2ND VERIFICATION
SALTO PILÃO HYDROPOWER PLANT PROJECT ACTIVITY

Document Prepared By Ecopart Assessoria em Negócios Empresariais Ltda.

Project Title	"Salto Pilão" Hydropower Plant Project Activity
Version	4
Report ID	*Identification number of this document*
Date of Issue	26-06-2012
Project ID	513
Monitoring Period	01-March-2011 to 31-March-2012
Prepared By	Ecopart Assessoria em Negócios Empresariais Ltda.
Contact	Rua Padre João Manoel, 222, São Paulo - SP, Brazil Telephone: +55 (11) 3063-9068 E-mail: focalpoint@eqao.com.br

Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of Project

Salto Pilão project activity consists of the construction of a hydropower plant with a reservoir of 0.15 km[21] and an installed capacity of 191.89 MW[2]. 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 follows[3]:

- Companhia Brasileira de Alumínio (CBA): 60%;
- Companhia Geração de Energia de Pilão (CGEP)[4]: 20%; and
- DME Energética Ltda. (DMEE): 20%.

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 1,000 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 America[5]).

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

[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] ANEEL Resolution Nº 3.303 dated January 17th 2012. Available at: http://www.aneel.gov.br/cedoc/rea20123303.pdf.
[3] 5th Addedum of the Concession Contract signed April 1st, 2011 and ANEEL Resolution nr. 2,741 issued on January 25th, 2011.
[4] In 2010, Camargo Corrêa Geração de Energia S/A (CCGE) negotiated its share of 20% in the consortium with Companhia Geração de Energia de Pilão (CGEP). This trade has been formalised by the 5th Addedum to the Concession Contract signed April 1st, 2011 and ANEEL Resolution nr. 2,741 issued on January 25th, 2011.
[5] 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.

electricity generation by fossil fuel sources (and CO_2 emissions), which would be generated (and emitted) in its absence. This monitoring report presents information related to the **second** verification of the project activity, which covers the period of March, 1st 2011 to March, 31st 2012. The total emission reductions by the project activity over the monitored period are **235,542** tCO_2e.

1.2 Sectoral Scope and Project Type

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

Category: Renewable electricity generation for a grid.

This project is not a grouped project.

1.3 Project Proponent

The table below provides the entities involved in the project activity.

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 and has the carbon credits rights of Salto Pilão project. This can be evidenced by contracts and governmental authorizations to explore the hydro potential of Salto Pilão project. All related documentation will be present to DOE during on-site visit.

Detailed contact information of Consórcio Empresarial Salto Pilão is listed below:

Organization:	Consórcio Empresarial Salto Pilão - CESAP
Street/P.O. Box:	Av. Desembargador Vitor Lima, 260 - ático
City:	Florianópolis
State/Region:	Santa Catarina
Postfix/ZIP:	88040-400
Country:	Brazil
Salutation:	Mr.

Last name:	Lomonaco
Middle name:	Ferrari
First name:	Braz
Telephone:	+55 (48) 3331 0300
E-Mail:	braz@usinasaltopilao.com.br

1.4 Other Entities Involved in the 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.

Detailed contact information of Ecopart Assessoria em Negócios Empresariais Ltda. is listed below:

Organization:	Ecopart Assessoria em Negócios Empresariais Ltda.
Street/P.O. Box:	Rua Padre João Manoel, 222
City:	São Paulo
State/Region:	SP
Postfix/ZIP:	01411-000
Country:	Brazil
Salutation:	Ms.
Last name:	Hirschheimer
Middle name:	Sawaya
First name:	Melissa
Telephone:	+55 (11) 3063-9068
E-Mail:	focalpoint@eqao.com.br

1.5 Project Start Date

According to the VCS Standard Version 3.2, the project starting date is the "*is the date on which the project began generating GHG emission reductions or removal*". Therefore, the UHESP starting date is December 11th, 2009[6], when the first generating unit started operation.

[6] ANEEL Ordinance nr. 4,597 issued on December 10th, 2009. Available at ANEEL's website: <http://www.aneel.gov.br/>.

1.6 Project Crediting Period

UHESP has a maximum of 10 years of crediting period (which can be renewed two times). The start date of the project crediting period is considered as the date on which both generating units of UHESP started operation, *i.e*, January 19th 2010[7] and the end date is January 18th 2020.

1.7 Project Location

The project is located in Itajaí-Açú River, between the cities of Lontras, Ibirama and Apiúna, Santa Catarina State, Southern region of Brazil.

