MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/09/2010

CONTENTS

* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
Version 1 – 24/03/2011

São João hydro power plant
Reference number 1342
(11/09/2008 - 31/12/2010)

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

With an energy deficit of around 85-90% at the project area, the project activity aims to generate clean energy from hydropower at the *Espírito Santo* state (Southeast of Brazil); an area with a high voltage fluctuation and high transmission losses for the imported energy. Based on a run-of the river scheme with a 7 kilometres penstock entirely in rock, the power plant has an yearly energy of 14.1 MWaverage, the project activity has a estimative in PDD[1] to reduce 32,344 tCO2e/year while contributing to increase the share of small hydro power generation in the rising thermal power generation scenario in Brazil.

Since 1984 there have been several governmental programs to promote the construction of small hydro power plants. The main goal of these programs was to decrease the oil consumption, promote local technology and promote rural development. However the last 20 years, several others programs to promote small hydro power generation were issued1, small hydro power generation has not substantially increase and in opposition, thermal power generation has been used instead to supply isolated and rural areas or peak loads for the grid.

The project activity is being carried out by *Energest* an energy generation facility which is part of the EDP group (Electricity of Portugal). The project activity was granted in 1999 by the *ANEEL* (National electricity agency) and the feasibility studies, a bureaucratic process, could be initiated. The Engineering Procurement and Construction (EPC) was finally granted in the year 2000 for 37.97 MR$ to three companies (*Engevix, Toniolo* and *Impsa*). The EPC was finally rejected based on a technical default risk due to the risk of non-delivery caused by macroeconomic problems affecting the companies within the EPC.

Finally the year 2002 a new EPC was signed out between *Vatech Hydro, Energ Power, Edex* and *Engevix* with an increased cost on the EPC up to 41.5 MR$ and 24 months of leading construction time. Further alterations on the construction cost and leading time for the project activity increased the EPC cost up to 41.78 MR$ due to social taxes (+3%) and civil works. On the year 2003, three new contract adjustments increased the cost of the EPC up to 43.73 MR$ (+15% initial EPC value) due to the unexpected incremental civil cost. The main incremental cost was due to the lack of know-how by the mining company for the implementation of the penstock (mechanical excavation in rock).

The year 2004 the EPC collapsed and the hydro power plant was put in hold. Several alternative scenarios were considered up to this point, based on the fact that the hydro power plant was partially constructed under such scenario the project developer requested a new EPC. At the end of 2004, the minimum value granted for the EPC was 83.82 MR$ (or + 219% or 45 MR$ of the initial EPC value).Up to this point the incremental cost of the hydro power plant were considered as a prohibitive either for the Brazilian energy standards or for the project developer internal benchmark (as defined in the addicionality check) and the project developer defined a set of investment and trade-off scenarios. The project activity increases the amount of capital based on the new generation activities, what may be

[1] http://cdm.unfccc.int/UserManagement/FileStorage/CFIKH885XU5MPV1WDZSUIOUYUFFYA4

translated into new and necessary investments on environmental education added to the already on place activities carried out by Energest and the local municipality of Baixo Guandu.

Finally at the end of 2005 the project developer closed the new EPC and the forecasted starting operation is scheduled on April 24, 2007.

Apart from the well-known positive benefits of the construction (job creation, technology well known), the benefits from the operation of the power plant (income taxes for the municipality) and environmental programs (*Energest* is highly engaged on environmental education and to assist the local stakeholders on sustainable development plans), the power plant will decrease the GHGs emissions that would otherwise been emitted under the baseline scenario, while contributing to the local economic development through environmental activities and direct tax income based on the generation activities. Thus, one of the most important impacts of the registration of the project activity as a CDM project it would be likely the promotion of several small hydro power schemes within the project boundary area, for a region which is highly dependent on energy imports and thermal generation.

During the monitoring period, 58.757 tCO_2 emissions reductions were achieved.

