
“Salto Pilão” Hydropower Plant Project Activity

**Monitored Period:
19 January 2010 to 28 February 2011**

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Section A. General description of project activity

A.1. Title of the project activity

Project title: “Salto Pilão” Hydropower Plant Project Activity.

Monitoring report version number: 3

Date (DD/MM/YYYY): 08/07/2011

A.2. Description of the project activity

Salto Pilão project activity consists of the construction of a hydropower plant with a reservoir of 0.15 km²¹ and an installed capacity of 182.3 MW². The plant is located between the cities of Lontras, Ibirama and Apiúna, state of Santa Catarina, Southern region of Brazil.



Figure 1 – Salto Pilão Hydropower Plant

Salto Pilão hydropower plant (from Portuguese *Usina Hidrelétrica Salto Pilão - UHESP*) is owned by an association of several companies called *Consórcio Empresarial Salto Pilão*. The current consortium structure is as follows³:

- Companhia Brasileira de Alumínio (CBA): 60%;
- Camargo Córrea Geração de Energia S/A (CCGE): 20%; and
- DME Energética Ltda. (DMEE): 20%.

¹ Operation License nr. 202/2009, issued on July 13th, 2009 by the environmental agency of Santa Catarina State (Fundação do Meio Ambiente – FATMA).

² 2nd Addendum of the Concession Contract signed August 20th, 2007 and Operation License nr. 202/2009, issued on July 13th, 2009 by FATMA.

³ 1st Addendum of the Concession Contract signed July 23rd, 2004 and ANEEL Resolution nr. 1,391 issued on June 3rd, 2008.

The primary objective of the UHESP 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 (run-of-river power plant), social (job creation about 1000 workers in the construction phase, and infra-structure enhancements in surrounded municipalities), and economic sustainability by increasing the share of renewable energy in total electricity consumption for Brazil (and for the region of Latin America⁴).

This indigenous and cleaner source of electricity has also an important contribution to environmental sustainability by reducing carbon dioxide emissions that would have occurred otherwise in the absence of the Project. The project activity reduces emissions of greenhouse gas (GHG) by avoiding electricity generation by fossil fuel sources (and CO₂ emissions), which would be generated (and emitted) in its absence.

A.3. Project participants

Detailed contact information on party(ies) and private/public entities involved in the project activity is listed in Annex 1.

Table 1 - Party(ies) and private/public entities involved in the project activity

Name of Party involved (* ((host) indicates a host Party)	Private and/or public entity(ies) project participants (* (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host Party)	Consórcio Empresarial Salto Pilão - CESAP (private entity)	No
	Ecopart Assessoria em Negócios Empresariais Ltda. (private entity)	

Consórcio Empresarial Salto Pilão is the owner of Salto Pilão project. This can be evidenced by contracts and governmental authorizations to explore the hydro potential of Salto Pilão project. Ecopart Assessoria em Negócios Empresariais Ltda. is the advisory company contracted to develop the VCS process of the project.

Consórcio Empresarial Salto Pilão and Ecopart Assessoria em Negócios Empresariais Ltda. are the project participants of Salto Pilão project activity in the VCS platform. However, only Consórcio Empresarial Salto Pilão has the carbon credits rights of Salto Pilão project. All related documentation will be present to DOE during on-site visit.

⁴ Brazil exports electricity for some countries of the Latin America region. Therefore, the project contributes for the increasing the share of renewable energy consumption in Brazil and, indirectly, for some countries in the Latin America region.

A.4. Technology employed by the project activity:

The equipment and technology used in UHESP has been successfully applied to similar projects in Brazil and around the world. Specifications and equipments that used in UHESP are presented in Table 2 below.

