MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	Malagone SHP CDM Project, Minas Gerais, Brazil (JUN1122)
Reference number of the project activity	4676
Version number of the monitoring report	3
Completion date of the monitoring report	01/10/2012
Registration date of the project activity	15/06/2011
Monitoring period number and duration of this monitoring period	First monitoring period. 291 days. (15/06/2011-31/03/2012)
Project participant(s)	Hidrelétrica Malagone S.A. and Carbotrader Assessoria e Consultoria em Energia Ltda (both Private Entity)
Host Party(ies)	Brazil
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope 1 – Energy Industries (Renewable / Non-renewable Sources) Methodology ACM0002
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	21,965 tCO2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	16,239 tCO2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The present project activity consists in the electricity generation by renewable sources – hydro potential, through the construction of a Small Hydro Power plant (SHP) called Malagone, developed by the Special Purpose Entity: Hidrelétrica Malagone S.A.

With an installed capacity of 19MW, the SHP is located in the Uberabinha river in the Uberlândia city, Minas Gerais State – south-east region, Brazil.

The electricity delivered to the National Interconnected Grid System (SIN) replaces thermal generation from fossil fuels that would have to be inputted in the system with the generation of a renewable source of energy.

The project activity contributes to the environmental sustainability by increasing the share of renewable energy in relation to the total electricity consumption in Brazil.

Considering that the project activity consists in a SHP with a small reservoir (1.72 km^2) –, it represents a virtually zero environmental impact when compared to large hydroelectric plants. This fact is very important because the construction of Small Hydro Power plants can really contributes to the efficient use of the environmental and natural resources, avoiding the growth of the environmental and social liabilities caused by new large hydroelectric power plants or fossil fuel thermal generation.

In this way, the investment in modern technology for small hydropower plants contributes for an efficient use of the water resources as a relevant factor to be emphasized, adding value to the natural resources.

The technology used in the enterprise is the Uberabinha River (Paranaíba River Basin) hydro energy potential for the electricity generation by the gravitational energy of the water, which is used to move the turbines and by doing this, trigger generators that enable the generation of electricity. This is a source of clean energy and renewable that presents minimal impact on the environment.

The Malagone SHP dispatches generated energy to the National Interconnected Grid (SIN - Sistema Interligado Nacional) through the Uberlândia SE Substation – 1 (CEMIG SE-1, which line extension has 34 Km, in 138 KV) located in the Uberlândia city, Minas Gerais state, Brazil. CEMIG is also the local distributor.

The emissions sources and GHGs involved are CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity and emissions of CH_4 from the reservoir.

The technical characteristics of equipments can be seen in Table 1 below:

Table 1 : SHP technical characteristics

SHP	Malagone
Installed Power (MW)	19
Reservoir (Km^2)	1.72
Assured Generation (MWh)	10.11
Flow Rate River Average (m^3/s)	25
Turbines	Francis
Quantity	2

Power (kW)	9,800
Flow rate (m^3/s)	26.36
Spin (rpm)	400
Generators	
Quantity	2
Nominal Power (kVA)	10,560
Effective Power (MW)	9.5
Voltage (kV)	6.9
Power factor	0.9
Frequency (Hz)	60

The relevant dates for the project activity are registered in the Table 2 below.

Table 2 : SHP Timeline

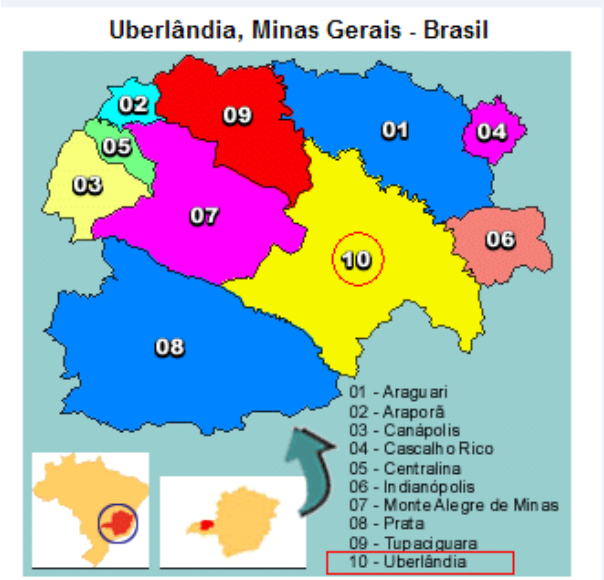
Timeline SHP Malagone	
Start of construction	1st April 2008
Electromechanical installation	30 May 2009
Commissioning of the UG1 and UG2	from 9 to 20 March 2010
Start of Commercial Operation	1st April 2010
Registration date at CIMGC	15 June 2011

The total GHG emission reductions in this monitoring period (15 June 2011 until 31 March 2012) were **16,239** tCO_2.

