



# VERIFICATION REPORT IBIRAMA ENERGÉTICA S.A.

## VERIFICATION OF THE IBIRAMA SMALL HYDROPOWER PLANT – A BRENNAND CDM PROJECT ACTIVITY

REPORT No.BVC/BRAZIL-VR/1254709/2013

REVISION No. 02

BUREAU VERITAS CERTIFICATION

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## VERIFICATION REPORT

Date of first issue: <b>12/08/2014</b>	Organizational unit: <b>Bureau Veritas Certification Holding SAS</b>
Client: <b>Ibirama Energética S.A.</b>	Client ref.: <b>Mr. Ricardo Jerônimo Pereira Rêgo Júnior</b>
<p><b>Summary:</b></p> <p>Bureau Veritas Certification has conducted the 1st periodic verification of Ibirama Small Hydropower Plant – a Brennan CDM Project Activity, CDM Registration Reference Number 6208, owned by Ibirama Energética S.A. , which is located in Ibirama municipality, State of Santa Catarina, Brazil, and applying the methodology ACM0002 Version 12.1.0, on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM rules and modalities and the subsequent decisions by the CDM Executive Board, as well as the host country criteria.</p> <p>The verification scope is defined as an independent and objective review and ex-post determination of the monitored GHG emission reductions, and consisted of the following three phases: i) desk review of the project design, the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final verification report and opinion. The overall verification, from Contract Review to Verification Report &amp; Opinion, was conducted using Bureau Veritas Certification internal procedures.</p> <p>In summary, Bureau Veritas Certification confirms that the project is implemented as planned and described in the validated and registered project design documents. Installed equipments being essential for generating emission reduction run reliably and are calibrated appropriately. The monitoring system is in place and the project is generating GHG emission reductions. The GHG emission reductions are calculated without material misstatements, and the emission reductions verified totalize 67,817 tons of CO<sub>2</sub>e for the monitoring period.</p> <p>Our opinion relates to the projects' GHG emissions and resulting GHG emission reductions reported and related to the valid and registered project baseline, approved monitoring plan and its associated documents.</p> <p>Reporting period: 25/07/2012 to 31/12/2013  Baseline emissions: 67,817 t CO<sub>2</sub> equivalents.  Project emissions: 0 t CO<sub>2</sub> equivalents.  Leakage emissions: 0 t CO<sub>2</sub> equivalents.  Emission Reductions: 67,817 t CO<sub>2</sub> equivalents.  16,608 tCO<sub>2</sub>e 25/07/2012 to 31/12/2012  51,209 tCO<sub>2</sub>e 01/01/2013 to 31/12/2013</p>	

Report No.: <b>BVC-Country/VR1254709/2013</b>	Subject Group: <b>CDM</b>
Project title: <b>Ibirama Small Hydropower Plant – a Brennan CDM Project Activity</b>	
Work carried out by: <b>Mr. Diego Serrano - Team Leader</b>	
Internal Technical Review carried out by: <b>Mr. Marco Prauchner</b>	
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## Indexing terms

Work approved by:

Ms Anna Kalacheva

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## Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CL	Clarification Request
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> e	Carbon Dioxide Equivalent
DOE	Designated Operational Entity
DRR	Daily Reading Record
ETN	Electricity Transaction Note
FAR	Forward Action Request
GHG	Green House Gas(es)
MoV	Means of Verification
MP	Monitoring Plan
MR	Monitoring Report
MRR	Monthly Reading Record
PDD	Project Design Document
PLF	Plant Load Factor
PP	Project Participant
PPA	Power Purchase Agreement
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation and Verification Standard



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## 1. INTRODUCTION

Ibirama Energética S.A. has commissioned Bureau Veritas Certification to verify the emissions reductions of its CDM project Ibirama Small Hydropower Plant – a Brennand CDM Project Activity (hereafter called “**the Project**”) at Project Location.

This report summarizes the findings of the verification of the Project, performed on the basis of UNFCCC criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

### 1.1. Objective

The objective of CDM verification is to conduct a thorough, independent assessment of the registered project activities.

In carrying out its verification work, the DOE shall ensure that the project activity complies with the requirements of paragraph 62 of the CDM modalities and procedures. In particular, this assessment shall:

- (a) Ensure that the project activity has been implemented and operated as per the registered PDD or any approved revised PDD, and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- (b) Ensure that the monitoring report and other supporting documents provided are complete in accordance with latest applicable version of the completeness checklist for requests for issuance of CERs, verifiable, and in accordance with applicable CDM requirements;
- (c) Ensure that actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan or any revised approved monitoring plan, and the approved methodology including applicable tool(s);
- (d) Evaluate the data recorded and stored as per the monitoring methodology including applicable tool(s).

### 1.2. Scope

The verification scope is defined as an independent and objective review and ex-post determination of the monitored GHG emission reductions. The verification is based on the validated and registered project design document, the monitoring report, emission reduction calculation spreadsheet, and supporting documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations.

The verification is not meant to provide any consulting service towards the PPs. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project monitoring towards reductions in the GHG emissions.



### 1.3. GHG Project Description

The Project consists of 03 sets of Francis turbines (7.25MW) and synchronous generators (7,78kVA) with a unit installed capacity of 7 MW, providing a total installed capacity of 21MW\*. The annual expected electricity supplied to Brazilian Interconnected Grid is 121,939 MWh and the annual estimated emission reductions are 28,363 tCO<sub>2</sub>e.

Project title: Ibirama Small Hydropower Plant – a Brennan CDM Project Activity  
 UNFCCC ref number: 6208  
 Registration Date: 25/07/2012  
 Crediting Period: 25/07/2012 to 24/07/2019 (renewable)  
 Monitoring Period: 25/07/2012 to 31/12/2013  
 Project Participants: Ibirama Energética S.A. (Brazil)  
 Ecopart Assessoria em Negócios Empresariais Ltda  
 Methodologies used: ACM0002 Version 12.1.0  
 Location of the Project: Ibirama municipality, State of Santa Catarina, Brazil  
 Geo coordinates: Longitude: 49° 34' 9.8" West, Latitude: 27° 02' 15.9" South  
 UNFCCC view page: <http://cdm.unfccc.int/Projects/DB/DNV-CUK1336731396.71/view>

#### [Post Registration Changes]

No post registration changes have been requested. [/Option C]

### 1.4. Verification Team

The assessment team and internal technical reviewer team consist of the following personnel:

FUNCTION	NAME	TA 1.2	TA X.X	TASK PERFORMED*
Team Leader	Mr. Diego Serrano	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> DR <input checked="" type="checkbox"/> SV <input checked="" type="checkbox"/> RI <input type="checkbox"/> TR
Internal Technical Reviewer (ITR)	Mr. Marco Prauchner	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> DR <input type="checkbox"/> SV <input type="checkbox"/> RI <input checked="" type="checkbox"/> TR

\*DR = Document Review; SV = Site Visit; RI = Report issuance; TR = Internal Technical Review

\* According to the CL14 of Validation Report: "... the revised "General Guidelines to SSC CDM methodologies" (EB59, Annex 9), "the rated/installed capacity for renewable energy generating units that involve turbine-generator systems shall be based on the installed/rated capacity of the generator". Therefore, the installed capacity of the project activity was readjusted from 21.75 MW as per the sum of the turbines' nameplate capacities to 21 MW, as per the sum of the 3 generators of 7 MW each (7.780 MVA x 0.9 of power factor = 21MW).



## 2. METHODOLOGY

The overall verification, from Contract Review to Verification Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

In order to ensure transparency, a verification protocol was customized for the project, according to the version 07.0 of the Clean Development Mechanism Validation and Verification Standard, issued by CDM Executive Board after its 80<sup>th</sup> meeting on 18/07/2014 /9/. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results from verifying the identified criteria. The verification protocol serves the following purposes:

- It organizes, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent verification process where the verifier will document how a particular requirement has been verified and the result of the verification.

The completed verification protocol is enclosed in Appendix A to this report.

### 2.1. Review of Documents

The assessment of the project documentation provided by the project participant is based upon both quantitative and qualitative information on emission reductions. Quantitative information comprises the reported numbers in the monitoring report (MR) version 04 dated 20/08/2014 /25/ and emission reduction calculation spreadsheet version 04 dated 20/08/2014/26/. Qualitative information comprises information on internal management controls, calculation procedures, procedures for transfer of data, frequency of emissions reports, and review and internal audit of calculations.

The monitoring report version 01 submitted by the project participant was also web hosted on the UNFCCC-CDM web site on 07/02/2014 and thus, was available in the public domain.

In addition to the monitoring documentation provided by the project participants, the DOE reviews:

- (a) The registered PDD and the monitoring plan, including any approved revised monitoring plan and/or changes from the registered PDD, and the corresponding validation opinion /1//3/;
- (b) The validation report
- (c) The applied monitoring methodology /8/;
- (d) Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board;
- (e) Other information and references relevant to the project activity's resulting emission reductions (e.g. IPCC reports, laboratory analysis or national regulations).