A.2. Project Participants

Nome of Party involved	Private and/or public entity(ies) project participants	Kindly indicate if the Party involved whishes to be considered as project participant
Brazil (host country)	ENERGEST S.A.	No

A.3. Location of the project activity:

River Castelo, Conceição do Castelo city, Espirito Santo state (south east Brazil), Brazil.

Physical coordinates: 20° 30’ 29.140’’ S and 41° 16’ 50.800’’ S.

A.4. Technical description of the project

The project activity is placed at the *São João Small Hydro Plant (PCH São João)* and it employs water from the *Castelo* River to generate energy, with a small dam of 0.21 km2 and net head of 259.4 metres. The power station is subterraneous, the only on the *Espírito Santo* State, with 2 horizontal Francis hydraulic turbines with 12.5MW of nominal power each, currently processing an average water flow of 11.20 m³/s.The synchronous generators have a nominal output of 14.0 MVA and a nominal voltage of 6.9kV each. The arrangement of the enterprises involves in the same axis the dams and spillway structures. The water is captured on the left margin of the *Castelo River* by a rock-drilled penstock. The energy generated, around 14.1 MW average, will be transported through a transmission line (96 kV) that connects the power plant to the substation of *Castelo.* The technology for hydro power generation is well known and it has been widely applied in the Brazilian energy sector for the last decades.

São João hydro power project	
Installed capacity	25 MW
Number of gensets	2
Turbines	Francis
Maximum discharge per turbine	5.6 m3/s
Spill lengths	60.0 m
Reservoir contents	1,950,000 m3
Inundated area	0.21 km2
Hydrografic basin area	552 km2
Length of delivery pipe	7,034 m
Waterfall	259.4 m

Voltage	6.9 kV

Table 1. Technical description of São João small hydro power project

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

The approved consolidated baseline and monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 6 (valid from 19 May 06 onwards) was used. The project activity relates to the sectoral scope number 1 "Energy industries (renewable - / non-renewable sources)".

The project activity has currently a power density of 119 W/m^2 and as stated by the CDM EB can use the approved ACM0002 baseline methodology and the project emissions from the reservoir may be neglected.

A.6. Registration date of the project activity:

The project was registered on 02/05/2008.

The monitoring period of this monitoring report comprises 11/10/2008 to 31/12/2010.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

The crediting period of the project is: seven years, renewable two times.

There are no changes to the start date of the crediting period post-registration.

A.8. Name of responsible person(s)/entity(ies):

Responsible person for the documentation development (technical consulting): Ernesto Cavasin, PricewaterhouseCoopers. Contact: (55 11) 3674-2333.

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

The project activity "*UHE Mascarenhas* power upgrading project" will claim CERs and has already been registered in the UNFCCC Executive Board on 2th April 2008 (reference number 1342). The project activity has already been implemented and is working under Clean Development Mechanism according to the descriptions contained in the PDD.

The enterprise started operations in April, 2007.

B.2. Revision of the monitoring plan

The approved consolidated baseline and monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 6 (valid from 19 May 06 onwards) was used.

B.3. Request for deviation applied to this monitoring period

The documents that were stored in paper format will be stored in electronic format, once that kind of storage assures security to the documents. The documents are related to EG_y data.

B.4. Notification or request of approval of changes

There are no notifications or requests of approval of changes.

SECTION C. Description of the monitoring system

The monitoring operational structure will be based on a continuous monitoring of the *Net energy generation* (EGy) delivered to the grid. Measures made by the *ONS* (National System Operator) will occur hourly and registered in electronic format, maintained as archive in electronic format.

It is responsibility of the project proponent, Energest, to develop the forms, registration formats for data collection and further classification of all data. In order to guarantee the well-working of the power plant, the operation team is trained for, among others, Inspection and Cleaning of separator boxes water-oil and Well drainage, Operation and maintenance of batteries, Noise and vibration monitoring, Maintenance and operation of *São João* hydro power plant. The further collection, data analysis and records' handling will be managed by the power plant operation staff and the records will be kept on electronic format.

