1ST VERIFICATION
FOZ DO CHAPECÓ HYDRO POWER PLANT

Foz do Chapecó
Foz do Chapecó Energia S.A.

Document Prepared By Enerbio Consultoria

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Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of Project

The project activity consists on the supply of clean hydroelectric energy to the Brazilian National Interconnected System (SIN) through the implantation and operation of Hydro Power Plant (HPP) Foz do Chapecó, located in the Southern Region of Brazil, between the cities of Águas de Chapecó, state of Santa Catarina (SC) and Alpestre, state of Rio Grande do Sul (RS), with an installed capacity of 855 MW, using a small reservoir, with low environmental impact related to its installed capacity.

Foz do Chapecó Hydro Power Plant generates electricity through clean and renewable source and it contributes to attend the growing demand for electricity in Brazil, due to the country's economical and population growth, contributing, thus, to the environmental, social and economical sustainability, by increasing the participation of clean and renewable energy in relation to the country's total consumption of electricity.

Baseline scenario establishes that electricity delivered to the grid by the project activity would have been generated otherwise by the operation of a grid-connected power plant and by the addition of new generating sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (Version 2.2.1). This Tool is from the Clean Development Mechanism (CDM).

The alternative scenarios to the project activity are two situations which reflect the calculation of the combined margin of baseline scenario: (i) the continuity of the present scenario, with electricity generation happening according to the current generation composition of the National Interconnected System, more specifically of the South Subsystem and (ii) the construction of a new mineral coal thermoelectric power plant.

1.2 Sectoral Scope and Project Type

Foz do Chapecó Project fits in the category of sectoral scope 1 - Energy (renewable/non-renewable) and it is not a grouped project.

1.3 Project Proponent

Foz do Chapecó Project has two participants: Foz do Chapecó Energia S.A. and Enerbio Consultoria Ltda. – ME.

Foz do Chapecó Energia S.A. is the owner of Foz do Chapecó Hydro Electric Plant and it is responsible, in the condition of independent producer of energy, for implanting and operating the

HPP Foz do Chapecó. Foz do Chapecó Energia has as shareholders the companies (1) CPFL Geração de Energia S.A., 51%; (2) Furnas Centrais Elétricas, 40%; (3) CEEE-GT Companhia Estadual de Geração e Transmissão de Energia Elétrica, 9%.

Enerbio Consultoria Ltda - ME advises Foz do Chapecó Energia to develop VCS Project and to monitor the VCUs to be generated from Foz do Chapecó Project.

Detailed contact information of Foz do Chapecó and Enerbio Consultoria Ltda - ME are listed below:

Organization name	Foz do Chapecó Energia S.A.
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1.4 Other Entities Involved in the Project

Not applicable.

1.5 Project Start Date

14/10/2010 (Operation Starting Date of the First Turbine)

1.6 Project Crediting Period

The Project crediting period is 14/10/2010 to 14/10/2020. The total number of years is 10 years renewed at most two times.

1.7 Project Location

HPP Foz do Chapecó is located in Uruguay River, between the municipalities of Águas de Chapecó/SC and Alpestre/RS, in Brazil. The geographic coordinates are: Latitude 27° 08' 24" South and Longitude of 53° 02' 36" West[1].

1.8 Title and Reference of Methodology

- Version 13.0.0 of consolidated baseline and monitoring methodology ACM0002 - Methodology Consolidated for grid-connected electricity generation from renewable sources.
- Version 2.2.1 of "Tool to calculate the emission factor for an electricity system".

For more information about the methodology consult the following website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

Project activity has been in commercial operation since 14/10/2010.

The amount of net electricity generation in 2010 (October to December) was 479,182.761MWh, in 2011 was 4,932,552.424 MWh and in 2012 (January to June) was 807,614.138 MWh.

The turbines started operation at:

Unit 1: 14/10/2010

Unit 2: 23/11/2010

Unit 3: 30/12/2010

[1]Available at: http://www.aneel.gov.br/cedoc/dsp2007911.pdf

Unit 4: 12/03/2011

Hydrological conditions and rainfall in the region can affect electricity generation and, consequently, it can also affect emission reductions. The emission reductions can also be affected by the variability of the Brazilian Grid emission factor. It is important to highlight that this electricity generation variability is normal once it is highly associated to rainfall regime.