## 2.2. Follow-up Interviews

On 05 and 06/05/2014, Bureau Veritas Certification performed a site visit and interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of Ibirama Energética S.A. and EQAO were interviewed (see References). The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organization	Interview topics
Ibirama Energética S.A. (the Project Owner)	<ul style="list-style-type: none"> <li>➤ Project Design and implementation</li> <li>➤ Technical equipment, calibration and operation</li> <li>➤ Monitoring Plan and management procedures</li> <li>➤ Monitoring data</li> <li>➤ Data uncertainty and residual risks (QA/QC)</li> <li>➤ GHG Calculation</li> <li>➤ Environmental Impacts</li> <li>➤ Compliance with National Laws and Regulations</li> </ul>
EQAO (the Consultant)	<ul style="list-style-type: none"> <li>➤ Monitoring Plan</li> <li>➤ Monitored data and Monitoring Report</li> <li>➤ GHG Calculations</li> </ul>

## 2.3. Resolution of Clarification, Corrective and Forward Action Requests

The objective of this phase of the verification is to resolve issues related to the monitoring, implementation and operations of the registered project activity that could impair the capacity of the registered project activity to achieve emission reductions or influence the monitoring and reporting of emission reductions prior to Bureau Veritas Certification's positive conclusion on the GHG emission reduction calculation.

Findings established during the verification can either be seen as a non-fulfillment of criteria ensuring the proper implementation of a project or where a risk to deliver high quality emission reductions is identified.

A Corrective Action Request (CAR) is raised, if one of the following situations occurs:

- (a) Non-compliance with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
- (b) Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;
- (c) Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions;
- (d) Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.





A Clarification Request (CL) is raised, if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A Forward Action Request (FAR) is raised, for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

To guarantee the transparency of the verification process, the concerns raised are documented in more detail in the verification protocol in Appendix A.

## **2.4. Internal Technical Review**

The verification report underwent an Internal Technical Review (ITR) before requesting issuance of CERs for the project activity.

The ITR is an independent process performed to examine thoroughly that the process of verification has been carried out in conformance with the requirements of the verification scheme as well as internal Bureau Veritas Certification procedures.

The Team Leader provides a copy of the verification report to the reviewer, including any necessary verification documentation. The reviewer reviews the submitted documentation for conformance with the verification scheme. This will be a comprehensive review of all documentation generated during the verification process.

When performing an Internal Technical Review, the reviewer ensures that:

- The verification activity has been performed by the team by exercising utmost diligence and complete adherence to the CDM rules and requirements.
- The review encompasses all aspects related to the project which includes project design, baseline, additionality, monitoring plans and emission reduction calculations, internal quality assurance systems of the project participant as well as the project activity, review of the stakeholder comments and responses, closure of CARs, CLs and FARs during the verification exercise, review of sample documents.

The reviewer may raise Clarification Requests to the verification team and discusses these matters with Team Leader.

After the agreement of the responses on the Clarification Requests from the verification team as well as the PP(s), the finalized verification report is accepted for further processing such as uploading via the UNFCCC interface.

## **3. VERIFICATION CONCLUSIONS**

In the following sections, the conclusions of the verification are stated.

The findings from the desk review of the original monitoring documents and the findings from interviews during the follow up visit are described in the Verification Protocol in Appendix A.



The Clarification, Corrective and Forward Action Requests are stated, where applicable, in the following sections and are further documented in the Verification Protocol in Appendix A. The verification of the Project resulted in 08 CAR(s), 04 CL(s) and 00 FAR(s).

The CARs, CLs and FARs were closed based on adequate responses from the Project Participant(s) which meet the applicable requirements. They have been reassessed before their formal acceptance and closure.

The number between brackets at the end of each section corresponds to the VVS paragraph.

### **3.1. Remaining issues from validation or previous verification (258)**

All CARs and CLs raised were successfully closed during the validation stage and previous verification of the Project, no remaining issues were left. [/Option A]

### **3.2. Compliance of the project implementation with the registered project design document (273)**

Bureau Veritas Certification has performed a site visit and found that the Project has been put into operation and the electricity generated is supplied to Brazilian Interconnected Grid according to the ANEEL Resolution # 247/2006 /14/ as well as the third paragraph of Distribution System Usage Contract, signed between PP and CELESC (regional distribution company) /15/. 03 sets of Francis turbines (7.25MW) and synchronos generators (7,78kVA) with a unit installed capacity of 7 MW, providing a total installed capacity of 21MW<sup>†</sup>. have been in operation during the monitoring period.

No changes to the project design have been identified during this verification. The implementation and operation of the project activity have been conducted in accordance with the description contained in the registered PDD. [/Option A]

According to the ANEEL report "Acompanhamento das Pequenas Centrais Hidrelétricas com Licença de Instalação". Version 2 /02/, the Project started construction on 01/07/2009. As per the ANEEL Ordinance # 3,643 issued on November 30th, 2010 /04/, the Project started commissioning on 01/12/2010, and was put into full operation on 21/12/2010 /13/.

[Power System]

As shown in the ANEEL Ordinance nr. 3,961 /13/ and ANEEL Resolution # 247/2006 /14/, the electricity generated by the Project is delivered to the Brazilian Interconnected Grid.

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<sup>†</sup> According to the CL14 of Validation Report: "... the revised "General Guidelines to SSC CDM methodologies" (EB59, Annex 9), "the rated/installed capacity for renewable energy generating units that involve turbine-generator systems shall be based on the installed/rated capacity of the generator". Therefore, the installed capacity of the project activity was readjusted from 21.75 MW as per the sum of the turbines' nameplate capacities to 21 MW, as per the sum of the 3 generators of 7 MW each (7.780 MVA x 0.9 of power factor = 21MW).

**[Metering System]**

There are six meters installed for the Project. 3 (three) located in each generator, 1 (one) meter (which writes up the total sum of generator meters) and 2 (two) at the substation (principal and backup)

The main meter was installed at the output of the on-site substation to measure the electricity exported to and imported from the grid by the Project.

The backup meter was installed beside the main meter to measure the electricity exported to and imported from the grid by the Project.

**[Management and Operation]**

The PP has operated the Project as per the registered PDD. The monitoring organization has been set up and all monitoring staffs have been trained. Meter reading records of all the meters are based on continuously measurement and monthly recorded by the PP /17/. CCEE consolidates the values of Individual Measurement for each power plant connected to the national grid and issues, for public consultation, the "General Reports of Individual Measurement" /18/. This report is issued every month to confirm the electricity exported to and imported from the grid. CDM Monitoring & Management Manual /23/ and internal training records /24/ have been provided and verified by the verification team.



Corresponding to the paragraph 273 of VVS version 07.0, Bureau Veritas Certification can confirm that:

- The implementation of the Project is consistent with the registered PDD.
- The Project is operated as per the registered PDD by the PP.
- Information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD, and has caused an increase in estimates of the emission reductions in the current monitoring period or is highly likely to increase the estimates of emission reductions in the future monitoring periods is reported.

**3.3. Compliance of the monitoring plan with the monitoring methodology including applicable tool(s) (277)**

The verification team has verified the monitoring plan, including the data and parameters required to be monitored, measurement procedures, monitoring frequency and QC/QA procedures as described in the registered PDD.



Corresponding to the paragraph 277 of VVS version 07.0, Bureau Veritas Certification can confirm that the monitoring plan is in accordance with the approved methodology including applicable tool(s) applied by the Project.



### 3.4. Compliance of monitoring activities with the monitoring plan (280-281)

Monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD.

#### [Parameters and information flow]

The parameters required by the monitoring plan and how Bureau Veritas Certification has verified the information flow (from data generation, aggregation, to recording, calculation and reporting) for these parameters including the values in the monitoring report are described below:

#### **Parameters monitored:**

- (1)  **$EG_{facility,y}$** : Quantity of net electricity generation supplied by the project plant/unit to the grid in year y

As described above, the meters have been installed in accordance with the registered PDD. The verification team has checked on-site the location of the meters against the diagram of power connection system and found them to be consistent.

The readings of the meters are continuously monitored and monthly recorded by the PP and the grid company. The grid company (CCEE) provides the General Reports of Individual Measurement /18/, for public consultation in its website. These reports contains the consolidated value of electricity exported to and imported from the grid by the Project. The PP cross-check its own Monthly Reading Records (MRR) /17/ against the General Reports of Individual Measurement /18/, adjusting the monthly values where applicable in the ER Calculation Spreadsheet version 4.

The verification team has verified the values provided in the monitoring report and ER spreadsheet against the relevant documented evidences, as: MRRs /17/ and the CCEE General Reports of Individual Measurement /18/ and found them to be consistent with the evidences. The MRRs and the General Reports of Individual can cover this monitoring period from 25/07/2012 to 31/12/2013.

- (2)  **$Cap_{PJ}$**  : Installed capacity of the hydro power plant after the implementation of the project activity.

The installed capacity of the power plant was checked by DOE during on-site visit and cross-checked with official documents, as Operation Licence, issued by the environmental agency of Santa Catarina (FATMA) /16/ and ANEEL Ordinance nr. 3,961 /13/. No discrepancy was found.

- (3)  **$A_{PJ}$**  : Area of the reservoir

The value of  $A_{PJ}$  is equal to area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.



The single reservoir area of the project is monitored through topographical studies (made once at the time of the project design) and water reservoir levels, which are monitored monthly by the project sponsors (plant operator). The DOE has assessed the monitored values of reservoir area /19/ and Calculation Spreadsheet version 4 /26/ and found them to be consistent with the evidences and the registered PDD.

- (4)  **$EF_{grid,CM,y}$**  : Combined margin CO<sub>2</sub> emission factor for grid connected power generation in year y

The Calculation of Combined margin has followed the steps provided by the “Tool to calculate the emission factor for an electricity system” applying the numbers published by the Brazilian DNA.

The Combined Margin was calculated as follow:

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

Were:

$EF_y$  = Combined margin CO<sub>2</sub> emission factor for grid connected power generation in year y

$w_{OM}$  = weighting of operating margin emissions factor (%);

$EF_{OM,y}$  = Operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh);

$w_{BM}$  = weighting of build margin emissions factor (%);

$EF_{BM,y}$  = Build margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh).

