

**MONITORING REPORT FORM (CDM-MR)\***  
**Version 01 - in effect as of: DD/MM/YYYY**

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\* 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, 06/05/2011

**Rialma Companhia Energética III S/A. – Santa Edwiges III Small Hydro Power Plant – Small Scale CDM Project**

**Reference number 2165**

**1<sup>o</sup> verification: 07/08/2009 -30/04/2011**

### SECTION A. General description of the project activity

#### A.1. Brief description of the project activity:

The primary objective of Santa Edwiges III project is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to the environmental, social and economic sustainability by increasing renewable energy's share of the total Brazilian (and the Latin America and the Caribbean region's) electricity consumption.

This indigenous and cleaner source of electricity has an important contribution to environmental sustainability by reducing carbon dioxide emissions that would have occurred otherwise in the absence of the project. The project activity reduces emissions of greenhouse gas (GHG) by avoiding electricity generation from fossil fuel sources (and CO<sub>2</sub> emissions), which would be generated (and emitted) in the absence of the project.

The PCH<sup>1</sup> Santa Edwiges III is located in the Midwest of Brazil. The project consists of a small-hydro power plant (11.6 MW) with a small reservoir of reservoir has 0.64 km<sup>2</sup>. The technology installed in the plant is described in the table below. For a more detailed technical description of the equipment used in the plant, please refer to section A.4.

**Table 1 - Technical description of the equipment**

<i>Turbine(s)</i>		<i>Generator(s)</i>	
Quantity	2	Quantity	2
Capacity (MW)	5.8	Capacity (kVA)	6,300

Relevant dates for the project activity are as follows:

- Construction license issuance: 10 August 2007;
- Commissioning phase<sup>2</sup>: 12 December 2008;
- Commercial operating phase<sup>3</sup>: 08 January 2009.

<sup>1</sup> PCH from the Portuguese "Pequena Central Hidrelétrica", small hydro facility.

<sup>2</sup> As per ANEEL Ordinance # 4,582, dated 11/12/2008, available at:  
<<http://www.aneel.gov.br/cedoc/dsp20084582.pdf>>.

<sup>3</sup> As per ANEEL Ordinance # 19, dated 07/01/2009, available at:  
<<http://www.aneel.gov.br/cedoc/dsp2009019.pdf>>.

The GHG emission reductions during the period from 7<sup>th</sup> August 2009 to 30<sup>th</sup> April 2011 were achieved through the dispatched electricity generated by PCH Santa Edwiges III which displaced a mix of electricity generation in the Brazilian South-Southeast-Midwest interconnected grid. This monitoring report presents information related to the **first** verification of project activity which covers the period from August 7<sup>th</sup>, 2009 to April 30<sup>th</sup>, 2011. The total emission reductions by the project activity over the monitored period are **29,485 tCO<sub>2</sub>e**.

## **A.2. Project Participants**

<b>Name of Party involved (*) ((host) indicates a host Party)</b>	<b>Private and/or public entity(ies) Project participants (*) (as applicable)</b>	<b>Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)</b>
Brazil (host)	Rialma Companhia Energética III S.A.	No
	Ecopart Assessoria em Negócios Empresariais Ltda.	No

(\*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

## **A.3. Location of the project activity:**

The project is located in the Buritis River, between the municipalities of Mambai and Buritinópolis, state of Goiás, Midwestern region of Brazil, at the intersection of longitude 46°17'29'' W and latitude 14°22' 18'' S, about 300 km from Brasília (Federal District).

## **A.4. Technical description of the project**

PCH Santa Edwiges III is a run-of-the-river small-hydro plant with 11.6 MW of installed capacity and a reservoir area of 0.64 km<sup>2</sup>. This small dam stores water in order to generate electricity. A low-level diversion dam raises the water level in the river sufficiently to enable an intake structure to be located on the side of the river. The intake consists of a trash screen and a submerged opening with an intake gate.