Figure 2 - Physical location of the cities involved in the project activity

Source: GOOGLE EARTH (2009)[8]

According to the project license[9], the geographic coordinates of the project activity are 27º06' and 27º08' S and 49º28' and 49º31' W.

1.8 Title and Reference of Methodology

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

2 IMPLEMENTATION STATUS

[7] ANEEL Ordinance nr. 102 issued on January 18th, 2010. Available at ANEEL's website: <http://www.aneel.gov.br/cedoc/dsp2010102.pdf>.
[8] GOOGLE EARTH (2009). Brazil's map. Available at: < http://earth.google.com/>. Accessed on 12 Nov 2009.
[9] Operation License nr. 202/2009, issued on July 13th, 2009 by the Environmental Agency of Santa Catarina State (FATMA).

2.1 Implementation Status of the Project Activity

UHESP project started commercial operations on December 11th, 2009[10] (first generating unit). The second generating unit started commercial operations on January 19th, 2010[11] . The equipment and technology used in UHESP has been successfully applied to similar projects in Brazil and around the world.

In January 2012, the Brazilian Electricity Regulatory Agency (from the Portuguese *Agência Nacional de Energia Elétrica – ANEEL*), authorized the increase in the installed capacity of the plant (from 182.3 MW to 191.89 MW)[12]. This modification is due to the expansion of the headrace tunnel during the construction period. It causes a decrease in the pressure drop and, consequently, an increase in the net head, allowing the increase of the installed capacity. Additionally, the specifications of the equipments installed in the plant allowed this power increase.

It's important to mention that no equipment has been modified or retrofitted since the plant became operational. In addition, any equipment modification or retrofit has to be authorized by the Regulatory Agency and such authorizations are not available. This is an evidence that the equipments have not been modified. Additionally, there was no modification in the reservoir area.

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)	97,65
	Nominal flow (m^3/s)	55.5
	Water head (meters)	194
	Manufacturer	Voith Siemens
Generators	Type	Vertical-shaft
	Quantity	2
	Nominal Power (MVA)	106.6 (95.94 MW)
	Tension (kV)	13.8
	Frequency (Hz)	60
	Manufacturer	Voith Siemens

No special events - such as overhaul times, downtimes of equipment, exchange of equipment – occurred during the monitored period. Therefore, there were no events or situations that could have impacted the GHG emission reductions and monitoring.

[10] As per ANEEL Ordinance # 4 .597 dated on 10/12/2009. Available at: http://www.aneel.gov.br/cedoc/dsp20094597.pdf
[11] As per ANEEL Ordinance # 102 dated on 19/01/2010. Available at: http://www.aneel.gov.br/cedoc/dsp2010102.pdf
[12] As per ANEEL Ordinance # 3.303 dated on 17/01/2012. Available at: http://www.aneel.gov.br/cedoc/rea20123303.pdf.

2.2 Deviations from the Monitoring Plan

As mentioned above, the installed capacity of the plant increased from 182.3 MW to 191.89 MW. Therefore, as required by the paragraph 3.6 of the VCS Standard version 3.2, a reassessment of the ACM0002 is conducted below.

- ✓ This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

  From the registered VCS PD:

  > *Prior to the project activity implementation, there was no hydropower plant or other project activity been implemented in the location of the UHESP project.*

  The change in the installed capacity of the plant (carried in January 2012) does not affect the conclusion in the registered PD, therefore, the methodology is still applicable.

The methodology is applicable under the following conditions:

- ✓ The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;

  From the registered VCS PD:

  > *Salto Pilão project activity consists of the construction of a hydropower plant (from the Portuguese Usina Hidrelétrica de Energia – UHE) located in Santa Catarina State, Southern region of Brazil, with the purpose of generated renewable energy to the National Interconnected Grid.*

  The change in the installed capacity of the plant (carried in January 2012) does not affect the conclusion in the registered PD, therefore, the methodology is still applicable.

- ✓ In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertake between the start of this minimum historical reference period and the implementation of the project activity;

  From the registered VCS PD:

  > *Salto Pilão project activity consists of the construction of a hydropower plant (from the Portuguese Usina Hidrelétrica de Energia – UHE) located in Santa Catarina State, Southern region of Brazil, with the purpose of generated renewable energy to the National Interconnected Grid.*

The change in the installed capacity of the plant (carried in January 2012) does not affect the conclusion in the registered PD, therefore, the methodology is still applicable.

