BAESA PROJECT

Document Prepared By Enerbio Consultoria

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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) Barra Grande, located in the Southern Region of Brazil, between the cities of Anita Garibaldi, state of Santa Catarina and Pinhal da Serra, state of Rio Grande do Sul, with an installed capacity of 708 MW, using a small reservoir, with low environmental impact related to its installed capacity.

Barra Grande 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. The installation of HPP Barra Grande provides the generation of enough electricity to the supply of 30% of the energetic demand of the state of Santa Catarina or 20% of the total energy consumed in the state of Rio Grande do Sul.

The scenario prior to the implantation of the project pointed to an important presence of thermoelectric power plants in the national energetic matrix (second greatest source of energy in the country), with total concentration of coal thermoelectric power plants (greatest contributors for the emission of CO_2 in the national energetic matrix) being in the Southern Region of the country, where BAESA Project is located. Moreover, the projection of the Ministry of Mines and Energy (MME) pointed to a total growth in the offer of thermoelectric energy in the country of 10,486 MW in the period of 2006 - 2015, based mainly on natural gas, oil and mineral coal, sources with more potential to contribute to global warming than the generation provided by the technology implanted by BAESA Project. It is important to highlight that all coal thermoelectric power plants projected by MME to start their operation in the period of 2006 - 2015 are located in the Southern region of the country, where BAESA Project is located.

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".

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.

BAESA Project uses three generator units with three specific meters (for each unit), destined to measure the Project's electricity generation. The project activity reduces the emission of greenhouse gases (GHGs) through the use of renewable sources of energy and making use of clean technology, avoiding the generation of electricity via sources of fossils fuels with consequent emissions of CO_2, that would be generated if the project did not exist. The reservoir of HPP Barra Grande is responsible for emissions of CH_4 which are accounted for and reduced from the total project emission reduction.

More information about the project activity can be found in the following website: https://vcsregistry1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=16

1.2 Sectoral Scope and Project Type

BAESA Project fits in the category of sectoral scope 1 – Energy Industries (Renewable Source) and it is not a grouped project.

1.3 Project Proponent

BAESA Project has two participants: BAESA - Energética Barra Grande S.A. and Enerbio Consultoria Ltda.

Energética Barra Grande S.A is the proprietor of Barra Grande Hydro Electric Plant and it is responsible, in the condition of independent producer of energy, for implanting and operating the HPP Barra Grande. Energética Barra Grande S.A has as shareholders the companies (1) Alcoa Alumínio S.A., 42.1752%; (2) CPFL Geração de Energia S.A., (3) 25.0059%; Companhia Brasileira de Alumínio, (4) 15.0000%; (5) Camargo Corrêa Cimentos S.A., 9.0000% e (6) DME Energética Ltda., 8.8189%.

Enerbio Consultoria Ltda advises Energética Barra Grande S.A to develop VCS Project and to monitor the VCUs to be generated from BAESA Project.

1.4 Other Entities Involved in the Project

Not applicable.

1.5 Project Start Date

11/01/2005 (Operation Starting Date of the First Turbine).

1.6 Project Crediting Period

01/01/2006 to 31/12/2015. Project crediting period is 10 years renewed at most two times.

1.7 Project Location

HPP Barra Grande is located in Pelotas River, about 43 km from its confluence with Canoas River, between the municipalities of Anita Garibaldi/SC and Pinhal da Serra/RS in Brazil. The geographic coordinates are: Latitude 27º46'South and Longitude of 51º13' West.

The reservoir formed by the Plant occupies an area of 94 km², partially flooding the areas of 9 municipalities: Anita Garibaldi, Cerro Negro, Campo Belo do Sul, Capão Alto and Lages, in Santa Catarina; and Pinhal da Serra, Esmeralda, Vacaria and Bom Jesus, in Rio Grande do Sul.

1.8 Title and Reference of Methodology

- Version 7 of consolidated baseline and monitoring methodology ACM0002 - Methodology Consolidated for grid-connected electricity generation from renewable sources.
- Version 01.1 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 is in commercial operation since 11/01/2005.

The amount net electricity generation in 2009 was 2,984 GWh and in 2010 was 4,164 GWh.

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.

In the 1st Monitoring Period (MP) the net electricity generated was 22% less than assured energy. In 2006 and 2008, the plant generated below the estimated assured energy (59.3% and 14.3%, respectively).