DOE has crosschecked the values used to calculate the  **$EF_{grid,CM,y}$**  for 2012 and 2013 against DNA official sources /21/. Also the calculus presented in the ER Calculation Spreadsheet version 4 /26/, was crosschecked against the “Tool to calculate the emission factor for an electricity system”. No discrepancies or error were found between the CER spreadsheet v.4 and the official sources. Please refer to sheet  **$EF_{grid,CM,y}$**  - 2012 and  **$EF_{grid,CM,y}$**  - 2013 of the ER Calculation Spreadsheet version 4 as well as the assessment for parameters  **$EF_{grid,OM,y}$**  and  **$EF_{grid,BM,y}$**  described below.

- (5)  **$EF_{grid,OM,y}$**  : Operating margin CO<sub>2</sub> emission factor for grid connected power generation in year y.

The selected option to calculate the operating margin was the dispatch analysis which does not permit the vintage of *ex-ante* calculation of the emission factor. Therefore, the chosen option was **ex-post** calculation. This parameter was calculated based in the hourly values of emission factor, provided by the Brazilian DNA /21/ and adjusted according to the hourly generation of the project activity, please refer to sheet  **$EF_{grid,CM,y}$**  - 2012 and  **$EF_{grid,CM,y}$**  - 2013 of the ER Calculation Spreadsheet version 4 /26/.

- (6)  **$EF_{grid,BM,y}$**  : Build margin CO<sub>2</sub> emission factor for grid connected power generation in year y.

The Build margin for 2012 and 2013 were calculated following the steps provided by the “Tool to calculate the emission factor for an electricity system” This calculus is done by the Brazilian DNA and issued in periodic reports /21/. DOE confirms the values applied by PP



are in accordance to the values issued by the Brazilian DNA. Please refer to sheet EF<sub>grid,CM,y</sub> - 2012 and EF<sub>grid,CM,y</sub> - 2013 of the ER Calculation Spreadsheet version 4 /26/.

- (7)  **$FC_{i,m,y}$ ,  $FC_{i,y}$ ,  $FC_{i,j,y}$ ,  $FC_{i,k,y}$ ,  $FC_{i,n,y}$  and  $FC_{i,n,h}$**  : Amount of fossil fuel type  $i$  consumed by power plant / unit  $m$ ,  $j$ ,  $k$  or  $n$  (or in the project electricity system in case of  $FC_{i,y}$ ) in year  $y$  or hour  $h$

These parameters are monitored by the Brazilian DNA, once they are already included in the EF<sub>grid,BM,y</sub>, and/or EF<sub>grid,OM,y</sub> calculation.

- (8)  **$NCV_{i,y}$**  : Net calorific value (energy content) of fossil fuel type  $i$  in year  $y$

These parameters are monitored by the Brazilian DNA and already included in the EF<sub>grid,BM,y</sub>/EF<sub>grid,OM,y</sub> calculation.

- (9)  **$EF_{CO2i,y}$  and  $EF_{CO2m,i,y}$**  : CO<sub>2</sub> emission factor of fossil fuel type  $i$  in year  $y$

These parameters are monitored by the Brazilian DNA and already included in the EF<sub>grid,BM,y</sub>/EF<sub>grid,OM,y</sub> calculation.

- (10)  **$EG_{m,y}$ ,  $EG_y$ ,  $EG_{j,y}$ ,  $EG_{k,y}$  and  $EG_{n,h}$**  : Net electricity generated and delivered to the grid by power plant / unit  $m$ ,  $j$ ,  $k$  or  $n$  (or in the project electricity system in case of  $EG_y$ ) in year  $y$  or hour  $h$ .

These parameters are monitored by the Brazilian DNA and already included in the EF<sub>grid,BM,y</sub>/EF<sub>grid,OM,y</sub> calculation.

- (11)  **$EG_{PJ,h}$**  : Electricity displaced by the project activity in hour  $h$  of year  $y$ .

As stated in the applied methodology /08/ and registered PDD /01/.

$$EG_{PJ,y} = EG_{facility,y}$$

Please refer to item (1) above, CER spreadsheet v.4 /26/ and Monthly Reading Records of the Project (MRR) /17/

- (12)  **$\eta_{m,y}$**  : Average net energy conversion efficiency of power unit  $m$  in year  $y$

This parameter is monitored by the Brazilian DNA and already included in the EF<sub>grid,BM,y</sub>/EF<sub>grid,OM,y</sub> calculation.

#### **Parameters determined ex-ante:**

- (1)  **$Cap_{BL}$**  : Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero.

According to the applied methodology /08/ the applied value for new hydro power plants (project case) is zero.





- (2)  $A_{BL}$  : Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity. For new hydro power plants, this value is zero.

According to the applied methodology /08/ the applied value for new hydro power plants (project case) is zero.

✌ Corresponding to the paragraph 280 and 281 of VVS version 07.0, Bureau Veritas Certification can confirm that:

- The monitoring has been carried out in accordance with the monitoring plan contained in the registered.
- All parameters required by the monitoring plan have been sufficiently monitored and correctly listed. The monitored data for required parameters have been verified by checking the whole information flow.

### 3.5. Compliance with the calibration frequency requirements for measuring instruments (288)

The registered monitoring plan requires that The registered monitoring plan requires that Calibration procedures must be in accordance to the requirements established by the ONS (Accuracy Class 0,2% and calibration each 2 years) /22/.

During this monitoring period, the installed measuring instruments have been operating well and were duly calibrated. The calibration records are shown in Table 2 below.

Table 2 The calibration records of the meters

Meter ID	Serial number	Accuracy	Calibration Date	Validity	Calibration entity
Main	458489	0.2%	29/01/2013	Yes	A
Back-up	458490	0.2%	29/01/2013	Yes	A

Entity A: LACTEC - Instituto para de tecnologia para o desenvolvimento (LACTEC certificate: CCR 447/12\_ validity Jun/2013)

#### [Instrument accuracy]

The verification team has verified the calibration records and the accreditation certificates of the calibration entity. All the meters meet the rated accuracy level as described in the monitoring plan and are in compliance with the ONS, *Submódulo 12.3 – Maintenance of billing measurement system* /22/.

#### [Calibration frequency]

It is identified that the calibration has been delayed during the monitoring period from 25/07/2012 to 28/01/2013, in a way that the calibration certificates cover only the period from



29/01/2012 until 31/12/2013. Thus a conservative approach was adopted in the calculation of emission reductions for the period between 25/07/2012 and 28/01/2013, as follows:

PPs have applied the discount following §283 of the CDM Validation and Verification Standard v.7. Considering that the error identified in the actual calibration was smaller than the maximum permissible error (0,2%), PP has applied the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration.

✎ Corresponding to the paragraph 288 of VVS version 07.0, Bureau Veritas Certification can confirm that:

- The calibration is conducted at the frequency as specified by the methodology and the monitoring plan contained in the registered PDD.
- For calibration that has been delayed, the conservative approach is adopted in the calculation of emission reductions and deemed as appropriate.

### 3.6. Assessment of data and calculation of emission reductions (291)

A complete set of data for the specified monitoring period is available. [/Option A]

The critical parameter used for the determination of the Emission Reductions is the net electricity supplied to the grid by the Project. The data pertaining to the above parameter are maintained in the identified records. All the data are in compliance with that stated in the Monitoring Report version 04 /25/.

As per the methodology ACM0002 Version 12.1.0 and the registered PDD, the emission reductions for the Project are calculated as the baseline emissions minus the project emissions and leakage. Hence the emission reduction is determined by the following formula:

$$ER_y = BE_y - PE_y - L_y$$

Where,

ER<sub>y</sub>: Emission reductions

BE<sub>y</sub>: Baseline emissions

PE<sub>y</sub>: Project emissions

L<sub>y</sub>: Emissions due to leakage

#### [Baseline emissions]

The baseline emissions are the baseline emission factor times the net electricity supplied to the grid. Therefore,





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

Where:

$EG_{PJ,y}$  = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr);

$EF_{grid,CM,y}$  = Combined margin 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).

Since Ibirama project is a new hydropower plant connected to the grid where no renewable power plant was operated prior to the project, Ibirama applies option (a). In this case,  $EG_{PJ,y}$  is calculated as follows:

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

$EG_{facility,y}$  = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

The verification team has cross-checked the values from the MRRs /17/ and ER Calculation Spreadsheet v.4 /26/ against the CCEE General Reports of Individual Measurement /18/ for the period from 25/07/2012 to 31/12/2013. The conservative values are used for emission reductions calculation. The verified values are shown in the following Table 3 and Table 4.