✓ In case of hydro power plants, one of the following conditions must apply:

- The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or
- The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or
- The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.

From the registered VCS PD:

> *Considering the applicability conditions, UHESP can use ACM0002 methodology as it is a new hydropower plant with a power density greater than 4 W/m^2.*

The change in the installed capacity of the plant (carried in January 2012) does not affect the conclusion in the registered PD, therefore, the methodology is still applicable.

Considering explanations above, modifications in the project plant did not impact application of the Approved Baseline and Monitoring Methodology in which the project activity was registered. Additionally, according to the VCS Standard, an official letter requesting the VCS Team approval of using a monitoring plan deviation to catalogue the modification of the installed capacity to the project was sent on March 27th 2012 and the project participants receive the VCS Team approval on March 30th 2012.

All documents related to the request for approval of the monitoring plan deviation are available with the Project Participants and will be presented to the DOE during verification.

2.3 Grouped Project

Not applicable.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

All the data and parameters will be monitored during the credit period. For more details, please refer to the section 3.2 below.

3.2 Data and Parameters Monitored

Data Unit / Parameter:	$EG_{facility,y}$
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:	Project sponsor and the power utility/CCEE.
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.
Frequency of monitoring/recording:	Hourly measurement and monthly recording.
Value monitored:	1,171,440
Monitoring equipment:	There are six energy meters (principal and backup): 2 installed at the power plants and 4 installed at the local substation, which continuously monitor the electricity generated by the plant and delivered to the grid. Their specification is detailed below in section 3.3. As per the information presented above, they are calibrated every two years following the recommendations of the System National Operator. Last calibration of the equipment took place in 2011. In this sense, the calibration is still valid and is due in 2013.
QA/QC procedures to be applied:	The equipments used have by legal requirements extremely low level of uncertainty.
Calculation method:	Not applicable.
Any comment:	-

Data Unit / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data:	Project site and official data source.
Description of measurement methods and procedures to be applied:	Installed capacity determined by official entities and can be confirmed during on-site visit verifications.

Frequency of monitoring/recording:	Data will be archived in paper format and will be monitored yearly.
Value monitored:	191,890,000
Monitoring equipment:	Not applicable.
QA/QC procedures to be applied:	Determined based on recognized standards with no possibility of uncertainty.
Calculation method:	Not applicable.
Any comment:	A deviation from the Monitoring Plan was applied to the project activity due the increase in the installed capacity of the plant. For more details, please refer to the section 2.2.

Data Unit / 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:	Project site and official data source.
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).
Frequency of monitoring/recording:	Monthly measurement and recording.
Value monitored:	150,000
Monitoring equipment:	-
QA/QC procedures to be applied:	Determined based on recognized standards with extremely low level of uncertainty.
Calculation method:	Not applicable.
Any comment:	-

Data Unit / 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 "*Tool to calculate the emission factor for an electricity system*".
Source of data:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC). Information

	available at: <http://www.mct.gov.br/index.php/content/view/72764.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.
Frequency of monitoring/recording:	-
Value monitored:	0.2011 for 2011 year
Monitoring equipment:	-
QA/QC procedures to be applied:	Official source of data.
Calculation method:	
Any comment:	-

Data Unit / 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 "*Tool to calculate the emission factor for an electricity system*".
Source of data:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC). Information available at: <http://www.mct.gov.br/index.php/content/view/72764.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 *ex-ante* vintage for the calculation of the emission factor. Therefore, the emission factor will be calculated ***ex-post*** applying the numbers provided by the Brazilian DNA.
Frequency of monitoring/recording:	-
Value monitored:	0.2965 for 2011 year
Monitoring equipment:	-
QA/QC procedures to be applied:	Official source of data.
Calculation method:	-
Any comment:	-

Data Unit / 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:	Brazilian DNA (Comissão Interministerial de Mudança Global do Clima – CIMGC). Information available at: <http://www.mct.gov.br/index.php/content/view/72764.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 ***ex-post*** applying the numbers provided by the Brazilian DNA. Numbers provided by the Brazilian DNA will be applied during the project verification.
Frequency of monitoring/recording:	-
Value monitored:	0.1056
Monitoring equipment:	
QA/QC procedures to be applied:	Official source of data.
Calculation method:	-
Any comment:	-

3.3 Description of the 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: 1 principal meter installed at each one of the generating units (total of 2 principal meters), which measure the gross energy, and 4 meters (2 principal meters and 2 backup meters) 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 used at UHE Salto Pilão.