In the 2nd MP the net electricity generation was 7.2 % above the assured energy. One factor very important that contributed to achieve higher emission reductions during the 2nd MP (comparing to the 1st MP) is that during 2010 the net electricity generation was 24.9% above the assured energy and the grid emission factor of this year was 0.3095 (approximately 39% above the medium emission factor of the 1st MP). Therefore, the emission reductions achieved during this specific year was significantly higher that what was observed in the first monitoring period due to two reasons (i) higher emission factor and (ii) more electricity generation.

It is important to highlight that this electricity generation variability is normal once it is highly associated to rainfall regime.

Moreover, it is important to highlight that comparing the total net electricity generation of the two monitoring periods with the assured energy of the project, this net electricity generation is 10.3% below that what was projected accordingly the assured energy.

Therefore, emissions reductions are directly connected to the hydraulic generation of energy, 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 and, consequently, may affect the emission reductions provided by it.

2.2 Deviations from the Monitoring Plan

Not applicable.

2.3 Grouped Project

Not applicable.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	*EFRes*
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs.
Source of data:	This value is supplied by ACM0002 - Methodology Consolidated for grid-connected electricity generation from renewable sources and it was defined by EB (CDM Executive Board) 23 Decision.
Value applied:	The default value as per EB23 is 90 $kgCO_2e/MWh$.
Purpose of the data:	This value was utilized to calculate project emission (PEy).
Any comment:	

3.2 Data and Parameters Monitored

Data Unit / Parameter:	Electricity Supplied to the Grid – Net Electricity (EGy)
Data unit:	MWh
Description:	Electricity supplied by the project activity to the

	grid
Source of data:	Project Activity Site (Meters).
Description of measurement methods and procedures to be applied:	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. Each Generation Unit has two specific meters located in the substation that registers the net electricity supplied to the System by the Unit.
Frequency of monitoring/recording:	Monthly, HPP Barra Grande operators collect, in the electricity meters mass memory, gross and net hourly generation data of generation unit referring to the previous month
Value monitored:	The values of EGy for each year are: Year 2009 - 2,984,606 MWh and Year 2010 - 4,164,863 MWh. Total EGy (2009-2010) value is7,149,469.
Monitoring equipment:	Each Generation Unit has two specific meters 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 ZIV, model 5CTE-E5A-2F6402UC, serie numbers 490186, 490187, 490189, 490190, 490191 and 490192 with accuracy class 0.2%.
QA/QC procedures to be applied:	The uncertainty level for these data is low. They were used to calculate the emission reductions. The electricity generated was monitored by the project participants and checked by spreadsheets available at the CCEE`s Website (information comparison between operation data and CCEE reports). All these meters were calibrated on 11th January 2011 by Metrowatt. Before this date, the meters were also calibrated on September 2008. The two meters of UG1 were calibrated on 18th September 2008;the two meters of UG2 were calibrated on 17th September 2008 and the two meters of UG3 were calibrated on 16th September 2008 by Metrowatt.

	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). In September 2010, the meters should be calibrated. However a new calibration was just carried out on January 2011. Therefore, in the period of September to December 2010, 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 three generator units), Thus, during these four months, the net electricity generated by HPP BAESA was calculated according to the item **b** and with the table 02, appendix -1 of these 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 September to December/2010, the requirements of the *Guidelines for assessing compliance with the calibration frequency requirements* were followed once the meters were just calibrated on

	January/2011.
Any comment:	

Data Unit / Parameter:	Total Electricity Generated (Gross Electricity) (TEG_y)
Data unit:	MWh
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y.
Source of data:	Project Activity Site
Description of measurement methods and procedures to be applied:	Spreadsheets were used, obtained directly from the meters with information generated hourly or according to what was programmed by CCEE. CCEE's readings comprise the sum of the three generating units. Each Generation Unit has one specific meter located in the Powerhouse that registers gross electricity generated by the Unit.
Frequency of monitoring/recording:	Monthly, HPP Barra Grande operators collect, in the electricity meters mass memory, gross and net hourly generation data of generation unit referring to the previous month.
Value monitored:	This data was used to calculate the expected emission reduction just for project emissions calculation, more specifically for reservoir emission calculation. The values of TEG_y for each year are: Year 2009 - 3,086,577 MWh.Year 2010 - 4,300,312. Total TEGy (2009-2010) value is 7,386,889.
Monitoring equipment:	Each Generation Unit has one specific meter located in the Powerhouse that registers gross electricity generated by the Unit. Each meter has the same model. The manufacturer is ZIV, model 5CTE-E5A-2F6402UC, series number 490182, 490183 and 490184 with accuracy class 0.2%. In February 05, 2010 the meter 490182 was replaced by meter 490185.
QA/QC procedures to be applied:	The uncertainty level for these data is low. The electricity generated was monitored by the project participants.