Water from the intake is normally taken through a pipe (called a penstock) downhill to a power station constructed downstream of the intake and at as low a level as possible to gain the maximum head on the turbine.

Inside the power house system comprising one turbine and generator is installed. The type of turbine installed is the Francis. Francis turbines are the most widely used among water turbines. This turbine is a type of hydraulic reactor turbine in which the flow exits the turbine blades in the radial direction. Francis turbines are common in power generation and are used in applications where high flow rates are available at medium hydraulic head. Water enters the turbine through a volute casing and is directed onto the blades by wicket gates. The low momentum water then exits the turbine through a draft tube. In the model, water flow is supplied by a variable speed centrifugal pump. A load applied to the turbine by means of a magnetic brake, and torque is measured by observing the deflection of

calibrated springs. The performance is calculated by comparing the output energy to the energy supplied (Figure 1).

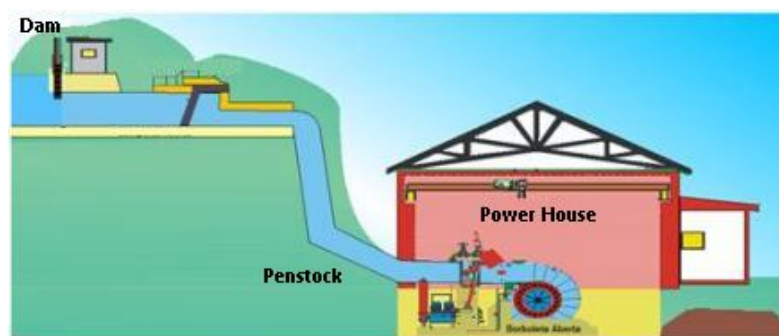


Figure 1 - Schematic diagram of a small hydropower plant

Source: Portal PCH<sup>4</sup>

The turbine system possesses 2 units of 5.8 MW, and the generators 6,300 kVA at 6.9 kV<sup>5</sup>. The main design characteristics of PCH Santa Edwiges III are shown below:

<i>PCH Santa Edwiges III</i>	
Power	11.6 MW
Power Output	84,930 MWh
Reservoir	0.64 km <sup>2</sup>

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

The SSC methodology applied to the project activity is AMS-I.D. “Grid connected renewable electricity generation” (version 12).

**A.6. Registration date of the project activity:**

This CDM project activity was registered on August 07<sup>th</sup>, 2009.

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

The project activity has opted for the renewable crediting period starting on August 07<sup>th</sup>, 2009. Therefore, the first crediting period lasts until August 06<sup>th</sup>, 2016.

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

Name of person/entity responsible for completing the monitoring report form (CDM-MR):

Company: Ecopart Assessoria em Negócios Empresariais Ltda.

<sup>4</sup> Available at:

<[http://www.portalpch.com.br/index.php?option=com\\_content&view=article&id=96&Itemid=187](http://www.portalpch.com.br/index.php?option=com_content&view=article&id=96&Itemid=187)>.

<sup>5</sup> The specifications of the equipment used at the time of project registration were taken from the manufactures’ proposals.

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## **SECTION B. Implementation of the project activity**

### **B.1. Implementation status of the project activity**

PCH Santa Edwiges III was implemented and is currently operational accordingly to what was stated in the registered PDD, *i.e.* no modifications took place since the CDM project activity was registered. The plant is operational since January 2009<sup>3</sup>.

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

### **B.2. Revision of the monitoring plan**

This section has been left blank on purpose. A revision of the monitoring plan is not applicable to this monitoring period.

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

This section has been left blank on purpose. A request for deviation revision of the monitoring plan is not applicable to this monitoring period.

### **B.4. Notification or request of approval of changes**

This section has been left blank on purpose. A request for approval of changes is not applicable to this monitoring period.

## **SECTION C. Description of the monitoring system**

The Monitoring Report is based on the electricity delivered to the grid by PCH Santa Edwiges III. The amount of energy delivered is monitored by the energy producer, Rialma Companhia Energética III S.A., as well as by CCEE – *Câmara de Comercialização de Energia Elétrica*, that controls all electricity delivered to the grid and assures, for the buyer, that the electricity generated is delivered to the grid.