In 2011, the river had a river flow[2] of 2,059 m^3/s. However the historical series between 1931 and 1994 had a river flows of 1,247 m^3/s[(3)]. Therefore, this increase of electricity delivered to the grid was directly related to the hydraulic generation, which depends significantly on the volume of water in the basin of the rivers in which the plant is located. Scarce rains, floods, or any other natural factor may cause an impact on the generation capacity of the project.

In 2012 (January to June), due the absence of rainfall, the river had a river flow[4] of 526m^3/s. 67.4% less than 2011 (January to June). Therefore, the net electricity generated by the project was minor than 2011.

The assured energy considers a long term historical series of the river's flow and the rainfall regime of the region. Electricity generation variability is normal once it is highly associated to rainfall regime. But, in the long-term and during all the concession period, electricity generation should be closed to the assured electricity.

The assured energy[5] is formally calculated and established for commercial purposes by the regulators (MME - Ministry of Mines and Energy[6]). The marketable product of a hydro power plant in Brazil is the assured energy. These values are the maximum quantity of electricity that can be sold under long term contracts.

The table below shows the electricity variation between the assured energy and the net electricity.

Table 1 – Variation Electricity

Year	Assured Energy (MWh)	Net Electricity supplied to the Grid (MWh)	Variation %
2010 (Oct-Dec)	809,424.000	479,182.761	-40.80%

[2] Report FUNDAGRO: Relatório de vazão 2011

[3] Source: http://www.ons.org.br/operacao/previsao_vazoes.aspx accessed in September/2012 and in the evidence file name: HFC-RT1P-GEG00-1001-0" page 18/130.

[4] Report FUNDAGRO: Relatório de vazão 2012

[5] ANNEL – Assured Energy, page 09

[6] Concession Contract , page 4.

2011	3,784,320.000	4,932,552.424	30.34%
2012 (Jan-Jun)	1,892,160.000	807,614.138	-57.32%

2.2 Deviations from the Monitoring Plan

The meters should have been calibrated in august/2011, because the first calibration happened in august/2009 and the monitoring plan predicted that calibration should occur every two years. However a new calibration was just carried out on 29 February 2012. Therefore, between 27/07/2011 to 29/02/2012, the meters were not calibrated.

Thus, during this period, the net electricity generated by Foz do Chapecó was calculated according to the item "a" and with the table 01, appendix -1 of the "Guidelines for assessing compliance with the calibration frequency requirements", version 01.

2.3 Grouped Project

Not applicable.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	Cap_{bl}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plant the value is zero.
Source of data:	Project site
Value applied:	0
Purpose of the data:	As HPP Foz do Chapecó is a new power plant, this value is 0 (zero).
Any comment:	-

Data Unit / Parameter:	A_{BL}
Data unit:	m^2
Description:	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.
Source of data:	Project site
Value applied:	0
Purpose of the data:	As HPP Foz do Chapecó is a new power plant, this value is 0 (zero).
Any comment:	-

3.2 Data and Parameters Monitored

Data Unit / Parameter:	Electricity Supplied to the Grid – Net Electricity ($EG_{facility,y}$)
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data:	Project Activity Site (Meters).
Description of measurement methods and procedures to be applied:	The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid Spreadsheets were used, obtained directly from the meters with information generated hourly, or according to what was programmed by CCEE (Câmara de Comercialização de Energia Elétrica/ Electric Power Commercialization Chamber). Monthly, the information was checked with the generation spreadsheets available at the CCEE's website. Besides, information of generation can be checked by receipt of sales, if it is necessary to do so.
Frequency of monitoring/recording:	Continuous measurement and at least monthly recording.
Value monitored:	The values of $EG_{facility,y}$ for each year are: Year