	All these meters were calibrated on 11th January 2011 by Metrowatt. Before this date, the meters were also calibrated on September 2008. The meter of UG1 was calibrated on 18th September 2008, the meter of UG2 was calibrated on 17th September 2008 and the meter of UG3 was calibrated on 16th September 2008, by Metrowatt. 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. In September 2010, the meters should be calibrated. However a new calibration was just carried out on January 2011. The gross electricity meter of Generator Unit 01 (UG01) 490185 was put into operation in February 2010. The company does not have calibration certificate for this meter for this date. However, this meter was also calibrated in January 2011. 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 gross electricity generation in a consolidated way (considering the three units), Therefore, in a

	conservative way, all gross electricity generated by HPP BAESA during period of February 2010 to December 2010, was calculated according to the item **b** and with the table 02, appendix -1 of this same guidelines.
Calculation method:	The gross electricity is calculated in a direct way with information controlled by the meters. For the period of February to December/2010, the requirements of the *Guidelines for assessing compliance with the calibration frequency requirements* were followed once the meters were just calibrated on January/2011. As the company did not present calibration certificate for meter 490185 when it got into operation (February 2010), the procedures recommended by the Guidelines were applied for the period February to December 2010. This meter was also calibrated in January/2011.
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 BAESA 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 the ONS data. The variables EFgrid,OM,y and EFgrid,BM,y, necessary for EFgrid,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 $EF_{grid,CM,y}$ are: Year 2009: 0.1635 tCO2/MWh Year 2010: 0.3095 tCO2/MWh.
Monitoring equipment:	Not applicable
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:	

3.3 Description of the Monitoring Plan

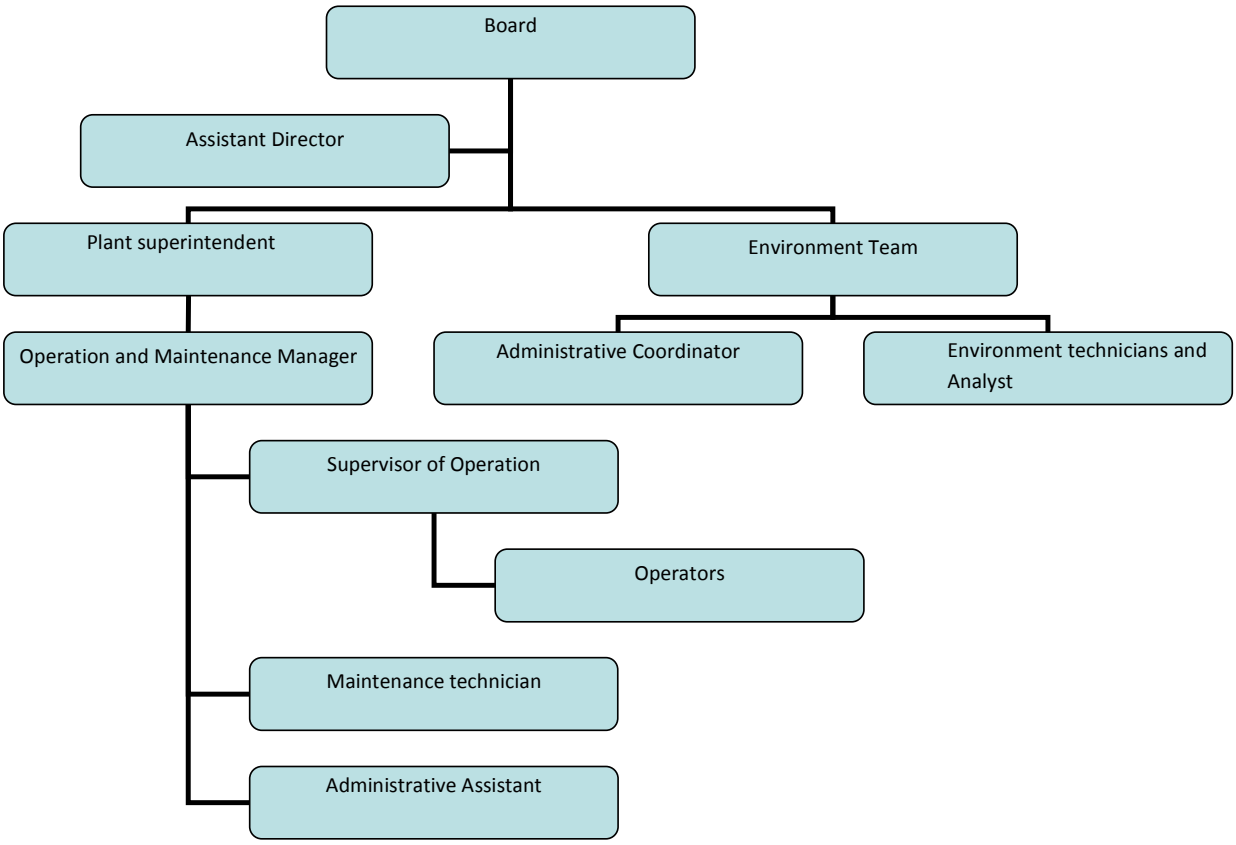
Monitoring has the objective of measuring the emission reductions achieved by the project. To elaborate the monitoring plan, it was followed the Monitoring Methodology present in consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 07 (methodology applied to the project).