Table 2 - Technical configuration of UHESP

Description		Salto Pilão HPP
Turbines	Type	Francis
	Quantity	2
	Power (MW)	93
	Nominal flow (m ³ /s)	52.90
	Water head (meters)	194.9
	Manufacturer	Voith Siemens
Generators	Type	Vertical-shaft
	Quantity	2
	Nominal Power (MVA)	101.3 (91.17 MW)
	Tension (kV)	13.8
	Frequency (Hz)	60
	Manufacturer	Voith Siemens

A.5. Type and category(ies) of project activity

Sectoral Scopes: 1 - Energy industries (renewable - / non-renewable sources).

Category: Renewable electricity generation for a grid.

A.6. Period of the monitoring report and amount of monitored emissions reductions

Monitoring period: 19 January 2010⁵ – 28 February 2011

Amount of VCUs: 203,408 tCO₂e

⁵ As mentioned in the registered PD, the starting date of the crediting period is considered as the date on which both generating units of UHESP started operations, i.e. January 19th, 2010. As per ANEEL Ordinance #102 dated on 18/01/2010, available at: <<http://www.aneel.gov.br/cedoc/dsp2010102.pdf>>.

SECTION B. Monitoring methodology and plan

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

ACM0002 – “Consolidated methodology for grid-connected electricity generation from renewable sources” (version 11).

B.2. Data to be monitored

The project is neither associated with leakage effects nor with new emissions of pollutants. According to the Project Design (PD) registered under VCS of UHESP project, the parameters that have to be monitored are:

1. Electricity generation of the project delivered to the grid ($EG_{\text{facility},y}$);
2. Installed capacity of the hydro power plant after the implementation of the project activity (C_{ppj});
3. Area of the reservoir measured in the surface of the water, after implementation of the project activity (A_{pj});
4. Combined margin CO₂ emission factor of the grid ($EF_{\text{grid,CM},y}$);
 - a) CO₂ operating margin emission factor of the grid ($EF_{\text{grid,OM},y}$);
 - b) CO₂ build margin emission factor of the grid ($EF_{\text{grid,BM},y}$);

All other pertinent data was analyzed and presented at the time of the VCS project validation. Table below shows the monitored parameters to calculate VCUs.

Data / Parameter:	$EG_{\text{facility},y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data to be used:	Project sponsor and the power utility/CCEE.
Value of data applied for the purpose of calculating expected emission reductions	1,244,086
Description of measurement methods and procedures to be applied:	Electricity supplied by the project activity to the grid. Double checked by Project Sponsors internal control and sales receipt or documents from the power

	utility/CCEE. CCEE is a Brazilian government entity which monitors the electricity on the national interconnected grid. Hourly measurement and monthly recording.
QA/QC procedures to be applied:	The equipments used have by legal requirements extremely low level of uncertainty.
Any comment:	-

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	Project site and official data source.
Value of data applied for the purpose of calculating expected emission reductions	182,300,000
Description of measurement methods and procedures to be applied:	Installed capacity determined by official entities and can be confirmed during on-site visit verifications.
QA/QC procedures to be applied:	Determined based on recognized standards with no possibility of uncertainty.
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m ²
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Project site and official data source.
Value of data applied for the purpose of calculating expected emission reductions	150,000 The reservoir area of the project is based on the Operation License nr. 202/2009, issued on July 13 th , 2009 by the Environmental Agency of Santa Catarina State (FATMA).
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc. (once at the time of the project conception) and water levels (during the project crediting period).

	Monthly measurement and recording.
QA/QC procedures to be applied:	Determined based on recognized standards with extremely low level of uncertainty.
Any comment:	-

Data / Parameter:	$EF_{grid.CM.y}$
Data unit:	tCO ₂ /MWh
Description:	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the “ <i>Tool to calculate the emission factor for an electricity system</i> ”.
Source of data to be used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions	0.1635 Calculated based on an average of the operating and build margin emission factors for the year of 2009 published by the Brazilian DNA: http://www.mct.gov.br/index.php/content/view/4016.html .
Description of measurement methods and procedures to be applied:	Since option C) for the calculation of the operating margin was chosen, this value will be up-dated annually according to data from the Brazilian DNA and following the prescription of the emission factor tool.
QA/QC procedures:	Official source of data.
Any comment:	-