Table 3 The verified electricity exported to the grid by the Project (MWh)

Period	MRRs	CCEE Reports	Verified EGexport
25/07/2012 - 31/12/2012	50,874	50,851	42,429.21
01/01/2013 - 31/12/2013	118,683	118,683	118,662.55
Total	169,556	169,534	161,091.76

Note that the discrepancy between CCEE values and the verified values is due to difference in the generation period considered for July 2012 (CCEE and MRR consider entire July generation, while the verified values has considered only the period from 25/07/2012 until 31/07/2012), and discount applied due to calibration delay (0,2% from 25/07/2012 until 29/01/2013). In addition, the discrepancy between MRR values and CCEE for 2012 is due to consolidation done by CCEE in the official generation values, before report issuance. In order to guarantee the conservativeness, the discount due to calibration delay was applied to the CCEE post consolidation values.

$$EG_y = EG_{\text{export}} - EG_{\text{import}} = 161,091.76 - 0 = 161,091.76 \text{ MWh}$$

The baseline emissions of the Project are calculated as:

2012:



$$BE_y = EF_y \cdot EG_y = 0.39142 \text{ tCO}_2\text{e/MWh} \cdot 42,429.21 \text{ MWh} = 16,608 \text{ tCO}_2\text{e}$$

2013:

$$BE_y = EF_y \cdot EG_y = 0.43155 \text{ tCO}_2\text{e/MWh} \cdot 118,662.55 \text{ MWh} = 51,209 \text{ tCO}_2\text{e}$$

$$\text{Total 2012} + \text{2013} = 67,817 \text{ tCO}_2\text{e}$$

### **[Project emissions]**

The Project is a newly built hydropower project, thus according to ACM0002 Version 12.3.0 the project emission only apply if the power density of power plant is greater than 4 W/m<sup>2</sup> and less than or equal to 10 W/m<sup>2</sup>.

Considering Ibirama SHPP has an installed capacity of 21 MW and a reservoir area 0.13 km<sup>2</sup>, the power density is 161.6 W/m<sup>2</sup>, thus the project emissions is zero.

### **[Leakage emissions]**

No leakage needs to be considered according to ACM0002 Version 12.1.0.

### **[Emission reductions]**

The emission reductions during the monitoring period from 25/07/2012 to 31/12/2013 are calculated as:

$$ER_y = BE_y - PE_y - L_y = 67,817 - 0 - 0 = 67,817 \text{ tCO}_2\text{e}$$

### **[Comparison of ERs]**

The annual estimated emission reductions are 28,363 tCO<sub>2</sub>e as per the registered PDD. The actual operation days of the Project in the monitoring period are 525 days. The corresponding estimate in the monitoring period are 40,796 (=28,363\*525/365) tCO<sub>2</sub>e. The actual emission reductions are 66.2% more than the estimated value in the monitoring period.

Despite of the reduction of 11.9% of electricity dispatched to the grid, when comparing to the registered PDD (161,092 MWh vs 182,909 MWh), there was an increase of emission reductions in comparison to the PDD values. These variation is due to the estimated CO<sub>2</sub> emission factor of the grid, considered in the registered PDD (0.2326 tCO<sub>2</sub>/MWh) based on the values published by the Brazilian DNA for the year of 2006 to 2008. This ex-ante emission factor value was far below the ex-post values for 2012 and 2013 (0.3914 and 0.4316 tCO<sub>2</sub>/MWh, respectively) and it is deemed to be reasonable.

Considering the parameter that increase the emission reductions of the project activity in comparison to the estimated value presented in the registered PDD is the combined margin CO<sub>2</sub> emission factor of the grid ( $EF_{\text{grid,CM,y}}$ ), The increase in emission reductions do not raises any concern regarding additionality of the project as delineated in the registered PDD.



Corresponding to the paragraph 291 of VVS version 07.0, Bureau Veritas Certification can confirm that:



- Data used for the determination of the emission reductions are available and monitored in accordance with the monitoring plan contained in the registered PDD.
- Information and data provided in the monitoring report have been cross-checked with other sources such as plant logbooks, inventories, purchase records, laboratory analysis.
- Appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been followed.
- Assumptions, emission factors and default values that were applied in the calculations have been justified.



#### 4. VERIFICATION OPINION

Bureau Veritas Certification has performed the 1st periodic verification of Ibirama Small Hydropower Plant – a Brennan CDM Project Activity, CDM Registration Reference Number 6208, which is located in Ibirama municipality, State of Santa Catarina, Brazil, and applying the methodology ACM0002 Version 12.1.0. The verification was performed based on the requirements set by the CDM and relevant guidance provided by CMP and the CDM Executive Board.

The verification consisted of the following three phases: i) desk review of the project design, the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final verification report and opinion.

The management of Ibirama Energética S.A. is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions of the project on the basis set out within the monitoring plan contained in the registered PDD. The development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of GHG emission reductions from the project, is the responsibility of the management of the project.

Bureau Veritas Certification has verified the project Monitoring Report version 04 dated 20/08/2014 for the reporting period as indicated below. Bureau Veritas Certification confirms that the project is implemented as described in the validated and registered project design documents. Installed equipments being essential for generating emission reductions run reliably and are calibrated appropriately. The monitoring system is in place and the Project is generating GHG emission reductions as a CDM project.

Bureau Veritas Certification can confirm that the GHG emission reductions are calculated without material misstatements. Our opinion relates to the projects' GHG emissions and resulting GHG emission reductions reported and related to the validated and registered project baseline, approved monitoring plan and its associated documents. Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, Bureau Veritas Certification confirms the following statement:

Reporting period:	25/07/2012 to 31/12/2013
Baseline emissions:	67,817 t CO <sub>2</sub> equivalents
Project emissions:	0 t CO <sub>2</sub> equivalents
Leakage emissions:	0 t CO <sub>2</sub> equivalents
Emission Reductions:	67,817 t CO <sub>2</sub> equivalents
	16,608 tCO <sub>2</sub> e 25/07/2012 to 31/12/2012
	51,209 tCO <sub>2</sub> e 01/01/2013 to 31/12/2013



A handwritten signature in blue ink, appearing to read 'Prauchner', with a large, sweeping initial 'P'.

Mr. Marco Prauchner  
Internal Technical Reviewer  
28/08/2014

Mr. Diego Serrano  
Team Leader  
28/08/2014



## 5. REFERENCES

### Documents reviewed:

- /1/ Registered PDD version 07 dated 19/09/2011, UNFCCC ref no.6208
- /2/ Project construction start evidence: ANEEL report "*Acompanhamento das Pequenas Centrais Hidrelétricas com Licença de Instalação*". Version 2. Available at: <http://aneel.gov.br/>.
- /3/ Validation Report revision 01b, dated 17/07/2012
- /4/ Project start commissioning evidence: ANEEL Ordinance # 3,643 issued on November 30th, 2010. Available at ANEEL's website: <http://www.aneel.gov.br/cedoc/dsp20103643.pdf>
- /5/ Monitoring Report version 01, dated 27/01/2014 (Ibirama\_Monitoring Report\_v.1\_2014.01.27)
- /6/ Monitoring Report version 02, dated 24/06/2014 (Ibirama\_Monitoring Report\_v.2\_2014.06.24)
- /7/ ER Calculation Spreadsheet version 01, dated 27/01/2014 (Ibirama\_CERs\_v.1\_2014.01.27.xlsx)
- /8/ ACM0002 Version 12.1.0 dated 17/09/2010
- /9/ Validation and Verification Standard Version 07.0 dated 01/06/2014
- /10/ Monitoring Report version 03, dated 16/07/2014 (Ibirama\_Monitoring Report\_v 3\_2014 07 16)
- /11/ Monitoring Report version 04, dated 20/08/2014 (Ibirama\_Monitoring Report\_v 4\_2014 08 20)
- /12/ ER Calculation Spreadsheet version 02, dated 24/06/2014 (Ibirama\_CERs\_v.2\_2014.06.24.xlsx)
- /13/ ER Calculation Spreadsheet version 03, dated 16/07/2014 (Ibirama\_CERs\_v 3\_2014 07 16.xlsx)
- /14/ ER Calculation Spreadsheet version 04, dated 20/08/2014 (Ibirama\_CERs\_v 4\_2014 08 20.xlsx)
- /15/ Operation Startup Evidence: ANEEL Ordinance nr. 3,961 dated December 20th, 2010. Available at: <http://www.aneel.gov.br/cedoc/dsp20103961.pdf>
- /16/ ANEEL Resolution # 247/2006 (conditions for the sale of electricity)
- /17/ Grid Connection Agreement dated (3rd paragraph of the Distribution System Usage Contract), Signed between PP and CELESC (distribution company)
- /18/ Operation Licence, issued by the environmental agency of Santa Catarina (FATMA) (n° 086/2010 GELRH)
- /19/ Monthly Reading Records of the Project (MRR), files: Dados horários de energia líquida entregue à rede (OUR-IBI) and CCEE-IBIRAMA\_MWh-v.2.xlsx
- /20/ CCEE General Reports of Individual Measurement (final reports of monthly net energy delivered to the grid - Jul 2012 to Dec 2013) available at: [http://www.ccee.org.br/portal/faces/pages\\_publico/o-que-fazemos/resultados?tipo=Medi%C3%A7%C3%A3o&\\_afzLoop=436035410149899#%40%3F\\_afzLoop%3D436035410149899%26tipo%3DMedi%25C3%25A7%25C3%25A3o%26\\_adf.ctrl-state%3Ds52p5ount\\_45](http://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/resultados?tipo=Medi%C3%A7%C3%A3o&_afzLoop=436035410149899#%40%3F_afzLoop%3D436035410149899%26tipo%3DMedi%25C3%25A7%25C3%25A3o%26_adf.ctrl-state%3Ds52p5ount_45)



- /21/ Monitoring Record of water level in the reservoir (Ibirama.zip)
- /22/ Calibration Records/Certificates, meters: 458489 (CCR 018/13, Calibration Date 29/01/2013) and 458490 (CCR 082/13, Calibration Date 29/01/2013)
- /23/ Official Emission Factor issued by Brazilian DNA (2012 values available at: <http://www.mct.gov.br/index.php/content/view/338047.html#ancor>. 2013 values available at <http://www.mct.gov.br/index.php/content/view/346664.html#ancora>)
- /24/ *Módulo 12 do ONS, Submódulo 12.3 – Manutenção do sistema de medição para faturamento* (Maintenance of billing measurement system). Available at: [http://www.ons.org.br/download/procedimentos/Submodulo%2012.3\\_v10.0.pdf](http://www.ons.org.br/download/procedimentos/Submodulo%2012.3_v10.0.pdf).
- /25/ CDM Monitoring & Management Manual
- /26/ Internal Training Records and Qualification Certificate of Operation Staff
- /27/ Monitoring Report version 04, dated 20/08/2014 (Ibirama\_Monitoring\_Report\_v4\_2014.08.20)
- /28/ ER Calculation Spreadsheet version 04, dated 20/08/2014 (Ibirama\_CERs\_v.4\_2014.08.20.xlsx)

**Persons interviewed:**

Ibirama Energética S.A.