	2010: 479,182.761; year **2011**: 4,932,552.424; Year **2012** 807,614.138. These values can be checked in the CCEE official generation spreadsheet of 2010, 2011, 2012. The evidences were provided to the auditors.
Monitoring equipment:	Each Generation Unit has two specific meters (principal and backup) located in the substation that registers the net electricity supplied to the Grid by the Unit. Each meter has the same model. The manufacturer is Schneider, model ION8600C, with accuracy class 0.2. The serial numbers of the main meters are: PT-0902A259-01 (UG1), PT-0907A212-01 (UG2), PT-0907A215-01 (UG3), PT-0902A220-01 (UG4). The serial numbers for back up meters are: PT-0902A301-01 (UG1), PT-0810A884-01 (UG2), PT-0907A574-01 (UG3), PT-0907A571-01 (UG4).
QA/QC procedures to be applied:	The uncertainty level for these data is low. They are used to calculate the emission reductions. The electricity generated is monitored by the project participants and checked by spreadsheets available at the CCEE`s Website (information comparison between operation data and CCEE reports). The first calibrations of the principal and rear meters for UG1 were in: *10/08/2009 (both)*, for UG2 were in: *11/09/2009* and *27/07/2009*, for UG3 were in *11/09/2009 (both)* and UG4 were in *10/08/2009* and *11/09/2009.* ONS Grid Procedures (Sub-module 12.3) establishes calibration frequency and other maintenance procedures. By the time of completion of this document, the frequency of calibration is a maximum of two years, but in the case of any changes occurred in the ONS Grid Procedures, the project owners shall follow the

	rules from the relevant sector organizations (e.g. ONS, ANEEL, CCEE). The meters should had been calibrated in august/2011. However a new calibration was just carried out on 29 February 2012. Therefore, between 27/07/2011 to29/02/2012, the meters were not calibrated. However, according to the "Guidelines for assessing compliance with the calibration frequency requirements", version 01, paragraph 04, if during verification of a certain monitoring period, the DOE identifies that the calibration has been delayed and the calibration has been implemented after the monitoring period in consideration (i.e. the results of delayed calibration are available), the DOE may conclude its verification, provided the following conservative approach is adopted in the calculation of emission reductions: (a) Applying the maximum permissible error of the instrument to the measured values, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error; or (b) Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment. The company controls the information of net electricity generation in a consolidated way (considering the four generator units), Thus, during this period, the net electricity generated by Foz do Chapecó was calculated according to the item "a" and with the table 01, appendix -1 of this same guidelines.
Calculation method:	The electricity supplied to the grid is calculated in

	a direct way with information controlled by the meters. For the period of August/2011 to February/2012, the requirements of the Guidelines for assessing compliance with the calibration frequency requirements were followed once the meters were just calibrated on 29 February, 2012.
Any comment:	-

Data Unit / Parameter:	$EF_{grid,CM,y}$ - Combined Margin CO_2 Emission Factor
Data unit:	tCO_2/MWh
Description:	The 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". The combined margin CO_2 emission factor used on Foz do Chapecó Project was calculated based on data supplied for the National Interconnected System by Brazilian DNA.
Source of data:	Ex-post emission factor was calculated by project participants with data supplied by MCTI with ONS data. The variables $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$, necessary for $EF_{grid,CM,y}$ calculation, was also monitored and calculated by MCTI and ONS, through the Dispatch Data of the National Interconnected System.
Description of measurement methods and procedures to be applied:	As described in the most recent version of the "Tool to calculate the emission factor for an electricity system".
Frequency of monitoring/recording:	Annually
Value monitored:	The values of Combined Margin CO_2, Emission Factor $EF_{grid,CM,y}$ 2010 is: 0.3095 tCO2/MWh

	Factor $EF_{grid,CM,y}$ 2011 is: 0.1988 tCO2/MWh Factor $EF_{grid,CM,y}$ 2012 is: 0.1988 tCO2/MWh[7]
Monitoring equipment:	As per the "tool to calculate the emission factor for an electricity system".
QA/QC procedures to be applied:	As described in the most recent version of the "Tool to calculate the emission factor for an electricity system". The uncertainty level for these data is low.
Calculation method:	As per the "tool to calculate the emission factor for an electricity system". Dispatch Data Analysis OM is the Operation Margin Emission Factor method used and the build margin emission factor is updated annually. Both Operating Margin Emission Factor and Build Margin Emission factor are supplied by MCTI. The combined margin emission factor considers the default value of 0.5 for each Emission factor as recommended by the methodology.
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
Description of measurement methods and procedures to be applied:	The installed capacity is monitored annually by ANEEL, environment regulators or by sub-hired companies, according recognized standards. It will be monitored yearly.
Frequency of monitoring/recording:	Yearly
Value monitored:	855,000,000 W

[7] For 2012, it was adopted 2011 vintage for build margin and operation margin calculation as they are the latest data available at de Brazilian DNA website. Accessed on September 2012.