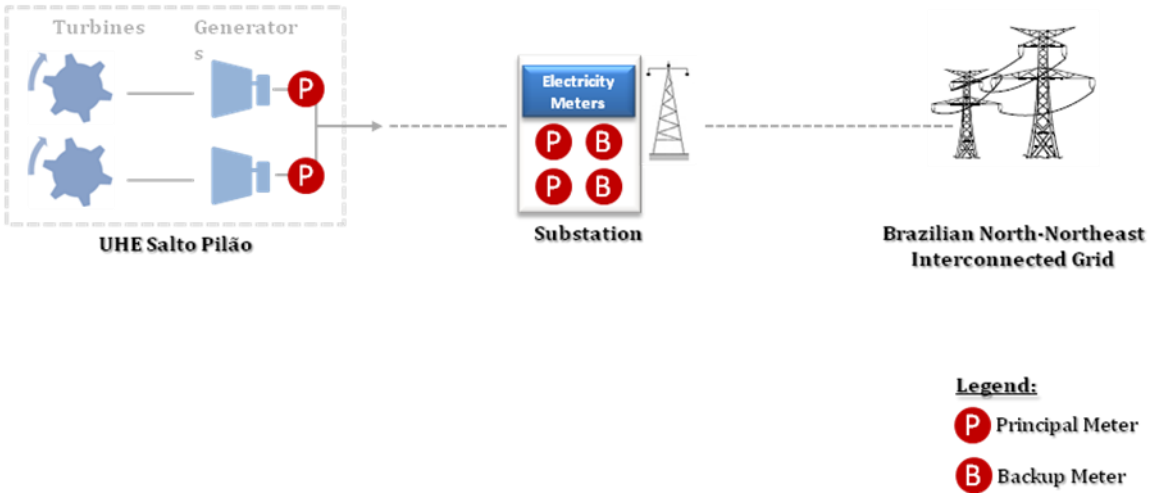

Figure 3 below is a diagram which presents the relevant monitoring points:

Table 3 - Meters description

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

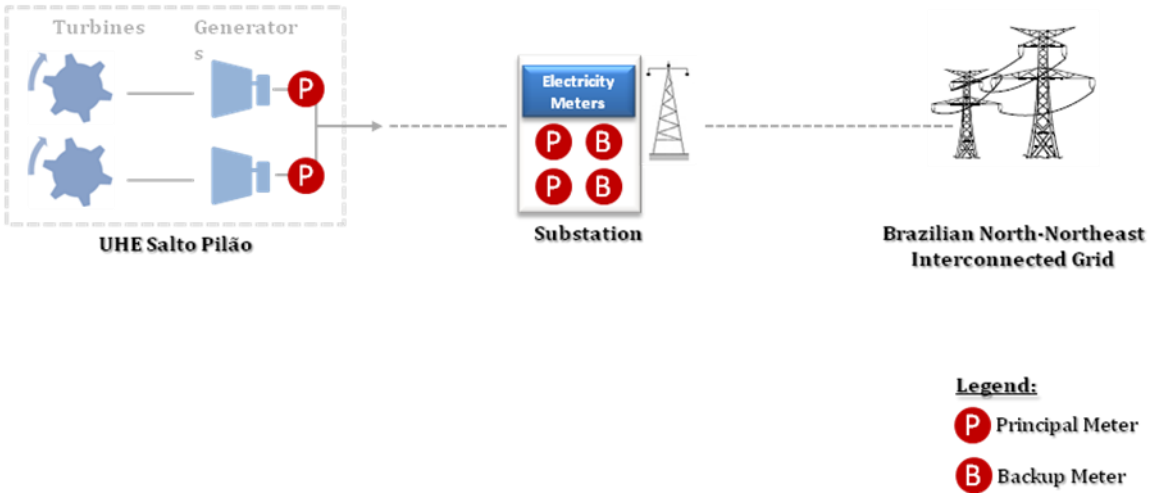

Figure 3 - Diagram of the relevant monitoring points

According to ONS procedures[13], these meters have to be calibrated every two years after operation starts. All meters calibration is made following the necessary requirements.