The main parameters that were controlled were:

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

HPP Barra Grande 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 operation team.

The organizational structure of the company is presented below:



Each generator unit has three measurement instruments. One of them is located in the Powerhouse and it measures the gross electricity generated by the unit and two of them, called “Principal” and “Retaguarda” (Rear), are located in the substation with the objective of measuring net electricity.

Daily, operators of BAESA operation team collects electricity generation data from each meter. Information of net electricity supplied by the three principal meters is consolidated in one spreadsheet. Information of gross electricity is consolidated in another spreadsheet.

This internal control is supplied every day for one of the shareholders (CPFL) which is responsible for the relations with CCEE.

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 EFgrid,OM,y and EFgrid,BM,y were calculated and monitored by Enerbio Consultoria through the dispatch data of National Interconnected System. Emission reductions calculation are carried out by Enerbio team.

All nine meters of the plant were calibrated on 11th January 2011 by Metrowatt. Before this date, the meters equipment also were calibrated by Metrowatt on 18th September 2008 (meters of UG1), 17th September 2008 (meters of UG2) and 16th September 2008 (meters of UG3) by Metrowatt. All meters were calibrated 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.

In February 05, 2010 the meter 490182 was replaced by meter 490185. The gross electricity meter 490185 was put into operation in February 2010. The company does not have calibration certificate for this meter for this date. However, this meter was also calibrated in January 2011.

ONS Grid Procedures (Sub-module 12.3) defines the calibration frequency and other maintenance procedures. In September 2010, the meters should be calibrated. However a new calibration was just carried out on January 2011.

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 September to December/2010, the net electricity generated by HPP BAESA was calculated according to the item **b** and with the table 02, appendix -1 of this same guidelines.

For Gross Electricity, conservatively, the gross electricity of the period February to December 2010 was calculated also according to the item **b** and to the table 02, appendix -1 of these same guidelines. This procedure was adopted once the meter 490185 did not present the calibration certificate in February/2010.

In HPP Barra Grande, 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 Barra Grande operators collect, in the electricity meters mass memory, gross and net hourly generation data of generation unit referring to the previous month. This 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 the losses of National Interconnected System (approximately 2.5%), 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 BAESA Manager. The non-conformity is investigated and if the problem is in the internal control, the spreadsheet is corrected. Up to now, no non-conformity has happened.

It is important to say that electricity generation information impacts directly the revenues of BAESA once electricity is the main product of the project. Therefore, a straight control is performed about this information. These controls follow the internal auditing processes presented in the management system of the company. It is important to highlight that the company is ISO 9001 and ISO 14001 certified.

The emission reduction calculation is done by Enerbio analyst and revised by Enerbio' manager. BAESA has internal auditing process once the company is certified ISO 9001 and ISO 14001. However, the company did not establish a formal procedures regarding emission reduction monitoring.

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.