Monitoring equipment:	The generator capacity at the project site
QA/QC procedures to be applied:	The uncertainty level for these data is low. The installed capacity is determined on the project's beginning and it will be monitored by the Regulator Agent.
Calculation method:	The total of 4 generators capacity (nominal power of 213.75 MW each generator)
Any comment:	-

Data Unit / Parameter:	A_{pj}
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data:	Project site
Description of measurement methods and procedures to be applied:	Measured from topographical surveys and satellite pictures. The reservoir area is also controlled by Brazilian Environmental Agency (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA) through the operation license. The reservoir area is defined by the engineering project and it would just change due to modifications in the project. To promote any changes in the reservoir area is necessary to have approvals by Environmental Agency. Therefore, the Operation License is an evidence for reservoir area.
Frequency of monitoring/recording:	Yearly

Value monitored:	The area of the reservoir of HPP Foz do Chapecó is 79,930,000 m^2 from the "principal reservoir"[8] + 90,000 m^2 from the "passage way"[9]. Total of 80,020,000 m^2.
Monitoring equipment:	Topographical measurement to measure the area of the reservoir.
QA/QC procedures to be applied:	The uncertainty level for these data is low. The reservoir area is monitored by environment regulators.
Calculation method:	The flooded area is demarcated by pickets. Each picket has precise geographical coordinates which generate a faithful reference to the area flooded. After the fulfillment of the reservoir, the water levels will get the base of each picket that will be monitored systematically during the plants operation. The level of water near to the pickets assures that the area of the reservoir is not changed.
Any comment:	-

3.3 Description of the Monitoring Plan

Monitoring has the objective of measuring the emission reductions achieved by the project. To elaborate the monitoring plan, it was followed the Monitoring Methodology present in consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 13.0.0 (methodology applied to the project).

The main parameters that were controlled were:

- Net Electricity Supplied to the Grid (MWh);

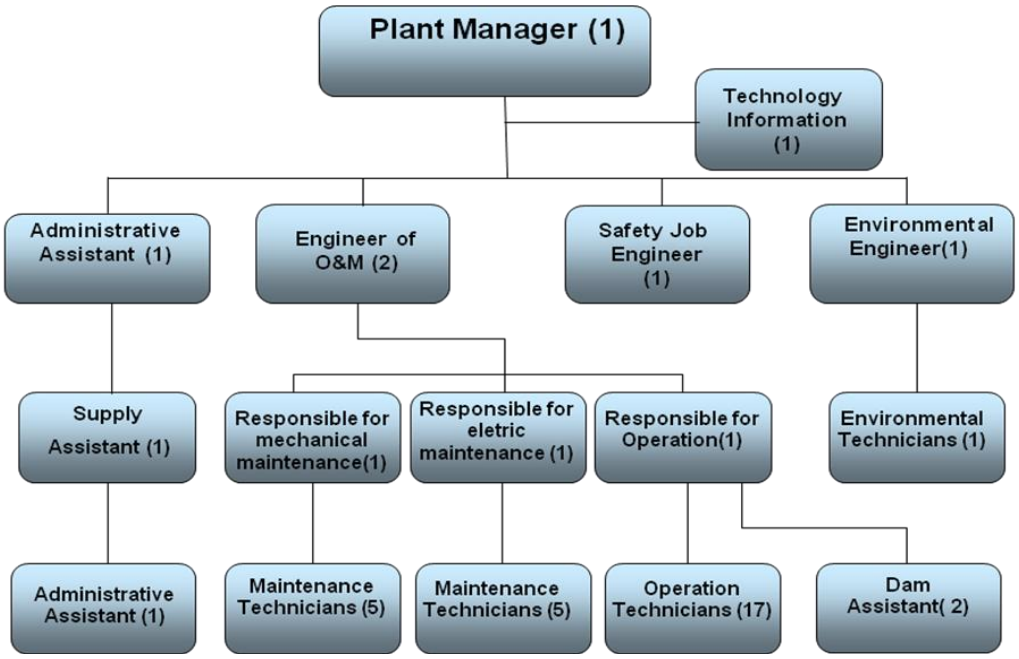
[8] ANEEL's Dispatch 911 of 30/03/2007 for flooded reservoir area of 79.93 km^2

[9] Consolidated Basic Engineering Project prepared by CENEC Engenharia S.A. "HFC-RT1P-GEG00-1001-0"

- Emission Factor for Electricity Generation Connected to the Brazilian Interconnected Grid (tCO_2e/MWh);

HPP Foz do Chapecó Operation and Maintenance Manager is responsible for the operation and maintenance activities of the plant and for the activities of consolidation and analysis of gross and net electricity. Measurements activities are carried out by the operators of the Technology Information team.