The monitoring plan provides a set of procedures for continuous monitoring of the electricity generation of the project activity that is exported to the grid and measured by means of an energy meter. The monitoring methodology schedules a continuous screening of the defined values and the further storage on electronic (excel spreadsheet).

ONS is an entity responsible for coordination and control of the generation and transmission Brazilian power units, under inspection and rules of ANEEL (Brazilian Electricity Regulatory Agency), and is responsible for installation and sealing of the meters. The meters cannot be violated without ONS' authorization.

The data to be collected for the monitoring reports are updated by the emission factors ($EF_{OM,y}$, $EF_{BM,y}$, EF_y) monthly value of energy generated (EGy). The data of the emission factors will be annually updated with information supplied by the ONS (National Operator of the Electric System).

The monitoring of São João hydro power plant is based on an internal control and data collection from the energy meters (specified in table 2 below), located in the Operation Room of São João substation.

	Main meter	**Backup meter**
Model	ION8600	ION8600
Manufacture	Power Measurement	Power Measurement
Serial number	PS 0510A255-01	PS 0510A259-01

Table 2 – Specifications of electricity meters

The further collection, data analysis and records' handling will be managed by the power plant operation staff and the records will be kept on electronic format. The measurement data, in São João plant, are generate every 5 minutes and recorded in the specific meters for 35 days. The data is also recorded in the software ION INTERPRISE. The measurement data of energy generated are registered in electronic format and archived in the Operation Room of Measurement Department.

The energy generated is measured by CCEE and net and gross values are registered by CCEE.

According to the sub modules of ONS (National Operator of Electrical System), the CCEE (Chamber of Electrical Energy Commercialization) is responsible to monitor and also register the generated energy daily based on measurement data from the main and the backup meter.

The measurement of the generated energy is totally automated. All measurements data are registered and sent daily to CCEE. In order to guarantee the accuracy of the measurement data, CCEE has also direct access to the meters. CCEE make available to its agent - *Energest*, electronic consultation. For this consultation the measurements data are available separately by turbine hourly, daily, weekly and/or monthly. Therefore the measurement data of energy generated will be cross checked with data generated from CCEE in order to assure the quality of data.

The meters work simultaneously, registering the same data about generation of energy. So, the meters work as back-up, when a meter is in maintenance, and as quality control, once that the meters are compared each minute, avoiding mistakes in data about generated energy.

The meters which register the energy generated by São João SHP are online, that way the power measurements are made online. CCEE receives the energy data each 5 minutes and also have an exclusive link with encrypted password to access the São João's meters and check the data about energy generated. That way, CCEE can realize an assurance of the energy data any moment. As CCEE is an entity that coordinates the activities relative an energy commercialization, the energy data are monitored and assured constantly by CCEE.

All energy generated by São João SHP is informed to the national regulatory authorities. The electric power market is strictly regulated and the existent norms specify the measurement equipments installed and the standard procedures to be followed. The whole documentation is electronically stored, and the operators have direct access in case the information and documentation is needed.

The maintenance structure will be based on the internal O&M (Operation and Maintenance) staff to guarantee the perfect operation of the electricity meters. The maintenance structure will also ensure that the monitoring equipment is perfectly calibrated based on the ANEEL, INMETRO and the equipment manufacturer standards. According to ONS (National Operator of Electrical System) the calibration, has to be made at least every 2 years.

Calibration of the energy meters is performed with ESCELSA calibration equipment (calibration agent) in compliance with ONS, through procedure "Sub-module 12.5 – Certification of work standard", that specifies the rules that have to be followed to meters calibration.

Roles and responsibilities of the monitoring

The project proponent will be responsible for the collection, monitoring, registration (including the development of the registry formats) and quality control of the data related to the amount of energy generation (EGy). The monitoring of this parameters include also the calibration and maintenance of the energy meter, as well as the record of the data for at least two years after the crediting period end.