A.2. Location of project activity

The project activity is located in the Uberabinha River in the municipality of Uberlândia, Minas Gerais State, Brazil. The geographical coordinates of the location of the dam are: 18º 40' 50´´ S e 48º 29´ 57´´ W. The Figure 1 illustrates the location of the enterprise:

Figure 1: Geographical location of Uberlândia city.



Source: Wikipedia - pt.wikipedia.org and City Brazil - www.citybrazil.com.br[1]

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (Host Country)	**Hidrelétrica Malagone S.A** (Private Entity)	No
	Carbotrader Assessoria e Consultoria em Energia Ltda (Private Entity)	

A.4. Reference of applied methodology

The methodology used was the ACM0002: **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" - version 11 (valid from 26 February 2010 to 16 September 2010).**

The methodology tool used to the baseline calculation was the **"Tool to calculate the emission factor for an electricity system" - version 02 (valid from 16 October 2009 to 14 April 2011).**

The methodology tool used to the additionality assessment is the **"Tool for the demonstration and assessment of additionality" - version 05.2 (valid from 26 August 2008 onwards).**

A.5. Crediting period of project activity

15/06/2011 to 14/06/2018, renewable.

[1] City Brasil – Percorrendo o Brasil de A a Z. http://www.citybrazil.com.br

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

The technology used in the enterprise is the Uberabinha River (Paranaíba River Basin) hydro energy potential for the electricity generation by the gravitational energy of the water, which is used to move the turbines and by doing this, trigger generators that enable the generation of electricity. This is a source of clean and renewable energy that presents minimal impact on the environment.

The Malagone SHP is a venture classified as Small Hydro Power Plant because according to the Brazilian Resolution no. 652, 09/12/2003, from National Electric Energy Agency (ANEEL), to be considered a SHP the reservoir area must be less than 3 Km2 (300 ha) and the total installed capacity between 1 MW and 30 MW. The Malagone SHP has 1.72 Km2 of reservoir area and total installed capacity of the 19 MW, thus this the Power density is 11.04 W/m2 (in accordance with CDM meth rules). The venture is also called a "run of river" plant which does not include significant water stocks.

The Malagone SHP dispatches generated energy to the National Interconnected Grid (SIN - Sistema Interligado Nacional) through the Uberlândia SE Substation – 1 (CEMIG SE-1, which line extension has 34 Km, in 138 KV) located in the Uberlândia city, Minas Gerais state, Brazil. The CEMIG is the local utility of energy distribution.

The technology and equipment used in the project activity were developed and manufactured in Brazil and there was not transferring of know-how or technology to the host country.