The organizational structure of the company is presented below:



Each generator unit has three measurement instruments, Model ION8600C – Schneider, with accuracy class 0,2. One of them is located in the Powerhouse and it measures the gross electricity generated by the unit and the other two, called “Principal” (Main) and “Retaguarda” (Rear), are located in the substation with the objective of measuring net electricity.

Daily, operators of Foz do Chapecó operation team collects electricity generation data from each meter. This activity occurs online with the software. Information of net electricity supplied by the principal meters is consolidated in one spreadsheet.

Data of net electricity generation may be confronted with the information present in the website of the CCEE (Câmara de Comercialização de Energia Elétrica/ Electric Power Commercialization Chamber) (CCEE - Entity responsible for measurements, accounting and settlement on Brazilian electric energy market).

The emission factor for power generation connected to Brazilian National Interconnected System was made available by Ministry of Science, Technology and Innovation (MCTI) with data of National System Operator, ONS. The variables $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ were calculated and monitored by Enerbio Consultoria through the dispatch data of National Interconnected System. Emission reductions calculations are carried out by Enerbio team.

ONS Grid Procedures (Sub-module 12.3) defines the calibration frequency and other maintenance procedures. By the time of completion of this document, the frequency of calibration is a maximum of two years, but in the case of any changes occurred in the ONS Grid Procedures, the project owners shall follow the rules from the relevant sector organizations (e.g. ONS, ANEEL, CCEE).

All eight meters of the substation plant were calibrated in different dates.

Table 2 – Calibration date

Unit Generator	Type	Location	Meters	Serial Numbers	1st Calibration date	2nd Calibration date
GEU1P	Net	substation	Main	PT-0902A259-01	10/08/2009	29/02/2012
GEU1R	Net	substation	Back-up	PT-0902A301-01	10/08/2009	29/02/2012
GEU2P	Net	substation	Main	PT-0907A212-01	11/09/2009	29/02/2012
GEU2R	Net	substation	Back-up	PT-0810A884-01	27/07/2009	29/02/2012
GEU3P	Net	substation	Main	PT-0907A215-01	11/09/2009	29/02/2012
GEU3R	Net	substation	Back-up	PT-0907A574-01	11/09/2009	29/02/2012
GEU4P	Net	substation	Main	PT-0902A220-01	10/08/2009	29/02/2012
GEU4R	Net	substation	Back-up	PT-0907A571-01	11/09/2009	29/02/2012

All eight meters were calibrated on February 2012 by Metrum and are according to the specifications of ONS. The standard used in these calibrations is calibrated in regular intervals, in INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia/National Institute of Metrology, Quality and Technology) and/or in accrediting agency by the same, with the calibration Brazilian Network Seal.

According to the “Guidelines for assessing compliance with the calibration frequency requirements”, version 01, paragraph 04, if during verification of a certain monitoring period, the

DOE identifies that the calibration has been delayed and the calibration has been implemented after the monitoring period in consideration (i.e. the results of delayed calibration are available), the DOE may conclude its verification, provided the following conservative approach is adopted in the calculation of emission reductions:

(a) Applying the maximum permissible error of the instrument to the measured values, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error; or

(b) Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment.

Thus, during this period , the net electricity generated by Foz do Chapecó was calculated according to the item “a” and with the table 01, appendix -1 of these same guidelines.

In HPP Foz do Chapecó, there is a Measurement Billing System (SMF- From the Portuguese Sistema de Medição de Faturamento) according the technical specifications defined by ONS Grid Procedures. The communication of this SMF with CCEE occurs directly through a VPN (Virtual Private Network) and, this way, SCDE (Sistema de Coleta de Dados de Energia Elétrica/ Electric Power Data Collection System) has direct access to the mass memory of the electricity meters.

Monthly, HPP Foz do Chapecó operators collect in the electricity meters mass memory, gross and net hourly generation data of generation unit referring to the previous month. These data are compiled in a unique spreadsheet which is the HPP internal control generation spreadsheet for the referred month under analysis.