- /1/ Carla Vilasboas Administrative Assistant
- /2/ Sergio Uliana PA-RDS Operator (Celesc)
- /3/ Célio A. Camerini Commissionaire (Brennand Energia)
- /4/ Ronaldo Cavalcanti Environment manager (Brennand Energia)  
EQAO
- /5/ Karen M. Nagai Analyst



## 6. CURRICULA VITAE OF THE DOE'S VERIFICATION TEAM MEMBERS

Mr. Diego Serrano	Bureau Veritas Certification, Brazil	Team Leader, Climate Change Lead Verifier, Forest engineer graduated at ESALQ/USP, has master degree in Energetic System Planning by UNICAMP (State University of Campinas). His abilities include coordination, elaboration, validation and verification of PDD's in the scopes 1, 4, 13 and 14. He is qualified as Lead Verifier for GHG – Green House Gases projects and ISO 14001:2004."
Mr. Marco Prauchner	Bureau Veritas Certification, Brazil	Technical Reviewer, Climate Change Lead Verifier. He is graduated in Mechanical Engineering with experience in Quality and Environmental management in mechanical, plastic and chemical industries. He is ISO 9001:2008 and ISO 14001:2004 Lead Auditor and has also experience in the implementation of Environmental Management Systems. Marco is qualified as Lead Verifier GHG – Green House Gases.





## APPENDIX A: CDM PROJECT VERIFICATION PROTOCOL



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
<b>Part I Cover Page</b>					
(a) Is the title of the project activity provided?	MR		Yes: " <i>Ibirama Small Hydropower Plant – a Brennand CDM Project Activity</i> "		OK
(b) Is the reference number of the project activity provided?	MR		Yes: "6208"		OK
(c) Is the version number of the monitoring report indicated?	MR		Yes: "v.1.0"		OK
(d) Is the completion date of the monitoring report provided in DD/MM/YYYY format?	MR		Yes: "27/01/2014"		OK
(e) Is the registration date of the project activity provided in DD/MM/YYYY format?	MR		Yes: "25/07/2012"		OK
(f) Are the monitoring period number and duration of this monitoring period (first and last days included in DD/MM/YYYY format) provided?	MR		Yes: " <i>1st verification: 25/07/2012 – 31/12/2013</i> "		OK
(g) Are project participants indicated?	MR		Yes: " <i>Ibirama Energética S.A. and Ecopart Assessoria em Negócios Empresariais Ltda.</i> "		OK
(h) Is the host party(ies) indicated?	MR		Yes: " <i>Brazil</i> "		OK
(i) Are the sectoral scope(s) and applied methodology(ies) indicated?	MR		Yes: " <i>Sectoral scope 1: Energy industries (renewable -/ non renewable sources)</i> "		OK
(j) Is the estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD indicated?	MR		Yes: " <i>42,428 tCO<sub>2</sub>e</i> "		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
(k) Are the actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period indicated?	MR		Yes: "60,719 tCO <sub>2</sub> e"		OK
(l) Are the actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012 indicated (if applicable)?	MR		Yes: "16,651 tCO <sub>2</sub> e"		OK
(m) Are the actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards indicated (if applicable)?	MR		Yes: "44,069 tCO <sub>2</sub> e"		OK
<b>Part II Monitoring Report</b>					
<b>A. Description of project activity</b>					
<b>A.1 Purpose and general description of project activity</b>					
A.1.1 Is the description of the project activity to be presented in this section a brief summary of the detailed description given in the section B.1 Implementation status of the project activity?	MR		Yes.		OK
A.1.2 Does this description include:					
A.1.2.1 Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG	MR		Yes.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
removals by sinks?					
A.1.2.2 Brief description of the installed technology and equipments?	MR		Yes.		OK
A.1.2.3 Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)?	MR		<b>CAR 01:</b> no information regarding relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.), was provided in the MR v.1	<b>CAR 01</b>	OK
A.1.2.4 Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period?	MR		Yes: "60,719tCO <sub>2</sub> e"		OK
<b>A.2 Location of project activity</b>					
A.2.1 Is the information on the location of the project activity provided, including Host Party(ies), Region/State/Province, City/Town/Community, Physical/Geographical location etc.?	MR		Yes: "the plant is located in the Ibirama municipality, State of Santa Catarina, Brazil's Southern region"		OK
<b>A.3 Parties and project participant(s)</b>					
A.3.1 Is the Party(ies) and project participant(s) involved in the project activity listed in the provided table?	MR		Yes.		OK
<b>A.4 Reference of applied methodology</b>					
A.4.1 Is the exact reference (number, title, version) of the methodology(ies) indicated?	MR		Yes: "ACM0002 – "Consolidated baseline methodology for grid-connected electricity generation from renewable		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
			<i>sources" (version 12.1.0)"</i>		



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
A.4.2 Is the exact reference (number, title, version) of any tools and other methodologies to which the applied methodology(ies) refers indicated?	MR		Yes: " <i>Tool to calculate the emission factor for an electricity system (Version 2.2.0); Tool for the demonstration and assessment of additionality (Version 5.2); Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (version 2) and Combined tool to identify the baseline scenario and demonstrate additionality (version 3.0.0).</i> ".		OK
<b>A.5 Crediting period of project activity</b>					
A.5.1 Are the type, start date and length of the crediting period corresponding to this monitoring period provided?	MR		<b>CAR 02:</b> the type of the crediting period corresponding to this monitoring period was not provided in the MR v.1	<b>CAR 02</b>	OK
<b>B. Implementation of project activity</b>					
<b>B.1 Description of implemented registered project activity</b>					
B.1.1 Is the description of the installed technology, technical processes and equipments provided, include diagrams where appropriate?	MR PS	191(a)	Yes.		OK
B.1.2 Is the information on the implementation and actual operation of the project activity, including relevant dates (e.g. construction, commissioning, continued operation periods, etc.) provided?	PS	191(b)	No, please refer to <b>CAR 01</b>	<b>CAR 01</b>	OK
B.1.3 Is the description of: (i) the events or situations that occurred during the	PS	191(c)	N.A.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
monitoring period that may impact the applicability of the methodology (ii) how the issues resulting from these events or situations have been addressed provided?					
B.1.4 Have the project participants addressed the FARs identified during validation or previous verification(s)?	VVS	213	N.A.		OK
B.1.5 Have the implementation and operation of the project activity been conducted in accordance with the description contained in the registered PDD?	VVS	226	Yes.		OK
B.1.6 Are all physical features of the project activity in the registered PDD in place?	VVS	227	Yes.		OK
B.1.7 Have the project participants operated the project activity as per the registered PDD or any approved revised PDD?	VVS	227	Yes.		OK
B.1.8 Was an on-site visit conducted?	VVS	227	Yes. between 10th and 14th March, 2014		OK
B.1.9 If an on-site visit is not conducted, is the rationale of the decision justified?	VVS	227	N.A.		OK
<b>B.2 Post registration changes</b>					
B.2.1 Temporary deviations from registered monitoring plan or applied methodology					
B.2.1.1 Is it indicated whether any temporary deviations have been applied during	MR		N.A.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
this monitoring period?					
B.2.1.2 Is a description of the deviation(s) in accordance with applicable provisions in the Project standard provided?	MR		N.A.		OK
B.2.1.3 Are the reasons for the deviation(s), how it deviates from the monitoring plan and/or applied methodology(ies), the duration for which the deviation(s) is(are) applicable and justification on the conservativeness of the approach included in the description?	MR		N.A.		OK
B.2.1.4 For deviation(s) that require prior approval by the Board, are the date of approval and reference number included in the description?	MR		N.A.		OK
<b>B.2.2 Corrections</b>					
B.2.2.1 Is it indicated whether any corrections to project information or parameters fixed at validation have been approved during this monitoring period or submitted with this monitoring report?	MR		N.A.		OK
B.2.2.2 In cases where the correction(s) and the revised PDD are approved prior to the submission of this monitoring report for request for issuance, are the	MR		N.A.		OK





## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
approval date and reference number provided? Otherwise, are the version number and the completion date of the revised PDD provided?					
<b>B.2.3 Permanent changes from registered monitoring plan or applied methodology</b>					
B.2.3.1 Is it indicated whether any permanent changes from the registered monitoring plan or applied methodologies have been approved during this monitoring period or submitted with this monitoring report?	MR		N.A.		OK
B.2.3.2 In cases where the change(s) and the revised PDD are approved prior to the submission of this monitoring report for request for issuance, are the approval date and reference number provided? Otherwise, are the version number and the completion date of the revised PDD provided?	MR		N.A.		OK
<b>B.2.4 Changes to project design of registered project activity</b>					
B.2.4.1 Is it indicated whether any changes to the project design of the project activity have been approved during this monitoring period or submitted with this monitoring report?	MR		N.A.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
B.2.4.2 In cases where the change(s) and the revised PDD are approved prior to the submission of this monitoring report for request for issuance, are the approval date and reference number provided? Otherwise, are the version number and the completion date of the revised PDD provided?	MR		N.A.		OK
B.2.5 Changes to start date of crediting period					
B.2.5.1 Is it indicated whether any changes to the start date of the crediting period have been approved during this monitoring period?	MR		N.A.		OK
B.2.5.2 In cases where the changes and the revised PDD are approved prior to the submission of this monitoring report for request for issuance, are the approval date and reference number provided?	MR		N.A.		OK
B.2.6 Types of changes specific to afforestation or reforestation project activity					
B.2.6.1 Is it indicated whether any changes specific to afforestation or reforestation project activities have been applied during this monitoring period based on applicable provisions in the Project standard that do not require prior	MR		N.A.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
approval by the Board?					
B.2.6.2 If changes were applied, are the version number and the completion date of the revised PDD provided?	MR		N.A.		OK
<b>C. Description of monitoring system</b>					
<b>C.1 General requirements</b>					
C.1.1 Have project participants described the monitoring system and provided line diagrams (graphical schemes) showing all relevant monitoring points?	MR PS	193	Yes.		OK
C.1.2 Does this description where appropriate include data collection procedures (information flow including data generation, aggregation, recording, calculations and reporting), organizational structure, roles and responsibilities of personnel, and emergency procedures for the monitoring system?	MR PS	193	Yes.		OK
C.1.3 Is the monitoring plan of the project activity in accordance with the applied methodology including applicable tool(s)?	VVS	229	Yes.		OK
C.1.4 For monitoring aspects that are not specified in the methodology, particularly in the case of small-scale methodologies (e.g.	VVS	231	N.A.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
additional monitoring parameters, monitoring frequency and calibration frequency), are there any issues which may enhance the level of accuracy and completeness of the monitoring plan and should bring to the attention of the Board?					
C.1.5 Has the monitoring plan been properly implemented and followed by the project participants?	VVS	234(a)	Yes.		OK
C.1.6 Have all parameters stated in the monitoring plan and relevant Board decisions been monitored and updated as applicable, including:	VVS	234(b)		-	-
C.1.6.1 Project emission parameters?	VVS	234(b)	Yes.		OK
C.1.6.2 Baseline emission parameters?	VVS	234(b)	Yes.		OK
C.1.6.3 Leakage parameters?	VVS	234(b)	N.A.		OK
C.1.6.4 Management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan?	VVS	234(b)	Yes.		OK
<b>D. Data and parameters</b>					



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
<b>D.1 Data and parameters fixed ex ante or at renewal of crediting period</b>					
D.1.1 For "Purpose of data", is one of the following options chose: (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by sinks; (c) Calculation of leakage?	MR		Yes.		OK
D.1.2 For "Value(s) applied", if applicable, is one table used to report multiple values referring to the same data and parameter? If necessary, are reference(s) to electronic spreadsheets used?	MR		Yes.		OK
D.1.3 Is the source of data provide and/or identified?	PS	195(d)	Yes.		OK
D.1.4 Is information about appropriate emission factors, IPCC default values and any other reference values that have been used in the calculation of GHG emission reductions or net GHG removals provided?	PS	195(g)	Yes.		OK
<b>D.2 Data and parameters monitored</b>					
D.2.1 For "Purpose of data", is one of the following options chose: (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by	MR		Yes.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
sinks; (c) Calculation of leakage?					
D.2.2 For "Value(s) of monitored parameter", if applicable, is one table used to report multiple values referring to the same data and parameter? If necessary, are reference(s) to electronic spreadsheets used?	MR		Yes.		OK
D.2.3 Are the values of the monitored parameter for the purpose of calculating GHG emission reductions or net GHG removals provided? Where data are measured continuously, are they presented using an appropriate time interval? For default values (such as an IPCC value), where it is ex post confirmed, is the most recent value applied?	PS	195(a)	Yes.		OK
D.2.4 Is the equipment used to monitor each parameter described, including details on accuracy class, and calibration information (frequency, date of calibration and validity), if applicable as per monitoring plan?	PS	195(b)	Yes.		OK
D.2.5 Is the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan, the applied methodology, the Board guidance, local/national standards, or as per the	VVS	234(c)	<b>CAR 03:</b> Information regarding serial numbers of the energy meters, date of calibration, validity and number of energy meters certificates, were not presented in MR v.1.	<b>CAR 03</b>	OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
manufacturer's specification?					
D.2.6 Is the calibration of those measuring equipments that have an impact on the claimed emission reductions conducted by the project participants at a frequency specified in the applied monitoring methodology and/or the monitoring plan?	VVS	237	<b>CAR 04:</b> The calibration certificates of substation meters, presented during site visit do not cover the entire monitored period.	<b>CAR 04</b>	OK
D.2.7 If, during verification of a certain monitoring period, the calibration has been delayed and the calibration has been implemented after the monitoring period in consideration (i.e. the results of delayed calibration are available), is the following conservative approach adopted in the calculation of emission reductions:	VVS	238			
D.2.7.1 Applying the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error?	VVS	238(a)	Please refer to <b>CAR 04</b>	<b>CAR 04</b>	OK
D.2.7.2 Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error	VVS	238(b)	Please refer to <b>CAR 04</b>	<b>CAR 04</b>	OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
of the measuring equipment?					
D.2.8 Has the error has been applied:	VVS	239	-	-	-
D.2.8.1 In a conservative manner, such that the adjusted measured values of the delayed calibration shall result in fewer claimed emission reductions?	VVS	239(a)	Please refer to <b>CAR 04</b>	<b>CAR 04</b>	OK
D.2.8.2 For all measured values taken during the period between the scheduled date of calibration and the actual date of calibration.	VVS	239(b)	Please refer to <b>CAR 04</b>	<b>CAR 04</b>	OK
D.2.9 In cases where the results of the delayed calibration are not available, or the calibration has not been conducted at the time of verification, prior to finalizing verification, were the project participants requested to conduct the required calibration have the project participants calculated the emission reductions conservatively using the approach mentioned in item "D.2.7" above?	VVS	240	N.A.		OK
D.2.10 In cases where it is not possible for the project participants to conduct the calibration at a frequency specified by either the applied methodology, guidance provided by the Board, and/or the registered monitoring plan due to reasons	VVS	241	N.A.		OK





## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
beyond the control of PPs, are the requirements for post registration changes, in section 9.5 of the VVS, followed?					
D.2.11 In cases where neither the monitoring methodology nor the monitoring plan specify any requirements for calibration frequency for measuring equipments, are the equipments calibrated either in accordance with the specifications of the local/national standards, or as per the manufacturer's specification? If neither local/national standards nor the manufacturer's specification are available, were international standards used?	VVS	242	N.A.		OK
D.2.12 Is it described how the parameters are measured/calculated and the measurement and recording frequency?	PS	195(c)	Yes.		OK
D.2.13 Are monitoring results consistently recorded as per approved frequency?	VVS	234(d)	Yes.		OK
D.2.14 Is the source of data (e.g. logbooks, daily records, surveys, etc.) provide and/or identified?	PS	195(d)	<b>CAR 05:</b> The monthly net energy values presented in the CER's spreadsheet and MR v.1(table 7), do not meet the CCEE General Report of Individual Measurement values, available for public consultation in the CCEE website.	<b>CAR 05</b>	OK
D.2.15 Where relevant is the calculation method of the parameter provided?	PS	195(e)	Yes.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
D.2.16 Are the QA/QC procedures applied described (if applicable per monitoring plan)?	PS	195(f)	Yes.		OK
D.2.17 Have quality assurance and quality control procedures been applied in accordance with the monitoring plan or the revised monitoring plan?	VVS	234(e)	Yes.		OK
D.2.18 Is information about appropriate emission factors, IPCC default values and any other reference values that have been used in the calculation of GHG emission reductions or net GHG removals provided?	PS	195(g)	Yes.		OK
<b>D.3 Implementation of sampling plan</b>					
D.3.1 Is a description provided on how project participants implemented the sampling efforts and surveys for those data and parameters according to the sampling plan, Include:	MR		N.A.		OK
D.3.1.1 Description of implemented sampling design?	MR		N.A.		OK
D.3.1.2 Collected data (electronic spreadsheets may be attached and referenced)?	MR		N.A.		OK
D.3.1.3 Analysis of the collected data?	MR		N.A.		OK