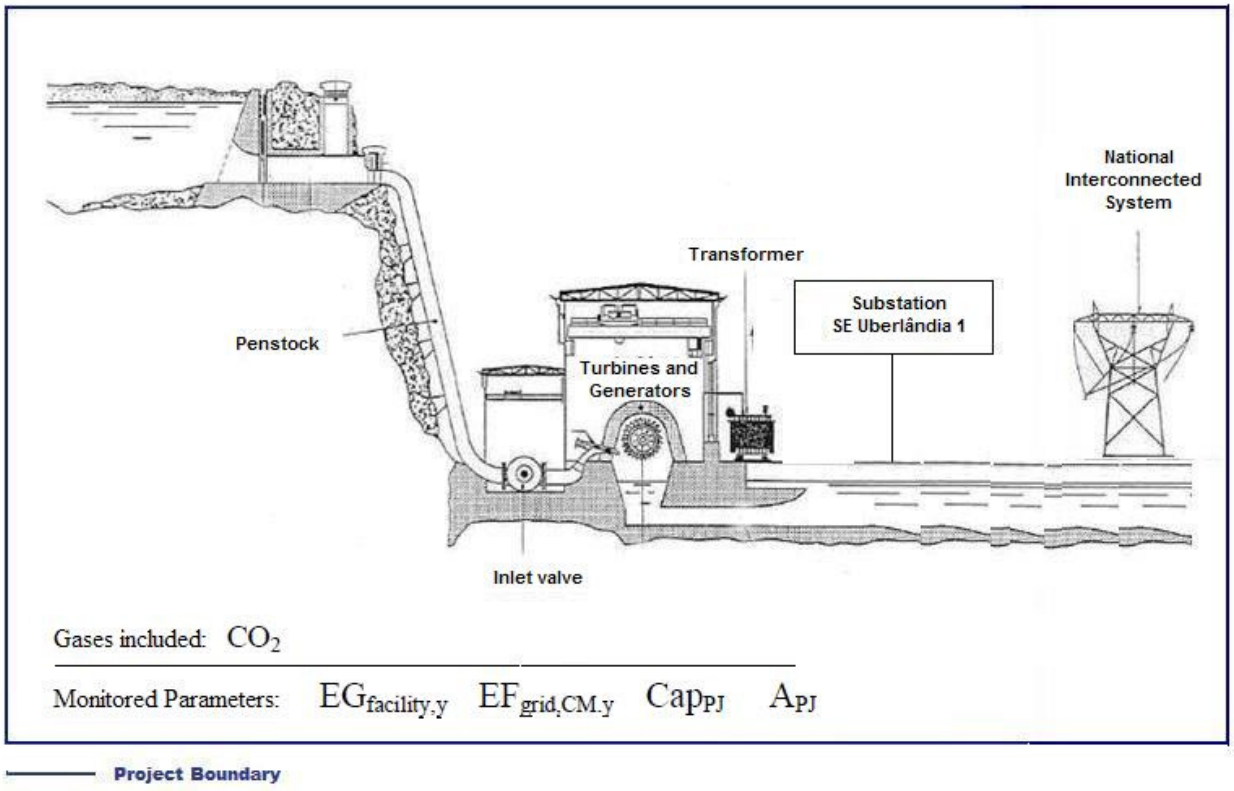
The emissions sources and GHGs involved are CO2 emissions from electricity generation in fossil fuel fired power plants that were displaced due to the project activity and emissions of CH_4 from the reservoir.

The technical characteristics of equipment that were implemented in SHP can be seen in Table 3 below:

Table 3: SHP technical characteristics

SHP	Malagone
Installed Power (MW)	19
Reservoir (Km^2)	1.72
Assured Generation (MWh)	10.11
Flow Rate River Average (m^3/s)	25
Turbines	Francis
Quantity	2
Power (kW)	9,800
Flow rate (m^3/s)	26.36
Spin (rpm)	400
Generator	
Quantity	2
Nominal Power (kVA)	10,560
Effective Power (MW)	9.5
Voltage (kV)	6.9
Power factor	0.9
Frequency (Hz)	60

The diagram below shows the project boundary, main equipments, monitored parameters and gases included:



The project was implemented according its technical specification. The commissioning was done from 9 to 20 March 2010, and the commercial operation started on 1st April 2010.
There were stops mainly due to hydrological reasons, cleaning the frontal grid (to retire waste accumulated), but these did not cause alterations in the calculations of the project emission reductions.
The unique difference in the technical characteristics in PDD was the dimension of reservoir, which changed from 1.27km2 to 1.72km2[2].
The crediting period began in 15 June 2011 (with the project registration on the CDM EB), and for its first monitoring the measures had been done until 31 March 2012.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

Not Applicable

B.2.2. Corrections

Not Applicable

B.2.3. Permanent changes from registered monitoring plan or applied methodology

Not Applicable

B.2.4. Changes to project design of registered project activity

Not Applicable

[2] The increasing in the dimension of reservoir was the result of applying two different methodologies for measuring the area, a less accurate at the time of the Previous and Installation Licenses and other more precise during the construction of the power plant. The dam height did not changed along the process (from the design phase until the implementation phase) keeping the 600.50 m all the time

B.2.5. Changes to start date of crediting period
Not Applicable

B.2.6. Types of changes specific to afforestation or reforestation project activity
Not Applicable

SECTION C. Description of monitoring system
The measurement system does the measure and records the value of the energy. For the measurement system of the SHP Malagone was installed a panel containing two meters (a main and one back-up). This panel measurement is exclusive of the SHP Malagone and is located in substation Uberlândia 1 from CEMIG (Companhia Energetica de Minas Gerais - the local energy utility). The measurement system measures and records the energy, and for this system is guaranteed the inviolability of the data, which is sealed for safety after the calibration.