Also the project proponent will ensure enough human and material resources for the accomplishment of the activities within the monitoring plan. These measurements are guaranteed by *ONS* through the sequence of Submodule 12.1 to 12.6 (ONS, 2008), that define the procedures of measurement in order to issue the invoices. Besides, there is an internal audit procedure, based on *ONS* submodules 12.1 to 12.6, named *Auditoria no Sistema de Medição ION Enterprise* –Measurement System Audit.

The technical team supervises the project activity based on monitoring spreadsheets, checking those parameters that are necessary in order to calculate the necessary data contained on the referred methodology. Furthermore the quality assessment procedures or/and any further technical assurance will be carried out at the project premises by the verification company. The monitoring of the generated energy will be cross-checked with the data measured by the kWh-meter of *CCEE* (*Câmara de Comercialização de Energia Elétrica* - Trade Chamber for Electric Energy).

The person responsible for managing, controlling and maintaining of the operation and attendance to the monitoring procedures established in this document is Mr. Pedro Sirgado (pedro.sirgado@energiasdobrasil.com.br) from *Energias do Brasil*. The maintenance and inspections are predicted under Submodule 12.3 (ONS, 2008). The monitoring processes are defined under Submodule 12.4 (ONS, 2008).

The calibration frequency should be made each two years and the proper procedures for this activity is elaborated by ONS – submodules 12.1, 12.2, 12.3, 12.4, 12.5 and 12.6. The responsible part for the maintenance, operation and meters calibration of the plant is *Energest* – Measurement Department, that must follow specifications for monitoring and calibration by ONS (regulates the energy sector in Brazil).

Calibration procedures for the energy meters were applied on the following occasions, before and after this crediting period:
• 24/06/2009: calibration performed by Escelsa;
• 13/01/2010: calibration performed by Escelsa;

According to procedures defined by ONS, calibration of energy meters may be delayed taking in consideration site specific historical data on energy generation. Therefore, the period of nearly three years between calibration procedures is in compliance with ONS and ANEEL regulations. As a conservative action, the Project Participant has applied the guidelines for assessing compliance with the calibration frequency requirements, and has deducted the monitored values of energy generation accordingly. More specifically, the monitored values for energy generation were reduced considering the maximum permissible error of the meters (0.2%, as determined by manufacturer specifications). This procedure was applied for monitored values from 11/10/2008 to 31/12/2010.

SECTION D. Data and parameters

The monitoring plan is based on the approved monitoring methodology ACM0002, version 6, which is applicable to grid-connected renewable power generation project activities such as electricity capacity additions from existing hydro power projects with existing reservoirs where the volume of the reservoir is not increased.

The monitoring will be developed to determine the amount of energy generated and delivered to the grid by the project activity (measured by energy meters), in order to calculate the emission reductions of the project activity in the crediting period considered. The monitoring periods considered in this verification comprises the period from 11/10/2008 to 31/12/2010.

For the monitoring, the parameter **EGy** (MWh) is applied. It represents the electricity generation delivered to grid and is measured hourly by the Measurement Department of *Energest*.

The emission factor (EFy) is calculated based on the combined margin approach, which depends on the operating (EF_OMy) and build (EF_BMy) margin values. For the values for EF_OMy the most recent numbers for the interconnected S-SE-CO system were used for the Brazilian national dispatch center (*ONS*) in the form of daily consolidated reports. For the values for EF_BMy, the Brazilian build margin refers to a baseline based only on the weighted average of fossil fuel-fired units that have been recently built were considered for the ONS.