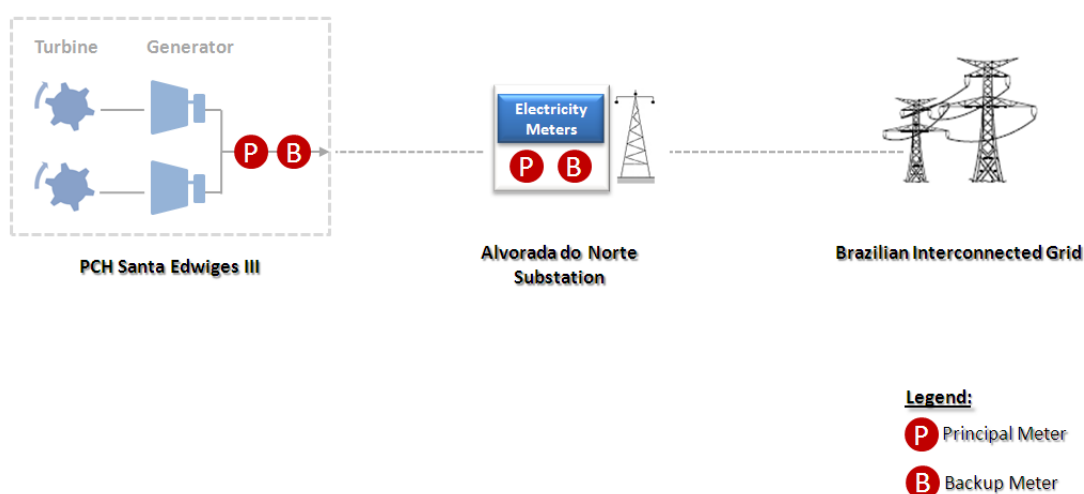
From what is established in the relevant regulation of the energy sector in Brazil, all the plants dispatching electricity to the grid have to implement a *Billing Commensuration System* (from the Portuguese, *Sistema de Medição e Faturamento - SMF*) in accordance with the specifications set by the Chamber of Electrical Energy Commercialization (from the Portuguese *Câmara de Comercialização de Energia Elétrica - CCEE*). Model and type of energy meters installed at the plant and substation are in accordance with what is established by CCEE.

There are four meters in the project: two at the power plant and two at the substation. Meters located at the power plant collect the total energy produced by Santa Edwiges III (gross energy) and meters located at the substation collect the energy dispatched to the grid (net energy). Meters are calibrated annually according to the specification of the company responsible for the automation of the plant.

The table below presents technical specifications of the meters used at PCH Santa Edwiges III. Figure 2 below is a diagram which presents the relevant monitoring points.

**Table 2 – Energy meters of Santa Edwiges III SHPP and Alvorada do Norte Substation**

<i>Description</i>		<i>Manufacturer</i>	<i>Type / Model</i>	<i>Number</i>
SHPP Santa Edwiges III	Principal	Power Measurement	ION 8600C	PT-0711A900-01
	Back-up	Power Measurement	ION 8600	PT-0711A418-01
Alvorada do Norte substation	Principal	Power Measurement	ION 8300	PS-0510A013-01
		Schneider	ION 8600	PT-0905A133-01
	Back-up	Power Measurement	ION 8300	PS-0410A148-01
		Power Measurement	ION 8600C	PT-0804A390-01
		Schneider	ION 8600	PT-0905A314-01



*Developed by Ecopart Assessoria Ltda.*

**Figure 2 - Diagram of the relevant monitoring points**

Energy is continuously measured by the meters and accumulated every five minutes, *i.e.* more frequent than what was established in the monitoring plan. CCEE has remote access to energy information. Energy generated by the plant is informed by the project owner to CCEE in an hourly frequency. CCEE verifies the consistency of information and accounts for all the energy generated and dispatched to the system as well as consumed. After the adjustments due to energy losses occurring in the transmission system are made, CCEE issues an official report named CB 0002 – which was used to certify the energy generation reported by the Project Participant (PP).