The complete Monitoring and Measurement System, called SMF, consists of a meter panel and a satellite-link to communicate and send the data to the CCEE and Malagone. SMF energy measurement includes the already said panel with a principal and a back-up meter (reserve meter). If there is a problem with the principal meter, the back-up meter automatically continues the measurement of energy, without any discontinuity. If, besides the main meter have a problem, the back-up meter have some problem too, it will be used the methodology to estimate data as the item 14.3 of the Procedure of Energy Commercialization PdC ME.01, version 4, that states a priority order for procedures:
Initially, if the problem had been happened for one hour only, to use an average between the immediate prior and posterior measures. Secondly, for measure of net generation, consider the measuring gross generation adjusted, e.g. subtracting estimates of domestic consumption and / or losses. To see the subsequent options verify the Procedure.

Both the measurement data (CCEE and Malagone) comes from the same meters, the main one with serial number PT-0902A505-01, or the back-up with serial number PT-0902A177-01, in case of fail of the main meter.

The CCEE reads the data through a GPRS system and the software: Sinercom. The same data is send to Malagone through the CAS system and the software Hemera Technology Platform.

To an easier understanding, see the figure 2 below.

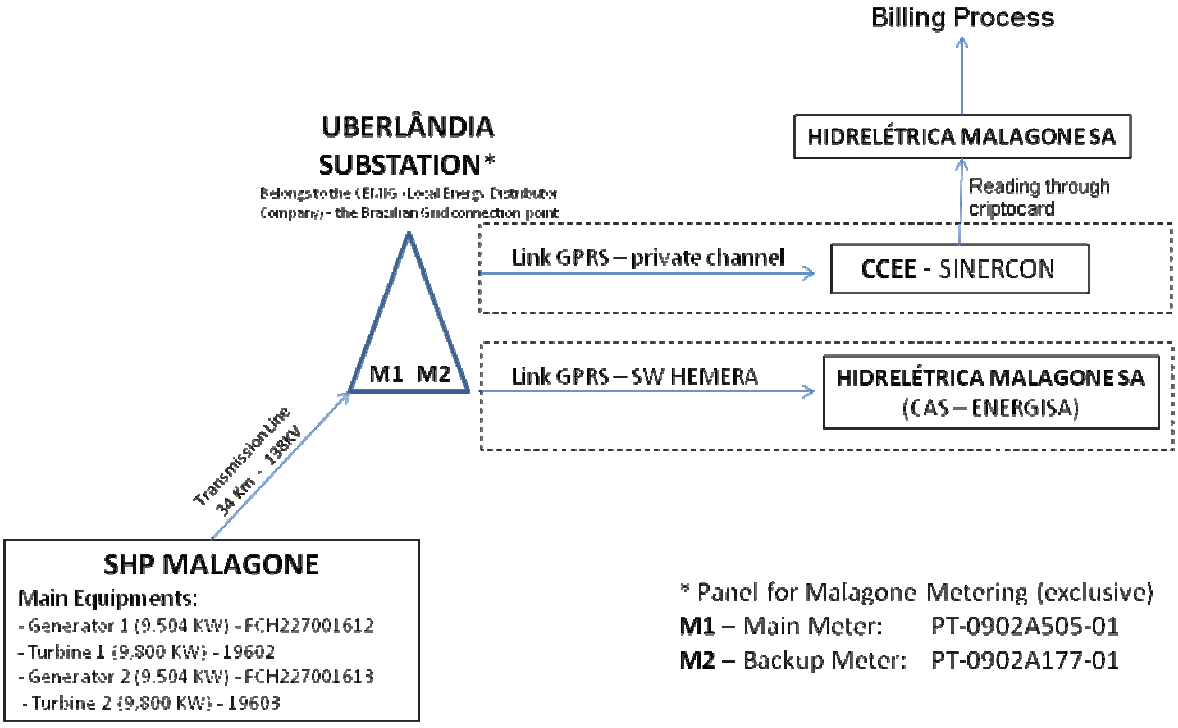


Figure 2: Flow chart of energy and generation data.

The procedures designed for monitoring electricity generation by the project activity follows the parameters and rules of the Brazilian energy sector. The National Grid Operator (ONS) and the Electric Power Commercialization Chamber (CCEE) are the entities responsible for specification of the technical requirements of energy measurement system for billing.