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CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
D.3.1.4 Demonstration on whether the required confidence/precision has been met?	MR		N.A.		OK
<b>E. Calculation of emission reductions or GHG removals by sinks</b>					
<b>E.1 Calculation of baseline emissions or baseline net GHG removals by sinks</b>					
E.1.1 Are the sample calculations for all formulae used and calculation of baseline emissions or baseline net GHG removals by sinks provided, applying actual values?	MR PS	197(a)	<p><b>CL 01:</b> in the Ibirama CER spreadsheet v.1 it is stated: <i>"The Build Margin of 2013 is not available yet. Hence, the number of 2012 year was used" as well as "Data of December 2013 for the Operating Margin is not available yet. Hence, data from November 2013 was used"</i>, in addition in the MR v.1 table 5, PP indicates EF<sub>BM</sub> 2012 will be updated during verification.</p> <p><b>CL 02:</b> official data source for EG<sub>pj,h</sub> was not provided</p>	CL 01 and CL02	OK
E.1.2 Are the electronic spreadsheets to present full calculations in the monitoring report attached?	MR		Yes.		OK
<b>E.2 Calculation of project emissions or actual net GHG removals by sinks</b>					
E.2.1 Are the sample calculations for all formulae used and calculation of project emissions or actual net GHG removals by sinks provided, applying actual values?	MR PS	197(b)	N.A.		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
E.2.2 Are the electronic spreadsheets to present full calculations in the monitoring report attached?	MR		N.A.		OK
<b>E.3 Calculation of leakage</b>					
E.3.1 Are the sample calculations for all formulae used and calculation of leakage provided, applying actual values?	MR PS	197(c)	N.A. as per ACM0002		OK
E.3.2 Are the electronic spreadsheets to present full calculations in the monitoring report attached?	MR		N.A. as per ACM0002		OK
<b>E.4 Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks</b>					
E.4.1 Are the results of above sections summarized and GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period presented, using the provided table?	MR PS	197(d)	Yes.		OK
E.4.2 Is a complete set of data for the specified monitoring period is available?	VVS	245(a)	Yes		OK
E.4.3 Has information provided in the monitoring report been cross-checked with other sources such as plant log books, inventories, purchase records, laboratory analysis?	VVS	245(b)	Please refer to <b>CL 02</b>	<b>CL 02</b>	OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
E.4.4 Have calculations of baseline emissions, and project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology document?	VVS	245(c)	Please refer to <b>CL 01</b>	<b>CL 01</b>	OK
E.4.5 Have any assumptions used in emission calculations been justified?	VVS	245(d)	Please refer to <b>CL 01</b>	<b>CL 01</b>	OK
E.4.6 Have appropriate emission factors, IPCC default values and other reference values been correctly applied?	VVS	245(e)	Please refer to <b>CL 01</b>	<b>CL 01</b>	OK
<b>E.5 Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD</b>					
E.5.1 Is a comparison of actual GHG emission reductions or net anthropogenic GHG removal of the project activity achieved during this monitoring period with the estimates in the registered PDD provided?	MR PS	198	Yes.		OK
<b>E.6 Remarks on difference from estimated value in registered PDD</b>					
E.6.1 For any registered CDM project activity, except A/R project activities, have project participants explained the cause of any increase in the actual GHG emission	MR PS	199	Yes, the increase of 43,1% in the monitored emission reductions is due to the increasing of 68.3% and 59.6% in the EF 2012 and 2013, respectively		OK



## VERIFICATION REPORT

CHECKLIST QUESTION	Ref.	§	COMMENTS	Draft Concl	Final Concl
reductions achieved during the current monitoring period (e.g. higher water availability, higher plant load factor, etc.), including all information (i.e. data and/or parameters) that is different from that stated in the registered PDD?					
<b>E.7 Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards</b>					
E.7.1 If the monitoring period starts before 31 December 2012 and ends anytime thereafter, are actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved for the following two periods provided respectively? (a) Up to 31 December 2012 (1st commitment period); (b) From 1 January 2013 onwards.	MR		Yes: 16,651 and 44,069tCO <sub>2</sub> e, respectively		OK
E.7.2 Is it ensured that the achieved GHG emission reductions or net anthropogenic GHG removals by sinks are calculated proportionally for each period? In cases where annual caps were applied in the calculations, is it ensured that the annual caps are pro-rated to each period?	MR		Yes.		OK



## VERIFICATION REPORT

**Table 2 Resolution of Corrective Action /Clarification / Forward Action Requests**

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
<b>CAR 01:</b> No information regarding relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.), was provided in the MR v.1	A.1.2.3	Relevant dates regarding construction, commissioning and operation periods were included in section A.1 of the MR. Furthermore, the PPs withdrawal technical data table of section A.1 and included in section B.1. Please refer to the second version of the document.	Ok, the requested information was included in MR v.2. CAR 01 is closed



## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
<b>CAR 02:</b> The type of the crediting period corresponding to this monitoring period was not provided in the MR v.1	A.5.1	Type of the crediting period was included in section A.5 of the MR. Please refer to the second version of the document.	Ok, the requested information was included in MR v.2. CAR 02 is closed
<b>CAR 03:</b> No line diagram (graphical schemes) showing all relevant monitoring points was presented in section C of MR v.1	C.1.1	Diagram presenting relevant monitoring points and monitored parameters of Ouro project activity were included in section C of the MR. Please refer to the second version of the document.	Ok, the requested information was included in MR v.2. CAR 03 is closed
<b>CAR 04:</b> In section D.2 of MR v.1, the field "Value(s) of monitored parameter" is empty for the parameter Cap <sub>PJ</sub> . Also, information regarding "details on accuracy class, and calibration information" for parameter EG <sub>facility,y</sub> was not provided.	D.2.3	Information regarding accuracy class for EG <sub>y</sub> parameter and monitored value for Cap <sub>PJ</sub> were included in tables of section D.2 of the MR. Please refer to the second version of the document.	Ok, the requested information was included in MR v.2. CAR 04 is closed
<b>CAR 05:</b> Information regarding serial numbers of the four energy meters, date of calibration, validity and number of energy meters certificates, were not presented in MR v.1.	D.2.5	PPs first response:  Serial number energy meters involved in the project activity as well as date of their calibration were included in section C of the MR. Please refer to the second version of the document.  PPs second response:  Validity and ID numbers of energy meters certificates were included in the new version of the MR (version 3).	validity and ID number of energy meters <u>certificates</u> are still missing in MR v.2 CAR 05 remains opened  DOE second response:  Ok, the requested information was included in MR v.4





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Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
		PPs stress that energy calibration certificates of Campos Novos SE do not present ID numbers, but only date of calibration.	CAR 05 is closed.



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Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
<b>CAR 06:</b> The MR v.1 does not present model or additional information for the two gross energy meters located at SHPP. It's worth mentioning the data generated by these two meters are used by CCEE to calculate the sharing of energy dispatched to the grid by Ouro and by Moinho SHPP, once both use the same substation net energy meters.	D.2.5	Detailed description of energy meters involved in the project activity was included in section C of the MR. Detailed information regarding Brazilian measurement system and electricity ratio among power plants that share the same energy meter in the "connection point" were also included. Please refer to the second version of the document.	Ok, the requested information was included in MR v.2. CAR 06 is closed
<b>CAR 07:</b> The calibration certificates of gross and net energy meters, presented during site visit, do not cover the entire monitored period.	D.2.6	In fact, calibration certificates of energy meters do not cover the monitored period. Therefore, the PPs applied the discount on net electricity meters – the ones used for invoice and emission reductions calculation – from 25/07/2012 to 01/10/2012 following §238 of the CDM Validation and Verification Standard. Please refer to the second version of the MR and CER spreadsheet.	The discount applied to the EGpj values (0,2%) is in accordance to the VVS requirements for delays in meters calibration. CAR 07 is closed
<b>CAR 08:</b> The monthly net energy values presented in the CER's spreadsheet and MR v.1 (table 6), do not meet the CCEE General Report of Individual Measurement values, available for public consultation in the CCEE website.	D.2.14	PPs first response:  In fact, net energy generated and dispatched to the grid of Ouro small hydropower plant presented in the CER spreadsheet and data from the CCEE's website is slight different. The PPs clarify that data considered in the CER spreadsheet (and for ER and OM EF grid calculation) is based on hourly data from electricity meters and data	The EGpj values for July, august and September 2012, were wrongly adjusted based in the ratio calculated for July, august and September 2013 (please refer to table "1-ratio*", presented in sheet "EGpjh"). Also, the values of



## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
		<p>presented. On the other hand, data presented at the CCEE's website is based on data from electricity meters + ex-post adjustment/consolidation of all power plants connected in SIN. Since CCEE does not publish hourly data required for the OM emission factor calculation, the PPs considered data from electricity meters in the first version of the MR.</p> <p>However, since data from CCEE is an official data source and is based on that data the project sponsor is paid, the PPs revised the CER spreadsheet (and ER and OM EF grid calculation) and MR to consider hourly data from electricity meters adjusted to the monthly difference identified in data from CCEE. Please refer to the second version of these documents.</p> <p>The PPs also attached to this response the spreadsheet presenting EG data of the monitoring period of this verification collected from CCEE's website.</p> <p>PPs second response:</p> <p>CER spreadsheet was revised to correct CCEE's ratio in the EG<sub>y</sub> values for July, August and September 2012. Please refer to the third version of the CER spreadsheet and MR.</p>	<p>"1-ratio*" for July 2012 and December 2013, do not make sense and looks incorrect.</p> <p>CAR 08 remains opened</p> <p><b>DOE second response:</b></p> <p>The adjustments done in the EG<sub>y</sub> ratio for August and September 2012 are ok. Also the applied ratio for December 2013 is ok once is deemed conservative. However the generated/consolidated ratio presented for July 2012 (210%), still looks overestimated. Please note that the OESA values used to calculate the ratio for July 2012, has considered only six days of generation (from 25/07/2012 until 31/07/2012), in the other hand the CCEE consolidated values has considered the entire month</p>