The table below presents the dates in which the meters mentioned above were last calibrated as well as the correspondent calibration certificates number. All of the meters possess a precision class of 0.2%. Both Alvorada do Norte Substation energy meters were replaced by new ones (with the following series numbers: PT-0905A133-01 and PT-0905A314-01) calibrated before the expiration calibration date of the former equipments, respecting the two year maximum limit established by ONS – the Brazilian Electric System National Operator.

**Table 3 – Calibration dates of the plant energy meters**

<i>Description</i>		<i>Number</i>	<i>Last Calibration Certificate # - Date</i>	<i>Re-calibration Certification # - Date</i>
SHPP Santa Edwiges III	Principal	PT-0711A900-01	DC-SLM-0075/08 – 15/10/2008	DC-SLM-0077/10 – 22/09/2010
	Back-up	PT-0711A418-01	DC-SLM-0076/08 – 15/10/2008	DC-SLM-0076/10 – 22/09/2010
Alvorada do Norte Substation	Principal	PS-0510A013-01 <sup>6</sup>	DC SLM 0177/07 - 08/10/2007	Substituted on 09/09/2009
		PT-0905A133-01	Operational from 09/09/2009 on	DC-SLM-0160/09 - 08/09/2009
	Back-up	PS-0410A148-01	DC SLM 0184/07 – 25/09/2007	Substituted on 14/10/2008
		PT-0804A390-01	Operational from 14/10/2008 0077/08 – 14/10/2008	Substituted on 09/09/2009
		PT-0905A314-01	Operational from 09/09/2009 on	DC-SLM-0161/09 – 08/09/2009

As it can be seen from data presented in the above table, both the calibration of the principal and back-up meters installed at the plant occurred on October 15<sup>th</sup>, 2008 – *i.e.* before the monitoring period. Therefore, the meters are deemed calibrated and their re-calibration will be done in September 22<sup>nd</sup>, 2012.

#### **SECTION D. Data and parameters**

Parameters used to calculate baseline, project, and leakage emissions as well as other relevant parameters required by the approved methodology and the monitoring plan; and specific information on how data and parameters have been monitored during the monitoring period are presented in this section.

Data determined only once for the crediting period which were used after registration of the project activity were included under section D.1.

##### **D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors**

<b>Data / Parameter:</b>	$EF_{grid, y}$ and $EF_{electricity, y}$
<b>Data unit:</b>	tCO <sub>2</sub> /MWh
<b>Description:</b>	CO <sub>2</sub> emission factor for the Brazilian South-Southeast-Midwest interconnected grid

<sup>6</sup> This meter is operational since 29/05/2008 when substituted the energy meter PS-0410A145-01.

Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> .
Value(s) :	0.2826
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	ONS supplied the raw dispatch data for the whole Brazilian interconnected grid, Other relevant sources of information used were: <i>i.</i> For the amount of fuel consumed by relevant fossil-fuel-fired plants, a research made by the International Energy Agency (Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba. Road testing baselines for greenhouse gas mitigation projects in the electric power sector. OECD and IEA information paper, October 2002) was used. The emission coefficients of each fuel are the ones indicated by the IPCC (Intergovernmental Panel on Climate Change. Revised 1996 Guidelines for National Greenhouse Gas Inventories).

<b>Data / Parameter:</b>	<b><math>EF_{OM,y}</math></b>
Data unit:	tCO <sub>2</sub> /MWh
Description:	CO <sub>2</sub> Operating Margin emission factor of the grid in a year y
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> .
Value(s) :	0.4749
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	ONS supplied the raw dispatch data for the whole Brazilian interconnected grid, Other relevant sources of information used were: <i>ii.</i> For the amount of fuel consumed by relevant fossil-fuel-fired plants, a research made by the International Energy Agency (Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba. Road testing baselines for greenhouse gas mitigation projects in the electric power sector. OECD and IEA information paper, October 2002) was used. The emission coefficients of each fuel are the ones indicated by the IPCC (Intergovernmental Panel on Climate Change. Revised 1996 Guidelines for National Greenhouse Gas Inventories).