[13] 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 webiste: http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.3_Rev_1.0.pdf

The table below presents the dates in which the meters mentioned above were 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	*Location*		*Number*	*Calibration Date*	*Re-calibrated date*
Salto Pilão	Power Plant	Principal	PT-0812A276-01	08/06/2009	02/06/2011
		Principal	PT-0811A790-01	08/06/2009	30/03/2011
	Substation	Principal	PT-0902A536-01	08/06/2009	02/06/2011
		Back-up	PT-0903A301-01	08/06/2009	02/06/2011
		Principal	PT-0903A335-01	08/06/2009	30/03/2011
		Back-up	PT-0903A346-01	08/06/2009	30/03/2011

As it can be seen from data presented in the above table, the last calibration of the principal and back-up meters occurred on 02/06/2011 for the first generation unit and 30/03/2011 for the second generation unit. Therefore, the meters calibrations were made following ONS procedures.

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 monitoring equipments, 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 are being carried out according to the regulations of the environmental agencies, through a team of environment experts, who are also monitoring 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 adopted during the construction phase. These measures have been taken seriously. Data about environmental impact are being archived by the hydropower plant and the environmental agency.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Emission reductions (ER_y)

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

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

Where:

ER_y = Emission reductions in year y (tCO_2e/yr);

BE_y = Baseline emissions in year y (tCO_2/yr);

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

Baseline emissions (BE_y)

Baseline emissions are calculated using the annual electricity dispatched to the grid (**$EG_{facility,y}$**) times the CO_2 baseline emission factor (EF_y), as follows:

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

Where:

BE_y = Baseline emissions in year y (tCO_2/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 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*" (tCO_2/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:

$$EG_{PJ,y} = EG_{facility,y} \qquad \textbf{Equation 3}$$

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 ($EG_{facility,y}$)

The period of this project VCS verification is from March 1st 2011 to March 31th, 2012. 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	2011	2012
January	-	112,224
February	-	112,013
March	119,635	47,220
April	82,408	-
May	83,099	-
June	64,016	-
July	127,998	-
August	116,158	-
September	102,193	-
October	79,615	-
November	81,945	-
December	42,916	-
Total	**899,983**	**271,457**

Source: *CCEE – Câmara de Comercialização de Energia Elétrica*

CO_2 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 factor apply to this monitored period correspond to 0.2011 tCO_2/MWh for 2011 year.

Considering Equation 2, the baseline emissions are as follow:

Table 6 – Baseline emissions in tCO_2

Month	2011		2012	
	$EG_{facility,y}$ (MWh)	BE_y (tCO_2)	$EG_{facility,y}$ (MWh)	BE_y (tCO_2)
January	-	-	112,224	22,565
February	-	-	112,013	22,522
March	119,635	24,055	47,220	9,495
April	82,408	16,570	-	-
May	83,099	16,709	-	-
June	64,016	12,872	-	-
July	127,998	25,737	-	-
August	116,158	23,356	-	-
September	102,193	20,546	-	-
October	79,615	16,008	-	-
November	81,945	16,477	-	-
December	42,916	8,629	-	-
TOTAL	**899,983**	**180,960**	**271,457**	**54,582**

4.2 Project Emissions

New hydro electric power projects resulting in new reservoirs, shall account for CH_4 and CO_2 emissions from reservoirs, 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:

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

Where:

PEy = Emission from reservoir expressed as tCO_2e/year;

EF_{Res} = Default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO_2e/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/m^2, PEy = 0.

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad \textbf{Equation 5}$$

Where:

PD = Power density of the project activity, in W/m^2.

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 (m^2).

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 (m^2). For new reservoirs, this value is zero.

For Salto Pilão HPP:

Capacity of the project = 191.89 MW

Reservoir area = 0.15 km^2

Power density = 191.89 / 0.15 = 1,279.27 W/m^2, so **PE_y = 0**.

4.3 Leakage

There is no leakage emissions involved in the project.

4.4 Summary of GHG Emission Reductions and Removals

The emission reductions due to the project activity during the monitored period are summarized below:

Table 7: Emission reduction over the monitored period

Year	*UHE Salto Pilão*	
	Month	*Emission Reduction (tCO_2e)*
2011	March	24,055
	April	16,570
	May	16,709
	June	12,872
	July	25,737
	August	23,356
	September	20,548
	October	16,008
	November	16,477
	December	8,629
	TOTAL 2011	**180,960**
2012	January	22,565
	February	22,522
	March	9,495
	TOTAL 2012	**54,582**
TOTAL		**235,542**

5 ADDITIONAL INFORMATION

No additional information is applicable for this monitoring period.