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Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
		<p>Regarding discrepancies from CCEE data and energy meters identified in July 2012 and December 2013, the PPs do not have detailed information regarding adjustment made by CCEE. Since CCEE makes the accountability of the total electricity supplied in the national grid and is an official source of data – also used for commercialization purposes –, CCEE's data was considered for the ER calculation.</p> <p>The CCEE's monitoring is possible through the Energy Data Collection System (SCDE), which is a system which consolidates the electricity data in the connection points of all power plants of the Brazilian grid. Therefore, it is an official and credible source of data.</p> <p>Therefore, the applied ratios in the <math>EG_y</math> values were calculated based on official source of data publicly available at the CCEE's website and hourly data from energy meters. While applying ratios, the result of hourly data (consolidated monthly) is the same of the CCEE's website. Therefore, PPs calculation is correct.</p> <p>PPs third response:</p> <p>Considering the DOE comments, the ratio applied in July 2012 was revised. Please refer to the new version of the MR, CER and CCEE spreadsheets attached to this</p>	<p>(31 days). This looks to be the root cause of the discrepancy. Please note that this discrepancy is overestimating the generation for the first 6 days of the monitored period (25 to 31 July 2012), once the <math>EG_{p,h}</math> values are much higher than the SHPP installed capacity, what is not technically possible, please also refer to CL01.</p> <p>CAR 08 remains opened</p> <p><b>DOE's third response:</b></p> <p>Ok, the adjustments were correctly applied in the MR v.4 and CER spreadsheet v.4</p> <p>CAR 08 is closed</p>



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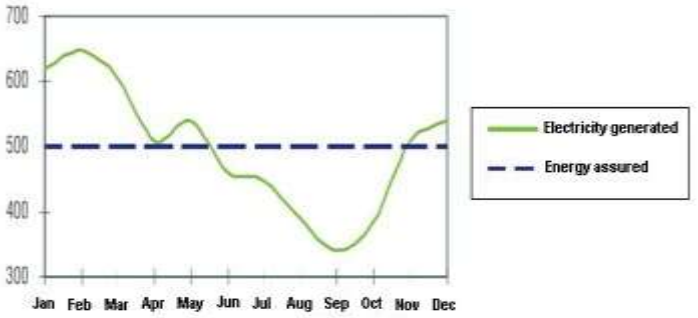
Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
		response.	



## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
<p><b>CL 01:</b> It is not clear whether the statement provided in footnote 2 of the MR v.1 is in line with EB48 ann67, section B.</p>	A.1.2.2	<p>First PPs response:</p> <p>Footnote 2 was withdrawal from the MR. please refer to the second version of the document.</p> <p>Second PPs response:</p> <p>The PPs clarify that installed capacity and technical description of equipment presented in the MR are in accordance with the registered PDD and the equipment tag as checked during the audit visit. Therefore, there is <u>no</u> conflict between technical information from this verification to the registered PDD.</p> <p>Regarding the real nominal power and the nominal power presented in the registered PDD, this issue was exhaustively discussed during validation. Please refer to footnote 15 from the registered PDD, Validation Report item 3.4 “project description”, CAR 4 of the Validation Report (“DOEs 5<sup>th</sup> answer”) and CL 1 of the Validation Report.</p> <p>PPs also clarify that the installed capacity of the project is 16MW and the estimated energy generation is 75,336 MWh/year. The estimated electricity generated by the project is based on the assured energy of 8.6MW-ave: 8.6MW x 365 days x 24 hours = 75,336 MWh/year or</p>	<p>To remove footnote 2 from the document does not solve the concern raised in this CL (possible conflict between real nominal power and the nominal power presented in the registered PDD). In this regarding, please note that some hourly values (EGpj,h) presented in CER’s spreadsheet v.2 are higher than 16MWh (installed capacity). Please refer to EB48 ann67, section B.</p> <p>CL01 remains opened</p> <p><b>DOE second response:</b></p> <p>The PP explanation to this CL was based in the assured energy approved by ANEEL. Notwithstanding, the issue in this case refers to inconsistencies between the installed capacity (16 MW)</p>

## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
		<p>6,278/month.</p> <p>According to ANEEL explanations (<a href="http://www.aneel.gov.br/arquivos/pdf/caderno3capa.pdf">http://www.aneel.gov.br/arquivos/pdf/caderno3capa.pdf</a>): <i>“....the assured energy is established independently of the real electricity generation; assured energy is associated to the estimated long-term operational conditions of power plants, assuming a specific risk of electricity supply (deficit) mainly because electricity generation is associated to hydrologic variability whose hydropower plants are subjected to”.</i></p>  <p>Figure 1 –Exemplification of electricity generation and energy assured of a hydropower project</p> <p>Source: Cadernos Temáticos ANEEL – energia assegurada – April, 2005</p>	<p>and the hourly generation (EG<sub>p,h</sub> values). Please note that several EG<sub>p,h</sub> values are higher than 16MWh (e.g: 16.226 MWh). It is not clear how it is possible the hourly generation (given in MWh) be higher than the installed capacity (given in MW).</p> <p>CL01 remains opened</p> <p><b>DOE's third response:</b></p> <p>Ok, the PP has clarified the issue (hourly generation surplus), providing clear evidences to support that project activity is in accordance to the registered PDD.</p> <p>CL 01 is closed</p>



## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion				
		<p>Considering the concept of assured energy above, the electricity estimative based on assured energy is not a limitation of electricity generation nor indicates that the project is operating with a higher installed capacity. On the contrary, there are some months that the hydropower projects generate more electricity than the assured energy and vice-versa. The assured energy is used for electricity commercialization, which considers the seasons/hydrologic variability and which project sponsors cannot sell more electricity than the one established in the assured energy of projects. While analyzing data from 2013 (full year period), in reality, the Ouro project generated 18.7% less than the electricity estimated on the registered PDD which is based on assured energy.</p> <table><tr><td>Estimated</td><td>Generated</td></tr><tr><td>75,336 MWh/year</td><td>61,212 MWh in 2013</td></tr></table> <p>PPs third response:</p> <p>While acquiring a generators group for a small hydropower plant, generators are delivered with capacity to generate a higher power than the nominal power authorized in the normative documents issued by the Brazilian Power Regulatory Agency (ANEEL) and the</p>	Estimated	Generated	75,336 MWh/year	61,212 MWh in 2013	
Estimated	Generated						
75,336 MWh/year	61,212 MWh in 2013						





## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
		<p>Mines and Energy Ministry (MME). Thus, turbines and generators can operate with higher capacity conditions than the nominal power without surpass the project conditions. As rule, contracts between manufacturers and project developers define significant penalties when the generator-turbine group does not reach the established nominal power. On the other hand, the additional generation to the authorized cannot be significant to not overload the transmission and distribution system. Therefore, ANEEL establishes up to 5% limit of electricity generation higher than the maximum generated. Higher values than contracted/authorized imply in significant penalties for the project owner. This information can be seen in the project Contract for the Use of the Distribution System of Ouro project and ANEEL Resolution #247 dated 21/12/2006 attached to this response.</p> <p>In summary, there were no changes in the project design to the one presented PDD, the project has been operating in accordance with national legislation and possible variations in the electricity generation are accommodated by regulations of the Brazilian electric sector.</p>	



## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
<p><b>CL 02:</b> The MR v.1 does not mention nor explain the sharing of the substation net energy meters, between Ouro and Moinho SHPP. Also, the calibration certificates of substation meters (Celesc certificate), presented during site visit do not inform the measurement uncertainties (%), thus it is not possible to the DOE to apply the uncertainty range to the measured error.</p>	D.2.4	<p>Considering the share of energy meters in SE Campos Novos (substation), the PPs included detailed information regarding the Brazilian measurement system and electricity ratio among power plants that share the same energy meter in the “connection point”. Please refer to section C of the MR (version 2) and PPs response in CAR 06.</p> <p>Regarding calibration certification from meters located at SE Campos Novos, the PPs clarify that the entity responsible for calibration of these meters is the power utility of Santa Catarina State (Centrais Elétricas de Santa Catarina S/A – CELESC) as explained in the Monitoring Plan of the MR. Therefore, the PPs have no control of type, presentation and format of calibration certificates issued by this entity. Anyway, the maintenance of electricity meters shall be made following the ONS Grid Procedures and technical conditions of National Institute of Metrology, Quality and Technology (“INMETRO” from the Portuguese Instituto Nacional de Metrologia, Qualidade e Tecnologia). Clarifications from CELESC – the power utility – regarding the maintenance of energy meters (maintenance system for invoicing) are also attached to this response.</p>	<p>Ok, the requested information was included in MR v.2 and additional clarification was also provided.</p> <p>CL02 is closed</p>
<p><b>CL 03:</b> In the Ouro CER spreadsheet v.1</p>	E.1.1	<p>The Brazilian DNA recently published the EF BM grid</p>	<p>Ok, the values of building and</p>



## VERIFICATION REPORT

Draft report clarifications and corrective action requests by verification team	Ref. to checklist question in table 1	Summary of project participant response	Verification team conclusion
it is stated: <i>"The Build Margin of 2013 is not available yet. Hence, the number of 2012 year was used"</i> as well as <i>"Data of December 2013 for the Operating Margin is not available yet. Hence, data from November 2013 was used"</i> , in addition in the MR v.1 table 4, PP indicates EF <sub>BM</sub> 2012 will be updated during verification.		and the EF OM grid of 2013 year. Therefore, EF BM grid and EF OM grid data were also updated based on data published by the Brazilian DNA.  The PPs also revised EF OM grid formulae in the CER spreadsheet since "EFEL,DD,h x EGPJ,h" was not considered for June 2012 and June 2013. Please refer to the second version of the CER spreadsheet and MR.	operating margin were updated according to the 2013 values, issued by DNA  CL03 is closed
<b>CL 04:</b> Official data source for EGpj,h was not provided	E.1.1	Please refer to the PPs response in CAR 08.	Ok, the EGpj,h source, as well as adjustment approaches to this parameter, are presented in the response given to CAR 08. DOE confirms these values are in line with CCEE official reports.  CL04 is closed