<b>Data / Parameter:</b>	<b><math>EF_{BM,y}</math></b>
Data unit:	tCO <sub>2</sub> /MWh



Description:	CO <sub>2</sub> Build Margin emission factor of the grid in a year y
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: < <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> >.
Value(s) :	0.0903
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	ONS supplied the raw dispatch data for the whole Brazilian interconnected grid, Other relevant sources of information used were: <i>iii.</i> For the amount of fuel consumed by relevant fossil-fuel-fired plants, a research made by the International Energy Agency (Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A. F. Simoes, H. Winkler and J.-M. Lukamba. Road testing baselines for greenhouse gas mitigation projects in the electric power sector. OECD and IEA information paper, October 2002) was used. The emission coefficients of each fuel are the ones indicated by the IPCC (Intergovernmental Panel on Climate Change. Revised 1996 Guidelines for National Greenhouse Gas Inventories).

<b>Data / Parameter:</b>	$\lambda_y$
Data unit:	No unit
Description:	Fraction of time during which low-cost/must-run sources are on the margin
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: < <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> >.
Value(s) :	$\lambda_{2004} = 0.4185$ , $\lambda_{2005} = 0.5275$ , $\lambda_{2006} = 0.4937$
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	-

<b>Data / Parameter:</b>	$F_{i,y}$
Data unit:	Mass or volume
Description:	Amount of each fossil fuel consumed by each power source/plant
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website:

	<a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> .
Value(s) :	$\frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	As the amount of values/data is extraordinary large, it will be omitted here. Data is available under request, together with the emission factor for grid calculations.

<b>Data / Parameter:</b>	<b><math>COEF_i</math></b>
Data unit:	tCO <sub>2</sub> /mass or volume
Description:	CO <sub>2</sub> emission coefficient of each fuel type i
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> .
Value(s) :	$\frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	As the amount of values/data is extraordinary large, it will be omitted here. Data is available under request, together with the emission factor for grid calculations.

<b>Data / Parameter:</b>	<b><math>GEN_{j/k/n,y}</math></b>
Data unit:	MWh/year
Description:	Electricity generation of each power source/plant <i>j</i> , <i>k</i> , or <i>n</i> in year <i>y</i>
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> .
Value(s) :	$\frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.

Leakage emission calculations)	
Additional comment:	As the amount of values/data is extraordinary large, it will be omitted here. Data is available under request, together with the emission factor for grid calculations.

<b>Data / Parameter:</b>	$GEN_{j/k/l/y, IMPORTS}$
Data unit:	tCO <sub>2</sub> /mass or volume unit
Description:	CO <sub>2</sub> emission coefficient of fuels used in connected electricity systems (if imports occur)
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> .
Value(s) :	$\frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	As the amount of values/data is extraordinary large, it will be omitted here. Data is available under request, together with the emission factor for grid calculations.

<b>Data / Parameter:</b>	$\frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}}$
Data unit:	tCO <sub>2</sub> /MWh
Description:	Operating Margin for non low-cost/must run power sources <i>j</i>
Source of data used:	Data provided by The National Operator of the Electricity System (in a free translation from the Portuguese <i>Operador Nacional do Sistema – ONS</i> ). Calculated according to the approved methodology – ACM0002 (version 6). Detailed information is presented in the registered PDD of the project available at UNFCCC's website: <a href="http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view">http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218634643.54/view</a> .
Value(s) :	2004: 0.9886 2005: 0.9653 2006: 0.8071
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the baseline emissions.
Additional comment:	-