Data / Parameter:	$EF_{grid.OM.y}$
Data unit:	tCO ₂ /MWh
Description:	Operating Margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the “ <i>Tool to calculate the emission factor for an electricity system</i> ”.
Source of data to be used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of	0.2476

calculating expected emission reductions	Calculated based on an average of the operating margin emission factor for the year of 2009 published by the Brazilian DNA: http://www.mct.gov.br/index.php/content/view/4016.html .
Description of measurement methods and procedures to be applied:	Option C) was chosen to calculate the operating margin. This option does not permit the <i>ex-ante</i> vintage for the calculation of the emission factor. Therefore, the emission factor will be calculated <i>ex-post</i> applying the numbers provided by the Brazilian DNA.
QA/QC procedures to be applied:	Official source of data.
Any comment:	-

Data / Parameter:	$EF_{grid.BM.y}$
Data unit:	tCO ₂ /MWh
Description:	Build margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.
Source of data to be used:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC)
Value of data applied for the purpose of calculating expected emission reductions	0.0794 Calculated based on an average of the build margin emission factor for the year of 2009 published by the Brazilian DNA: http://www.mct.gov.br/index.php/content/view/4016.html .
Description of measurement methods and procedures to be applied:	Option 2 was chosen to calculate the build margin. Therefore, the emission factor will be calculated <i>ex-post</i> applying the numbers provided by the Brazilian DNA. Numbers provided by the Brazilian DNA will be applied during the project verification.
QA/QC procedures to be applied:	Official source of data.
Any comment:	-

B.3. Monitoring Plan

Project sponsor will proceed with the necessary measures for the power control and monitoring. Together with the information produced by both project sponsor and the power utility/Electric Energy Commercialization Chamber (CCEE), it will be possible to monitor the power generation of the project (in MWh/year). CCEE makes feasible and regulates the electricity energy commercialization in Brazil.

There are six energy meters (principal and backup) specified by CCEE: 2 installed at the power plants (which measure the gross energy) and 4 installed at the local substation (which measure the net energy). CCEE has on-line access to the energy readings from meters located at the substation.

Energy data is measured by the meters in real time. Monthly, consolidations are made for payment purposes. Cross check is made between reports from CCEE/power utility and power plant. However, energy data from meters located at the power plant is higher than data from meters at the substation, considering transmission losses from the power plant to the substation. The table below presents the meters description:

Table 3 - Meters description

Model	Manufacturer	Quantity	Location
ION 8600B	Schneider Electric	2	Power plant
ION 8600A		4	Substation

According to ONS procedures⁶, these meters have to be calibrated every two years after operation starts. All meters calibration will be made following the necessary requirements.

The table below presents the dates in which the meters mentioned above were last calibrated as well as the correspondent calibration certificates number. All of the meters possess a precision class of 0.2%.

Table 4: Calibration dates of the energy meters

Description		Number	Last Calibration Certificate # - Date
Salto Pilão	Power Plant	PT-0811A790-01	003/2009 - 08/06/2009
		PT-0903A301-01	
	Substation	PT-0903A346-01	
		PT-0902A536-01	
		PT-0903A335-01	

⁶ ONS procedures. "Sub-module 12.3 Maintenance of the metering system for invoicing" (in a free translation from the Portuguese *Submódulo 12.3. Manutenção do sistema de medição para faturamento*). Available at ONS's website: http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.3_Rev_1.0.pdf

		PT-0812A276-01	
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As it can be seen from data presented in the above table, both the calibration of the principal and back-up meters occurred on June 08th, 2009 – *i.e.* before the monitoring period. Therefore, the meters are deemed calibrated and their re-calibration will be done in June, 2011.