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors	
Data / Parameter:	**Area**
Data unit:	m2
Description:	Surface area at full reservoir level
Source of data used:	Online meters
Value(s) :	210

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Leakage emission calculation
Additional comment:	According to ACM0002

D.2. Data and parameters monitored	
Data / Parameter:	**EF**
Data unit:	**tCO2e/MWh**
Description:	CO2 emission factor of the grid
Measured /Calculated /Default:	0.262
Source of data:	ONS system
Value(s) of monitored parameter:	2008: 0.3112 2009: 0.1635 2010: 0.2790 (will be updated during 2011)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	ONS system page (www.mct.gov.br)
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Yearly calculation and electronic storage The value of building margin of 2010 will be updated during 2011 in ONS site. As soon as possible, these values will be updated in the Monitoring Report.

Data / Parameter:	**EF_OMy**
Data unit:	**tCO2e/MWh**
Description:	CO2 operating margin of the grid
Measured /Calculated /Default:	0.413
Source of data:	ONS system
Value(s) of monitored parameter:	2008: 0.4766 2009: 0.2476 2010: 0.4787
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	ONS system page (www.mct.gov.br)
Measuring/ Reading/ Recording frequency:	Yearly

Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Yearly calculation and electronic storage

Data / Parameter:	**EF_BMy**
Data unit:	**tCO2e/MWh**
Description:	CO2 building margin of the grid
Measured /Calculated /Default:	0.11
Source of data:	ONS system
Value(s) of monitored parameter:	2008: 0.1458 2009: 0.0794 2010: 0.0794 (will be updated during 2011)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	ONS system page (www.mct.gov.br)
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Yearly calculation and electronic storage The values of building margin of 2010 and operating margin of December 2010 will be updated during 2011. As soon as possible, these values will be updated in the Monitoring Report.

Data / Parameter:	**EGy**
Data unit:	**MWh**
Description:	Electricity generation delivered to grid
Measured /Calculated /Default:	123,516
Source of data:	Measured by project developer and monitored by ONS
Value(s) of monitored parameter:	11th to 31st October to December 2008: 30,614.553 2009: 141,360.566 2010: 93,782.932
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Monitored has described in section SECTION C. Description of the monitoring system
Measuring/ Reading/ Recording frequency:	Hourly measurement and electronic storage
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Cross check of the meters with ONS system

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

According to ACM0002 version 6, baseline emissions are the product of baseline emissions factor (EF_y in tCO2e/MWh) times the electricity supplied to the project activity to the grid (EG_y in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities (not applicable).

$BE_y = (EG_y – EG_{baseline}) * EF_y$

That way,

EF_y:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$$

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emission factor (%)

2008 data (Source: ONS):

Operating Margin (EF_{OM})	January	February	March	April	May	June	
	0.5727	0.6253	0.5794	0.4529	0.4579	0.5180	
	July	August	September	October	November	December	Average
	0.4369	0.4258	0.4102	0.4369	0,3343	0.4686	0.4766

Buid Margin (EF_{BM})	2008
	0.1458

Peso	Default
(W_{om}/W_{bm})	0.5000

Emission Factor - Combined Margin (EF_{CM})	2008
	0.3112

Combined margin emission factor
$EF_{CM} = (EF_{OM} * W_{om}) + EF_{BM} * W_{bm})$

2009 data (Source: ONS):

Operating Margin (EF_{OM})	January	February	March	April	May	June	
	0.2813	0.2531	0.2639	0.2451	0.4051	0.3664	
	July	August	September	October	November	December	Average
	0.2407	0.1988	0.1622	0.1792	0.1810	0.1940	0.2476

Buid Margin (EF_{BM})	2009
	0.0794

Peso	Default
(W_{om}/W_{bm})	0.5000

Emission Factor - Combined Margin (EF_{CM})	2009
	0.1635

Combined margin emission factor
$EF_{CM} = (EF_{OM} * W_{om}) + EF_{BM} * W_{bm})$

2010 data (Source: ONS):

Operating Margin (EF_{OM})	January	February	March	April	May	June	
	0,2111	0,2798	0,2428	0,2379	0,3405	0,4809	
	July	August	September	October	November	December	Average
	0,4347	0,6848	0,7306	0,7320	0,7341	0,6348	0,4787