<b>Data / Parameter:</b>	<i>Area</i>
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Data unit:	km <sup>2</sup>
Description:	Surface area at full reservoir level
Source of data used:	ANEEL Resolution nr. 2386, from July 27 <sup>th</sup> , 2007
Value(s) :	0,64 km <sup>2</sup>
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This parameter is used to calculate the project emissions.
Additional comment:	-

## **D.2. Data and parameters monitored**

Data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

<b>Data / Parameter:</b>	<b>EGy</b>
Data unit:	MWh
Description:	Net electricity generation of the Project delivered to grid in a year y
Measured /Calculated /Default:	Measured.
Source of data:	Internal records of the company
Value(s) of monitored parameter:	For the monthly monitored values please refer to section E.1. below.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This information is used to calculate baseline emissions.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	There are four electricity meters (principal and back-up) - two located at the plant and two located at the substation - which continuously monitor the electricity generated by the plant and delivered to the grid. Their specification is detailed above in section C. As per the information presented above, they are calibrated every two years following the recommendations of the System National Operator. Last calibration of the equipment took place in 2009. In this sense, the calibration is still valid and is due in 2011. More details about the discount applied in the energy generation please refer to the spreadsheet "SEIII CERs 2011.05.06 v.01.xls".
Measuring/ Reading/ Recording frequency:	Electricity is measured continuously, read and recorded every 5 minutes and reported on a monthly basis.
Calculation method (if applicable):	Not applicable.
QA/QC procedures applied:	Information reported by the company is confirmed using the reports issued by CCEE verifies the consistency of information and accounts for all the energy generated and dispatched to the whole Brazilian system.

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

According to the methodology, baseline emissions are determined as the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO<sub>2</sub>e/kWh). Electricity produced by the plant during the monitored period is presented in Table 4.

The baseline emission factor was calculated as the average of the “approximate operating margin” and the “build margin”, where:

(a) The average of the “approximate operating margin” and the “build margin”, where:

(i) The “approximate operating margin” emission factor ( $EF_{OM,y}$ ) is the weighted average emissions (in kg CO<sub>2</sub>e/MWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. Using the notation from approved methodology,

$$EF_{OM, simple-adjusted,y} = (1 - \lambda_y) \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_j GEN_{j,y}} + \lambda_y \cdot \frac{\sum F_{i,k,y} \cdot COEF_{i,k}}{\sum_k GEN_{k,y}} \quad \text{Equation 1}$$

Where,

$\lambda_y$	=	Share of hours in year y (in %) for which low-cost/must-run sources are on the margin,
$\sum_{i,j} F_{i,j,y}$	=	Amount of fuel $i$ (in mass or volume unit) consumed by relevant power sources $j$ in year(s) $y$ ,
$COEF_{i,j}$	=	CO <sub>2</sub> e coefficient of fuel $i$ (tCO <sub>2</sub> e/mass or volume unit of the fuel), taking into account the carbon dioxide equivalent emission potential of the fuels used by relevant power sources $j$ and the percent oxidation of the fuel in year(s) $y$ and,
$\sum_j GEN_{j,y}$	=	Electricity (MWh) delivered to the grid by source $j$ .

The CO<sub>2</sub>e coefficient  $COEF_i$  is obtained as,

$$COEF_{i,j} = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad \text{Equation 2}$$

Where,

$NCV_i$	=	Net calorific value (energy content) per mass or volume unit of fuel $i$ ;
$OXID_i$	=	Oxidation factor of the fuel $i$ ;
$EF_{CO2,i}$	=	CO <sub>2</sub> e emission factor per unit of energy of the fuel $i$ .

(ii) The “build margin” emission factor ( $EF_{BM,y}$ ) is the weighted average emissions (in kg CO<sub>2</sub>e/MWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants,

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_m GEN_{m,y}} \quad \text{Equation 3}$$

Where  $F_{i,m,y}$ ,  $COEF_{i,m}$  and  $GEN_{m,y}$  are analogous to the variables described above for the operating margin for plants  $m$  (sample group  $m$  defined in (ii)), based on the most recent information available on plants already built.