Data monitoring:

The meter readings are used to calculate the emission reductions. The monitoring steps are as follows:

(1) The data will be measured hourly and recorded monthly;
(2) Spreadsheets containing the electricity dispatched to the grid are generated; CCEE data measured (from CCEE databank – SINERCON) are used to calculate the emissions reductions and, if necessary, sales receipts will be used to cross check the monitored data;
(3) The Malagone provides to Carbotrader their recorded datas from the meters, CCEE datas and, when necessary, copies of energy bills.
(4) The emissions reductions are managed by the project manager responsible at Carbotrader;

Details regarding the parameter to be monitored can be founded in the section D.2.

Quality control:

(1) Calibration of meters
The calibration of meters is conducted by a qualified organization that complies with national standards and industrial regulations to ensure the accuracy. After calibration, the meters are sealed for safety and the calibration certificates are archived with the monitoring datas.
In the generation energy values from 15/06/2011 and 20/07/2011 (inclusive) were discounted the imprecision of the meters (0.2%), since the calibration did not cover this period. It can be seen in the document annexed "CERs 1st MR_rev3.pdf"(June 11 and July 11 Tabs).

As described in the EB 52 annex 60, paragraph 4, the option applied was "a" because the errors from calibration were smaller than the maximum permissible error.
See below the Table 4 with the calibration datas:

Nº	METERS IDENTIFICATION		NUMBER OF CALIBRATION CERTIFICATE	DATE OF ISSUE	VALIDITY
1	Serie number: PT-0902A505-01 Manufacturer: Schneider Electric	Main meter	Report N° 003/2009	08/06/2009	08/06/2011
2	Serie number: PT-0902A177-01 Manufacturer: Schneider Electric	Back-up meter	Report N° 003/2009	08/06/2009	08/06/2011
3	Serie number: PT-0902A505-01 Manufacturer: Schneider Electric	Main meter	CC-0127-11	20/07/2011	20/07/2013
4	Serie number: PT-0902A177-01	Back-up meter	CC-0128-11	20/07/2011	20/07/2013

Table 4: Calibration datas

(2) Emergency treatment
In case of unavailability of measures from any point of measurement, due to maintenance, commissioning or for any other reason, will be used the methodology to estimate data as the item 14.3 of the Procedure of Energy Commercialization PdC ME.01, version 4, that states that:
As the first option, to use the back-up measure. Second option, if the measure lost is only one hour, to use an average between the immediate prior and posterior measures. To see the subsequent options verify the Procedure.

Data Management:

All data gathered in the monitoring range will be electronically filed and kept for at least 2 years after the last crediting period. The crediting to be generated will be calculated regularly by the project proponents and kept for the verification phase.

Procedures:

The procedures are the described in the ONS site – "Module 12: Measurement for billing", as well as in sub-modules:

12.1 - Billing Measurement: An Overview,
12.2 - Installation of the measuring system for billing,
12.3 - Maintenance of the measurement system for billing,
12.4 - Collection of metering data for billing,
12.5 - Certification of labor standards,
12.6 - Settings for measuring revenue.

These procedures are available in http://www.ons.org.br/procedimentos/modulo_12.aspx, and are being followed by the agents responsible for the generation of the SHP Malagone. Thus, here are defined procedures for collection of data generation, frequency calibration of the measuring system, equipment accuracy class of the measuring system, etc.

Authority and Responsibility

The Hidrelétrica Malagone S.A is responsible for the maintenance and calibration of the monitoring equipments, compliance to operational requirements and corrective actions related to the functionality of the project activity. Moreover, the company has authority and responsibility for registration, monitoring, and measurement as well as managing the project, to organize staff training to use appropriated techniques in those procedures.

The Baseline and Emissions Reductions calculations were performed by Carbotrader Assessoria e Consultoria em Energia Ltda which reported the results in a proper way to the entities related with the CDM process.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/Parameter	Cap_{PJ}
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data	Project site
Value(s) applied	19,000,000
Purpose of data	Calculation of the project emissions.
Additional comment	In Brazil, the installed capacity of hydropower plants is determined and authorized by the competent regulatory agency. Furthermore, any modification must be authorized and made public available. Thus, annually, any new authorization to increase the installed capacity of plan is monitored.