The combined margin emission factor EFgrid,CM,y is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \qquad \textbf{Equation 1}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2e/ MWh)

$EF_{grid,OM,y}$ = Operating Margin CO_2 emission in year *y* (tCO_2e/ MWh)

W_{OM} = Weighting of operating margin emissions factor (%)

W_{BM} = Weighting of build margin emissions factor (%)

The CO_2 emission factors of build margin and operating margin is calculated ***ex-post***. CO_2 emission factors from electricity generation verified on Brazilian Interconnected System (SIN) are calculated based on the generation record of plants centrally dispatched by the **National Operator of the System** (From the Portuguese Operador Nacional do Sistema - ONS).

Combined Margin CO_2 Emission Factor was calculated based on data supplied by Ministry of the Science, Technology and Innovation (MCTI) (www.mct.gov.br), institution which chairs the Brazilian DNA of CDM. Operating Margin Emission Factor and Build Margin Emission Factor, necessary data to calculate the Combined Margin Emission Factor were calculated by ONS (National System Operator) and made available by MCTI.

The tool to calculate the emission factor for an electricity system recommends that the following default values should be used for W_{OM} and W_{BM}:

- Wind and Solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.
- All other projects: W_{OM} = 0.5 and W_{BM} = 0.5 for the first crediting period, and W_{OM} = 0.25 and W_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

This way, for BAESA Project, it was adopted the following weights: W_{OM} = 0.50 and W_{BM} = 0.50.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

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

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

Table 1 – Baseline emissions

Year	EFgrid,OM* (tCO2/MWh)	EFgrid,BM* (tCO2/MWh)	W_{OM}	W_{BM}	EFgrid,CM* (tCO2/MWh)	Net Electricity - EGy (MWh/yr)	BEy (Baseline Emissions) (tCO2e/yr)
Total 2009	0.2476	0.0794	0.5	0.5	0.1635	2,984,606	487,868
Total 2010	0.4787	0.1404	0.5	0.5	0.3095	4,164,863	1,289,164
Total						7,149,469	1,777,032

4.2 Project Emissions

There is no leakage for the project activity; however, power density of Barra Grande Power Plant is 7.3 W/m^2, therefore emissions from its reservoir must be considered. To calculate project emission, it was used equation below:

$$PEy = \frac{EFRes * TEGy}{1000}$$ **Equation 2**

Where:

PEy = Emission from reservoir expressed as tCO_2e/year;

EFRes = is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO_2e/MWh;

TEGy = 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).

Table 2 – Project Emissions in the Monitored Period

Year	PEy (Project Emissions) (tCO2e/yr)
Total 2009	277,792
Total 2010	387,028
Total	664,820

4.3 Leakage

There is no leakage for the project activity.

4.4 Summary of GHG Emission Reductions and Removals

Project emission reduction is calculated according version 07 of ACM0002 methodology. As mentioned previously, LEy is zero. Therefore, emission reduction is calculated as described below:

$ERy = BEy - PEy$ **Equation 3**

Where:

ERy = Emission Reduction in year y (t CO_2e/yr)

BEy = Baseline emissions in year y (t CO_2e/yr)

PEy = Project emissions in year y (t CO_2e/yr)

Baseline emissions are calculated as indicated by the baseline methodology ACM0002, version 7 that 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 baseline emission is calculated as follows:

$BEy = (EGy - EGbaseline) * EF_{grid,CM,y}$ **Equation 4**

Where:

BEy = Baseline Emission in year y (t CO_2e/year)

EGy = Electricity supplied by the project activity to the grid (MWh)

EGbaseline = Baseline electricity supplied to the grid in case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.

$EF_{grid,CM,y}$ = 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".

EGy and $EF_{grid,CM,y}$ are monitored as it was described previously and EGbaseline is 0 (zero) because HPP Barra Grande is a new power plant to be connected to the interconnected grid.

Therefore, the baseline emission, project emissions and emission reductions provided by the project are presented in the table below.

Table 3 – Project Emission

Reductions Year	BEy (Baseline Emissions) (tCO2e/yr)	PEy (Project Emissions) (tCO2e/yr)	ERy (tCO2e/yr)
Total 2009	487,868	277,792	210,076
Total 2010	1,289,164	387,028	902,136
Total	1,777,032	664,820	1,112,212

5 ADDITIONAL INFORMATION

There is no additional information for this project activity.