Electricity from CCEE/power utility reports will be considered for emission reduction purposes. Therefore, these monthly reports will be available during the project verification (estimated to happen yearly) as well as the calibration certificates from meters involved in the project activity.

Salto Pilão Consortium will be responsible for the maintenance of the equipments' monitoring, for dealing with possible monitoring data adjustments and uncertainties, for review of reported results/data, for internal audits of GHG project compliance with operational requirements and for corrective actions. Salto Pilão Consortium is also responsible for the project management, as well as for organizing and training of the staff in the appropriate monitoring, measurement and reporting techniques.

In addition, the Brazilian Power Regulatory Agency (ANEEL) can visit the plant to inspect the operation and maintenance of the facility assuring that project sponsors are carrying out the necessary procedures for the project operation.

Salto Pilão Consortium has hired expert companies to execute their environmental programs. After the beginning of the commercial operations, renovation of degraded areas and of permanent preservation areas will be done according to the regulations of the environmental agencies, through a team of environment experts, who will also monitor the compliance with the environmental agencies' regulations. Studies done during the design phase of the project activities have shown the environmental impacts and the interference on the social development in the region of the plant, indicating the mitigation measures to be adopted during the construction phase. These measures are being taken seriously. Data about environmental impact are being archived by the hydropower plant and the environmental agency.

SECTION C. Calculation of GHG emissions by source

C.1 Calculation of GHG's in the baseline scenario

Emission reductions (ER_y)

According to the selected approved methodology ACM0002, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \text{Equation 1}$$

Where:

ER_y = Emission reductions in year y (tCO₂e/yr);

BE_y = Baseline emissions in year y (tCO₂e/yr);

PE_y = Project emissions in year y (tCO₂e/yr).

Baseline emissions (BE_y)

Baseline emissions are calculated using the annual electricity dispatched to the grid ($EG_{facility,y}$) times the CO₂ baseline emission factor (EF_y), as follows:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad \text{Equation 2}$$

Where:

BE_y = Baseline emissions in year y (tCO₂/yr);

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr);

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “*Tool to calculate the emission factor for an electricity system*” (tCO₂/MWh).

For Greenfield projects installed at a site where no electricity generation occurred previously, as it is the case of the proposed project activity, the calculation of $EG_{PJ,y}$ is as follows:

$$EG_{PJ,y} = EG_{facility,y} \quad \text{Equation 3}$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr);

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr).

Electricity generation of the project delivered to the grid ($EG_{facility,y}$)

UHESP project started to export electricity to the grid since December 11th, 2009. According to the PD registered under VCS, the starting date of the crediting period is considered as the date on which both generating units of UHESP started operations, *i.e.* January

19th, 2010⁷. Hence, the period of this project VCS verification is from January 19th, 2010 to February 28th, 2011. Energy exported to the grid in the above mentioned period is as follows:

Table 5 - Energy exported to the grid of UHESP in MWh

Month	2010	2011
January*	40,292	115,828
February	103,318	121,339
March	76,009	-
April	83,520	-
May	111,503	-
June	96,620	-
July	69,341	-
August	65,592	-
September	52,041	-
October	111,451	-
November	66,626	-
December	130,606	-
Total	1,006,919	237,167

Source: CCEE – Câmara de Comercialização de Energia Elétrica

* Since January, 19th when both generating units of UHESP started operations.

CO₂ emission factor of the grid (EF_y)

As mentioned in the PD registered, the baseline emission factor is defined as EF_y and is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors, following the “Tool to calculate the emission factor for an electricity system”. Following this tool, UHESP Project utilizes the “delineation of the project electricity system and connected electricity systems” published by the Brazilian DNA in its Resolution nr. 8, which defines a single system for the Brazilian Interconnected Grid, covering all the five geographical regions of the country (North, Northeast, South, Southeast and Midwest).