Data/Parameter	A_{PJ}
Unit	m^2
Description	Area of the reservoir measured in the water surface, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site
Value(s) applied	1,717,174
Purpose of data	Calculation of the project emissions.
Additional comment	

D.2. Data and parameters monitored

Data/Parameter	$EG_{facility,2011-2012}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in the years 2011 and 2012.
Measured/Calculated /Default	Measured
Source of data	Project site - Energy Meters
Value(s) of monitored parameter	80.472,18
Monitoring equipment	2 meters (main and back-up), Type: ION-8600, Manufacturer: Schneider Electric, accuracy class 0.2; Serial number: PT-0902A505-01 and PT-0902A177-01; calibration frequency: each 2 years; Last calibration: 20 July 2011; validity: 20 July 2013.
Measuring/Reading/ Recording frequency	Hourly measurement and reading and monthly recording.
Calculation method (if applicable)	-
QA/QC procedures	These data will be used for calculate the emission reductions. The data will be archived monthly (electronic) and will be archived during the credit period and two years after. The data from the energy meters will be cross checked with the CCEE databank in order to verify the coherency of the data.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{grid,CM,2011-2012}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *2011 and 2012.*
Measured/Calculated /Default	Calculated
Source of data	Based on data provided by the DNA (Designated National Authority).
Value(s) of monitored parameter	0.2018
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Annually
Calculation method (if applicable)	The Combined Margin is calculated through a weighted-average formula, considering the $EF_{grid,OM-DD,y}$ and the $EF_{grid,BM,y}$ and the weights w_{OM} and w_{BM} default 0.5. as defined in the "Tool to calculate the emission factor for an electricity system", version 02.
QA/QC procedures	
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	$EF_{grid,OM\text{-}DD,2011\text{-}2012}$
Unit	tCO_2/MWh
Description	CO_2 Operating Margin emission factor of the grid, in a year *2011 and 2012.*
Measured/Calculated /Default	Calculated
Source of data	Data provided by the DNA (Designated National Authority) monthly
Value(s) of monitored parameter	0.2980
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Hourly
Calculation method (if applicable)	As defined in the "Tool to calculate the emission factor for an electricity system"
QA/QC procedures	This data, updated, will be applied in *ex-post* calculation of the Emission Factor.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	$EF_{grid,BM,2011}$
Unit	tCO_2/MWh
Description	CO_2 Build Margin emission factor of the grid, in a year *2011*
Measured/Calculated /Default	Default
Source of data	Data provided by DNA (Designated National Authority) to the year *y*.
Value(s) of monitored parameter	0.1056
Monitoring equipment	Not applicable.
Measuring/Reading/ Recording frequency	Annual
Calculation method (if applicable)	As defined in the "Tool to calculate the emission factor for an electricity system"
QA/QC procedures	This data, updated, will be applied in *ex-post* for the calculation of the Emission Factor.
Purpose of data	Calculation of baseline emissions
Additional comment	

D.3. Implementation of sampling plan

Not applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

The baseline methodology considers the determination of the emissions factor to the grid which the project activity is connected as the core data to be determined in the baseline scenario. In Brazil, the grid is interconnected by the National Interconnected System (SIN) in a single system[3].

[3] http://www.mct.gov.br/upd_blob/0024/24834.pdf

"Operating Margin *OM* Emission Factor" calculation ($EF_{grid,OM-DD,y}$)

The calculation of the $EF_{grid,OM-DD,y}$ was done using the form and datas below. The $EF_{grid,OM-DD,y}$ is published by the Brazilian DNA monthly and is available in its website[4].

$$EF_{grid,OM-DD,y} = \frac{\sum_{h} EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}}$$

Where:
$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year y (tCO_2/MWh);
$EG_{PJ,h}$ = Electricity displaced by the project activity in hour h of year y (MWh);
$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO_2/MWh);
$EG_{PJ,y}$ = Total electricity displaced by the project activity in year y (MWh).
h = Hours in year *y* in which the project activity is displacing grid electricity
y = Year in which the project activity is displacing grid electricity

The calculation of the $EF_{grid,OM-DD,y}$ was done using the form above and the datas from the tab "Hourly" of the worksheet CERs 1st MR_rev3.

As the period measured includes measures since June 2011 until March 2012, the calculation includes the multiplication of the generation in each hour of this period times the EF factor of each hour correspondent. Then, the EFOM is that result divided by the total generation in this period, therefore, encompasses 2011 and 2012 years.