Buid Margin (EF_{BM})	2009*
	0,0794

Peso	Default
(W_{om}/W_{bm})	0,5000

Emission Factor - Combined Margin (EF_{CM})	2010
	0,2790

Combined margin emission factor

$EF_{CM} = (EF_{OM} * W_{om}) + EF_{BM} * W_{bm})$

* 2010 Build Margin will be updated during 2011

EGy:

2008 data (Source: CCEE):

2008	EG_y (MWh)	EG_y (MWh) corrected
11th to 31st October	2,430.981	2,426.119
November	10,120.433	10,100.192
December	18,063.139	18,027.013
Total	30,614.553	30,553.324

2009 data (Source: CCEE):

2009	EG_y (MWh)	EG_y (MWh) corrected
January	18,544.024	18,506.936
February	16,572.021	16,538.877
March	13,989.887	13,961.907
April	13,694.853	13,667.463
May	13,891.368	13,863.585
Until 24th June	8,257.372	8,240.857
24th to 30th June	1,838.342	
July	8,810.182	
August	6,363.424	
Setember	5,678.436	
October	7,662.962	
November	11,896.608	
December	14,161.087	
Total	141,360.566	141,190.667

2010 data (Source: CCEE):

2010	EG_y (MWh)
January	10,494.242
February	6,625.216
March	12,332.816
April	13,920.943
May	9,848.077
June	7,027.884

July	5,386.603
August	4,091.560
September	2,921.663
October	3,996.978
November	9,332.120
December	7,804.830
Total	93,782.932

Baseline emissions:

Baseline emission 2008 = $EF_{grid,CM.2008}$ * EG_{2008}
Baseline emission 2008 = (0.3112) * (30,553.324)
Baseline emission 2008 = 9,507 tCO2e

Baseline emission 2009 = $EF_{grid,CM.2009}$ * EG_{2009}
Baseline emission 2009 = (0.1635) * (141,190.667)
Baseline emission 2009 = 23,082 tCO2e

Baseline emission 2010 = $EF_{grid,CM.2010}$ * EG_{2010}
Baseline emission 2010 = (0.2790) * (93,782.932)
Baseline emission 2010 = 26,168 tCO2e

Sum of 2008, 2009 and 2010's baseline emissions:

Baseline emissions total = 9,507 + 23,082 + 26,168
Baseline emissions total = 58,757

E.2. Project emissions calculation

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

According to ACM002, version 6 for hydro power project activities with reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, based on the power density.

The power density is calculated as above:

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

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 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

(a) If the power density of the project activity (*PD*) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} * EG_y}{1000}$$

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* ($kgCO_2e/MWh$) (default value per EB23 is 90kg CO2e/MWh)
EG_y = Electricity produced by the project activity in year *y* (MWh)

(b) If the power density of the project activity (*PD*) is greater than 10 W/m^2:
$PE_{HP,y} = 0$

In UHE Mascarenhas project:

$PE_{HP,y}$ = 25,000 W /210 m^2 = 119 W/m^2

E.3. Leakage calculation

The leakage and the emissions from the project activity are equal to zero. The main emissions giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation. No sources of leakage were identified for the project activity.

E.4. Emission reductions calculation / table

According to ACM0002, version 06, the emission reduction *ERy* by the project activity during a given year y is the difference between baseline emissions (*BEy*), project emissions (*PEy*) and emissions due to leakage (*Ly*), as follows:

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2008	0	9,507	0	9,507
2009	0	23,082	0	23,082
2010	0	26,168	0	26,168
Total (tCO_2e)	**0**	**58,757**	**0**	**58,757**

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	71,865	58,757

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

According to the guideline for issuance, the project participant has to explain the cause any increase in the actual emission reductions achieved during the current monitoring period. As SHP São João has not increased the emissions reductions comparable to the values applied ex-ante calculation, this section do not need be filled.

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History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Guideline, Form **Business Function**: Issuance		