The baseline emission factor  $EF_y$  is the average of the operating margin factor ( $EF_{OM,y}$ ) and the build margin factor ( $EF_{BM,y}$ ),

$$EF_y = 0.5 \cdot EF_{OM,y} + 0.5 \cdot EF_{BM,y} \quad \text{Equation 4}$$

Dispatch data for the whole Brazilian interconnected grid from the national dispatch center (*Operador Nacional do Sistema Elétrico, Centro Nacional de Operação do Sistema, Acompanhamento Diário da Operação do Sistema Interligado Nacional*, daily reports from Jan. 1, 2002 to Dec. 31, 2004) was used to calculate the emission factor of the grid. *Ex-ante* data vintage was used. Please refer to the registered PDD for details. The value used to determined baseline emissions is 0.2826 tCO<sub>2</sub>e/MWh. The results of baseline emissions are presented in Table 5.

**Table 4 – Electricity exported to the grid by the plant over the monitored period**

<i>Month</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>
January	-	5,315	5,678
February	-	4,339	5,001
March	-	5,197	6,892
April	-	5,109	5,109 <sup>7</sup>
May	-	4,628	-
June	-	3,751	-
July	-	4,384	-
August	4,108	4,191	-
September	4,497	3,931	-
October	4,838	4,467	-
November	5,680	5,425	-
December	5,573	6,221	-
<b>TOTAL</b>	<b>24,697</b>	<b>56,957</b>	<b>22,680</b>

Source: Câmara de Comercialização de Energia Elétrica (CCEE) and Rialma Companhia Energética III S.A

**Table 5 – Baseline emissions by the project over the monitored period**

<i>Month</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>
January	-	1,502	1,605
February	-	1,226	1,413
March	-	1,469	1,948
April	-	1,444	1,444
May	-	1,308	-
June	-	1,060	-
July	-	1,239	-
August	1,161	1,184	-

<sup>7</sup> This value will be updated during the verification.

September	1,271	1,111	-
October	1,367	1,262	-
November	1,605	1,533	-
December	1,575	1,758	-
<b>TOTAL</b>	<b>6,979</b>	<b>16,096</b>	<b>6,409</b>

## **E.2. Project emissions calculation**

According to the applicable methodology, project emissions by the project activity are zero.

## **E.3. Leakage calculation**

According to the applicable methodology, leakage emissions by the project activity are zero.

## **E.4. Emission reductions calculation / table**

Emission reductions by the project activity ( $ER_y$ ) during a given period of year  $y$  are the product of the baseline emissions factor ( $EF_y$ , in tCO<sub>2</sub>e/MWh) multiplied by the electricity supplied by the project to the grid ( $EG_y$ , in MWh), as follows:

$$ER_y = (EF_y \cdot EG_y) \quad \text{Equation 5}$$

Summarizing data discussed above, the total of the emission reductions achieved during the monitoring period are:

- Total baseline emissions: 29,485 tCO<sub>2</sub>e
- Total project emissions: 0 tCO<sub>2</sub>e
- Total leakage: 0 tCO<sub>2</sub>e
- Total emission reductions: 29,485 tCO<sub>2</sub>e

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

Below table presents a comparison between the actual values of emission reductions achieved during the monitoring period and the estimations as per the registered CDM-PDD.

<b>Item</b>	<b>Values applied in ex-ante calculation of the registered CDM-PDD</b>	<b>Actual values reached during the monitoring period</b>
<b>Emission reductions (tCO<sub>2</sub>e)</b>	<b>41,558</b>	<b>29,485</b>

<b>E.6. Remarks on difference from estimated value in the PDD</b>
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As per information presented in the previous section, there are no increase in the actual emission reductions achieved during the current monitoring period when the comparison is done considering an equivalent period (from 07/08/2009 to 30/04/2011).

In fact the actual monitored value is inferior to the estimated one. However, considering that electricity generation is dependent on river flow, small variations such as this can be expected.

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**History of the document**

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