Information present in internal control generation spreadsheet was confronted with SCDE spreadsheet. SCDE spreadsheets provide electricity generation values identical to the values of the HPP internal control generation spreadsheet. However, for emission reductions calculation, it was used electricity generation data of CCEE General Measurement Report, present in the CCEE website. This data is consisted by the net electricity generation minus losses, setting, therefore, a more conservative value.

Both generation information, internally generated and through CCEE website, are electronically stored by the Operation and Maintenance Manager.

Enerbio cross-checks internal control generation spreadsheet with electricity generation data supplied by CCEE. If non-conformities are identified, an email is sent to Operation and Maintenance Foz do Chapecó Manager. The non-conformity is investigated and if the problem is in the internal control, the spreadsheet is corrected.

It is important to say that electricity generation information impacts directly the revenues of Foz do Chapecó once electricity is the main product of the project. Therefore, a straight control is performed about this information.

The emission reduction calculation is done by Enerbio analyst and revised by Enerbio's manager.

Periodically, the Information Technology Area accomplishes an insurance backup for all plant data through backup tapes.

All data collected as part of the monitoring will be archived and be kept for at least 2 years after the end of the last crediting period.

HPP Foz do Chapecó is in processing of deployment ISO 14001, ISO 9001 and OHSAS. The certification will occur in December 2012.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

To monitor Baseline emissions is necessary to monitor also the electricity supplied to the grid (EG_y) and the Combined Margin Emission Factor and its components.

The baseline methodology ACM0002, version 13.0.0, establishes that baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emission is calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \qquad \textbf{Equation 1}$$

Where:

BE_y = Baseline Emission 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).

Table below provides an overview of the data collected to monitor and to calculate Baseline Emissions of Foz do Chapecó Project for this monitoring period.

Table 3 – Baseline emissions

Years	EFgrid,OM* (tCO_2/MWh)	EFgrid,BM* (tCO_2/MWh)	W_{OM}	W_{BM}	EFgrid,CM* (tCO_2/MWh)	Net Electricity - EGy (MWh/yr)	BEy (Baseline Emissions) (tCO_2e/yr)
2010	0.4787	0.1404	0.5	0.5	0.3095	479,182.761	148,323.037
2011	0.2920	0.1056	0.5	0.5	0.1988	4,932,552.424	980,488.660
2012	0.2920	0.1056	0.5	0.5	0.1988	807,614.138	160,536.865
TOTAL						6,219,349.322	1,289,348.563

4.2 Project Emissions

According to ACM0002 (version 13.0.0) methodology, the project emissions and the power density are calculated below.

For most renewable power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \qquad \textbf{Equation 2}$$

Where:

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

$PE_{FF,y}$, = Project emissions from fossil fuel consumption in year y (tCO_2e/yr)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, estimated as follows:

(a) If the power density of the single or multiple reservoirs is greater than 4 W/m^2 and less than or equal to 10 W/m^2.

$$PE_{HP,y} = EF_{Res} * TEG_y \qquad \textbf{Equation 3}$$

1000

Where:

$PE_{HP,y}$ = Project emissions from water reservoirs (tCO_2e/yr)

EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year y ($kgCO_2e/MWh$)

TE_{Gy} = 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 the power density of the project activity is greater than 10 W/m^2

$PE_{HP,y} = 0$

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ **Equation 4**

Where:

PD = Power density of the project activity (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 single or multiple reservoirs 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 single or multiple reservoirs 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

The power density of Foz do Chapecó Power Plant is 10.68 W/m^2. Therefore emissions from its reservoir must not be considered.

4.3 Leakage

There is no leakage for the project activity according to methodology ACM 0002 (Version 13.0.0).

4.4 Summary of GHG Emission Reductions and Removals

Project emission reduction is calculated according version 13.0.0 of ACM0002 methodology. As mentioned previously, LE_y and PE_y are zero. Emission reduction is calculated as described below:

$ER_y = BE_y – PE_y$ **Equation 5**

Where:

ER_y = Emission Reduction in year y (tCO_2e/yr)

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

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

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

Table 4 – Emissions Reductions

Year	Emission Reduction (tCO_2e/yr)
2010 (October until December)	148,323.037
2011 (January until December)	980,488.660
2012 (January until June)	160,536.865
Total	**1,289,348.563**

5 ADDITIONAL INFORMATION

No additional information is applicable for this monitoring period.