The Brazilian DNA made available the emission factor calculation based on information of the grid power plants only. More information of the methods applied can be obtained in the DNA’s website (<http://www.mct.gov.br/index.php/content/view/4016.html>). The emission

⁷ As per ANEEL Ordinance #102 dated on 18/01/2010, available at: <http://www.aneel.gov.br/cedoc/dsp2010102.pdf>.

factor apply to this monitored period correspond to 0.1635 tCO₂/MWh. It is important to mention that the emission factor for 2010 year was not available yet, and the value used in this report is based on 2009 data.

Considering Equation 2, the baseline emissions are as follow:

Table 6 – Baseline emissions for 2010 year

Month	EG _{facility,y} (MWh)	BE _y (tCO ₂)
January	40,292	6,588
February	103,318	16,892
March	76,009	12,427
April	83,520	13,656
May	111,503	18,231
June	96,620	15,797
July	69,341	11,337
August	65,592	10,724
September	52,041	8,509
October	111,451	18,222
November	66,626	10,893
December	130,606	21,354
TOTAL	1,006,919	164,631

Table 7 – Baseline emissions for 2011 year

Month	EG _{facility,y} (MWh)	BE _y (tCO ₂)
January	115,828	18,938
February	121,339	19,839
March	-	-
April	-	-
May	-	-
June	-	-
July	-	-
August	-	-
September	-	-
October	-	-
November	-	-
December	-	-
TOTAL	237,167	38,777

C.2 Calculation of project emissions

New hydro electric power projects resulting in new reservoirs, shall account for CH₄ and CO₂ emissions from reservoirs, estimated as follows:

- a) If the power density (*PD*) of power plant is greater than 4 W/m² and less than or equal to 10 W/m²:

$$PE_y = \frac{EF_{Res} \times TEG_y}{1000} \quad \text{Equation 4}$$

Where:

- PE_y* = Emission from reservoir expressed as tCO₂e/year;
EF_{Res} = is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO₂e/MWh;
TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

- b) If power density (*PD*) of the project is greater than 10W/m², *PE_y* = 0.

The power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \text{Equation 5}$$

Where:

- PD* = Power density of the project activity, in W/m².
Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W).
Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.
A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²).
A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero.

For Salto Pilão HPP:

Capacity of the project = 182.3 MW

Reservoir area = 0.15 km²

Power density = 182.3 / 0.15 = 1,215.3 W/m², so **PE_y = 0**.

C.3 Calculation of leakage

As mentioned in section 4.1 above, there are no leakage emissions involved in the project.

C.4 Emission reductions due to the project activity during a given period

According to the selected approved methodology ACM0002, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \text{Equation 6}$$

Where:

ER_y = Emission reductions in year y (tCO₂e/yr);

BE_y = Baseline emissions in year y (tCO₂e/yr);

PE_y = Project emissions in year y (tCO₂e/yr).

C.5 Table providing values obtained when applying formulae above

Table 8 – Emission reductions in 2010

Month	BE _y (tCO ₂ e)	PE _y (tCO ₂ e)	ER _y (tCO ₂ e)
January	6,588	0	6,588
February	16,892	0	16,892
March	12,427	0	12,427
April	13,656	0	13,656
May	18,231	0	18,231
June	15,797	0	15,797
July	11,337	0	11,337
August	10,724	0	10,724
September	8,509	0	8,509
October	18,222	0	18,222
November	10,893	0	10,893
December	21,354	0	21,354
Total	164,631	0	164,631

Table 9 – Emission reductions in 2011

Month	BE _y (tCO ₂)	PE _y (tCO ₂)	ER _y (tCO ₂)
January	18,938	0	18,938
February	19,839	0	19,839
March	-	-	-

April	-	-	-
May	-	-	-
June	-	-	-
July	-	-	-
August	-	-	-
September	-	-	-
October	-	-	-
November	-	-	-
December	-	-	-
Total	38,777	0	38,777

ANNEXES**Annex 1 - Contact information**

Organization:	Consórcio Empresarial Salto Pilão - CESAP
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