The method used was the Dispatch Data Analysis, like described in the Tool to calculate emission factor_EB50_14_version2.pdf, item c, page12. In this method we multiply the energy generated in each hour by the emission factor of each hour and add all of these factors. After, we divide this result by the total energy generated in the total period. This result is the EF_{OM} to the period. The $EF_{grid,OM-DD,y}$ is published by the Brazilian DNA monthly[5].

$EF_{grid,OM-DD,y}$ = 0.2980 tCO_2/MWh

The month datas are showed below:

2011 SHP Malagone Power Generation (MWh)

JAN	FEV	MAR	ABR	MAI	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0,00	0,00	0,00	0,00	0,00	4238,18	6968,74	5741,20	4321,58	6833,34	6972,49	9707,77

TOTAL: 44783,31

2012 SHP Malagone Power Generation (MWh)

JAN	FEB	MAR	ABR	MAI	JUN	JUL	AGO	SET	OUT	NOV	DEZ
13322,95	11465,16	10900,76									

TOTAL: 35688,87

[4] Besides the publication is updated monthly, the data is informed in hourly base. Explained in other words, DNA updates the information monthly, but the information inputted by DNA is the EFhourly. http://www.mct.gov.br/index.php/content/view/333605.html#ancora

[5] Besides the publication is updated monthly, the data is informed in hourly base. Explained in other words, DNA updates the information monthly, but the information inputted by DNA is the EFhourly.

"Building Margin *BM* Emission Factor" ($EF_{grid,BM,y}$)

The $EM_{grid,BM,y}$ is published by the Brazilian DNA annually and it is available in its website[6]. The last data available is of the year 2011.

$EF_{grid,BM,y} = 0.1056\ tCO_2/MWh$

"Baseline Emission Factor" calculation ($EF_{grid,CM,y}$)

The baseline emission factor ($EF_{grid,CM,y}$) is calculated through a weighted-average formula, considering both the $EF_{OM,,y}$ and the $EF_{BM,,y}$ weighted 50% each, by definition, that gives:

$$EF_{grid,CM,y} = EF_{grid,OM\text{-}DD,y} * 0{,}5 + EF_{grid,BM,y} * 0{,}5\ (tCO_2/MWh)$$

$EF_{grid,CM,y} = 0.2980 * 0.5 + 0.1056 * 0.5$

$EF_{grid,CM,y} = 0.2018\ tCO_2/MWh$

Emission Reduction

The emission reduction values are presented below, in tCO_2. They are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) multiplied by the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh) , as follows:

$$ER_y = EF_{grid,CM,y} * EG_{PJ,y}$$

Where:

ER_y = Emission reduction in year y (tCO_2);

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

$EG_{PJ,y}$ = 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);

Then:

$ER_y = EF_{grid,CM,y} * EG_{PJ,y}$

$ER_y = 0.2018 * 80{,}472.18$

$ER_y = 16{,}239\ tCO_2$

Baseline Emissions

Baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) multiplied by the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh), as follows:

[6] http://www.mct.gov.br/index.php/content/view/333605.html#ancora

$$BE_y = EF_{grid,CM,y} * EG_{PJ,y}$$

Where:

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

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

$EG_{PJ,y}$ = 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);

$BE_y = EF_{grid,CM,y} * EG_{PJ,y}$

BE = 0.2018 * 80,472.18
BE = 16,239 tCO_2

E.2. Calculation of project emissions or actual net GHG removals by sinks

The power density of the project activity is calculated as stated in the ACM0002: **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" - version 11, that** follows below:

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

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.

$$PD = \frac{19{,}000{,}000 - 0}{1{,}717{,}174 - 0} = 11.06 \text{ W/m}^2$$

As the Power Density of the project activity is greater than $10W/m^2$, then Project Emissions (PE) are zero.

As stated in the version 11 of ACM0002, the Emission Reductions are calculated by the form below:

ER = BE − PE

Where:
ERy = Emission reductions in year *y* (t CO2e/yr)
BEy = Baseline emissions in year *y* (t CO2/yr)
PEy = Project emissions in year *y* (t CO2e/yr)

Then,
ER= 16,239 - 0 = 16,239 t CO2e

That is ER total of the period.

E.3. Calculation of leakage

There is no leakage associated with this project activity.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	16,239	0	0	16,239

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	21,965	16,239

The value for the estimated emission reduction in this table was broken down for the monitoring period.

E.6. Remarks on difference from estimated value in registered PDD

Not applicable.

- - - - -

History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Form **Business Function**: Issuance		