CO_2 Build Margin emission factor of the grid

Emission factors for the Brazilian South-Southeast-Midwest interconnected grid				
Baseline (including imports)	EF_{OM} [tCO2/MWh]	Load [MWh]	LCMR [MWh]	Imports [MWh]
2003	0,9823	288.933.290	274.670.644	459.586
2004	0,9163	302.906.198	284.748.295	1.468.275
2005	0,8086	314.533.592	296.690.687	3.535.252
	Total (2003-2005) =	906.373.081	856.109.626	5.463.113
	$EF_{OM,simple-adjusted}$ [tCO2/MWh]	$EF_{BM,2005}$	Lambda	
	0,4349	0,0872	$\Box_{2003}$	
	Weights	Default weights	0,5312	
	w_{OM} = 0,50	w_{OM} = 0,5	$\Box_{2004}$	
	w_{BM} = 0,50	w_{BM} = 0,5	0,5055	
	EF_y [tCO2/MWh]	Default EF_y [tCO2/MWh]	$\Box_{2005}$	
	0,2611	0,2611	0,5130	

Source: UNFCCC's website. Fundão-Santa Clara Energetic Complex Project (FSCECP) PDD registered, version 3a, 05 May 2008.

Considering section C.I information and the table above, baseline emissions are given below with the use of equation 2 from section D.I:

Fundão-Santa Clara Energetic Complex Project (FSCECP)				
Year	**Months**	**EG_y (MWh)**	**EF_y (tCO_2/MWh)**	**BE (tCO_2)**
2008	May (from 25th)	18,983.06	0.2611	4,956.48
	June	116,788.88		30,493.58

	July	123,285.64		32,189.88
	August	145,782.32		38,063.76
	September	143,250.96		37,402.82
	October	130,522.20		34,079.35
	November	153,046.64		39,960.48
	December	96,599.56		25,222.15
2009	January	66,734.67		17,424.42
	February	42,475.14		11,090.26
	March	44,177.28		11,534.69
	April	20,974.78		5,476.51
	TOTAL	**1,102,621.12**		**287,894.3752**

Project emissions

The power density of the project complexes are:

Description	Fundão Complex	Santa Clara Complex
Power (MW)	122.50	123.60
Reservoir area (km^2)	2.15	20.14
Power density (MW/km^2)	56.98	6.14

Considering the table above, $PE_{y,Fundão\ Complex}$ is 0 tCO_2. For $PE_{y,Santa\ Clara}$, formula (a) of project emissions calculation on section D.I is used:

SANTA CLARA COMPLEX			
Year	**Months**	**EG (MWh)**	**PE (tCO_2e)**
2008	May (from 25th)	9,389.25	845.03
	June	72,729.91	6,545.69
	July	67,262.82	6,053.65
	August	83,612.66	7,525.14
	September	70,840.22	6,375.62
	October	75,346.45	6,781.18
	November	86,100.82	7,749.07
	December	46,379.46	4,174.15
2009	January	31,003.12	2,790.28
	February	19,472.67	1,752.54
	March	20,593.68	1,853.43
	April	9,650.77	868.57

TOTAL	**592,381.82**	**53,314.36**

Leakage emissions

Considering methodology AM0002 (version 6):

$$L_{y\ \text{Santa Clara}} = L_{y,\text{Fundão}} = 0$$

Where:

$L_{y\ \text{Santa Clara}}$ is the Leakage from the Santa Clara Hydro Power Plant during the year *y*;

$L_{y,\text{Fundão}}$ is the Leakage from Fundão Hydro Power Plant during the year *y*.

Emission reductions

Applying equation 1, emission reductions of the project activity are:

Year	**Month**	**Project activity emissions** (tonnes of CO_2e)	**Baseline emissions** (tonnes of CO_2e)	**Leakage** (tonnes of CO_2e)	**Emission reductions** (tonnes of CO_2e)
2008	May (from 25th)	845.0	4,956	0.0	4,111
	June	6,545.7	30,494	0.0	23,948
	July	6,053.7	32,190	0.0	26,136
	August	7,525.1	38,064	0.0	30,539
	September	6,375.6	37,403	0.0	31,027
	October	6,781.2	34,079	0.0	27,298
	November	7,749.1	39,960	0.0	32,211
	December	4,174.2	25,222	0.0	21,048
2009	January	2,790.3	17,424	0.0	14,634
	February	1,752.5	11,090	0.0	9,338
	March	1,853.4	11,535	0.0	9,681
	April (until 30th)	868.6	5,477	0.0	4,608
Total (tonnes of CO_2e)		**53,314**	**287,894**	**0**	**234,580**

Annexes

Annex 1 - Contact information

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