



**Monitoring report form  
(Version 05.1)**

*Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.*

**MONITORING REPORT**

<b>Title of the project activity</b>	Jirau Hydro Power Plant	
<b>UNFCCC reference number of the project activity</b>	9226	
<b>Version number of the monitoring report</b>	1.0	
<b>Completion date of the monitoring report</b>	08/04/2016	
<b>Monitoring period number and duration of this monitoring period</b>	Monitoring Period Number: 1 <sup>st</sup> Duration: From 01/07/2014 to 28/02/2015 (243 days)	
<b>Project participant(s)</b>	Energia Sustentável do Brasil S.A GDF SUEZ Energy Latin America Participações Ltda	
<b>Host Party</b>	Brazil	
<b>Sectoral scope(s)</b>	1 - Energy industries (renewable / non-renewable sources)	
<b>Selected methodology(ies)</b>	ACM0002 (version 13.0.0) - Consolidated baseline methodology for grid-connected electricity generation from renewable sources	
<b>Selected standardized baseline(s)</b>	Not applicable	
<b>Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD</b>	4,114,769 tCO <sub>2</sub> e (equivalent for 243 days)	
<b>Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period</b>	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	None. Not applicable.	1,699,285 tCO <sub>2</sub> e

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

Jirau Hydro Power Plant (JHPP), developed by Energia Sustentável do Brasil S.A. (ESBR), is a greenfield grid-connected renewable energy run-of-river hydropower plant located in the municipality of Porto Velho, state of Rondônia, Brazil (host country). The project generates electricity by installing and operating 50 bulb turbines with a nominal capacity of 75 MW each, totalling a nominal capacity of 3,750 MW. The JHPP is connected to the national Interconnected Grid System (Sistema Interligado Nacional – SIN) through three 500 kV transmission lines. In the baseline, electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, which is in accordance with the approved consolidated baseline and monitoring methodology ACM0002 – “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (version 13.0.0) and as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”, as required by the methodology ACM0002 (version 13.0.0). Therefore, the project activity promotes GHG emission reductions by displacing fossil fuel-based electricity generation that would have been generated and dispatched to the grid if the project would not have been built. This effect was especially relevant during the first Monitoring Period as other hydropower plants in Brazil southern and south-eastern region suffered from unfavourable hydrology. In this situation, the growing generation of renewable energy that was offered by JHPP was essential to reduce the necessity of thermal power dispatch.

The relevant dates for the project activity are indicated in the table below.

**Table 1. Relevant dates for the implementation of the project activity**

Milestones	Dates	Reference
Construction Start	14/11/2008	Preliminary Installation License 563/2008 issued by the environmental agency IBAMA for the implementation of the job-site. Full Installation License 621/2009 was issued on 03/06/2009.
CDM registration	26/12/2012	JHPP CDM registration was announced on 17/05/2013, effective as of 26/12/2012 <sup>1</sup> .
Start of Commissioning Period	09/08/2013	ANEEL's Dispatch N° 2.824/2013 authorizing the commissioning of the first generating unit, as published in the Federal Official Journal (“Diário Oficial da União – DOU”) – Section 1, N° 153, dated 09/08/2013, page 99. <sup>2</sup>
Commercial operation	06/09/2013	ANEEL's Dispatch N° 3.087/2013 authorizing the commercial operation of the first generating unit, as published in the Federal Official Journal (“Diário Oficial da União – DOU”) – Section 1, N° 173, dated 06/09/2013, page 78. <sup>3</sup>
Start Date of the Crediting Period	01/07/2014	Project Participants requested to postpone the start date of the crediting period from 01/07/2013 to 01/07/2014. Further details and references are available in Sections B.1 and B.2.3 of this Monitoring Report.

The total GHG emission reductions achieved and monitored by the project activity during this 1<sup>st</sup> verification covers the monitoring period from 01/07/2014 to 28/02/2015 and accounts for 1,699,285 tCO<sub>2</sub>e.

<sup>1</sup> Available at: <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1356533361.56/view>

<sup>2</sup> Available at: <http://www.jusbrasil.com.br/diarios/57606437/dou-secao-1-09-08-2013-pg-99>.

<sup>3</sup> Available at: <http://www.jusbrasil.com.br/diarios/58795845/dou-secao-1-06-09-2013-pg-78>.

## A.2. Location of project activity

The following information on the location of the project activity is provided below:

- (a) Host Party(ies): Brazil;
- (b) Region / State / Province, etc.: Rondônia State, North Region of Brazil;
- (c) City / Town / Community, etc.: Porto Velho;
- (d) Physical / Geographical location: 9° 15' 17.96" S, 64° 38' 40.13" W (dam coordinates).



Figure 1: Location of the CDM Project 9226 – Jirau Hydro Power Plant

## A.3. Parties and project participant(s)

Table 2. List of Party and Project Participants involved in the Project Activity

Party involved (host indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Brazil (Host Country)	Private entity: Energia Sustentável do Brasil S.A  Private entity: GDF SUEZ Energy Latin America Participações Ltda	No

## A.4. Reference of applied methodology and standardized baseline

The exact reference (number, title, version) of the applied methodology, tools and standardized baseline are provided below:

- (a) Applied methodology: ACM0002 (version 13.0.0) – “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”<sup>4</sup>.

<sup>4</sup> As approved by EB 67, Annex 13. Available at: <http://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>.

- (b) Tools and other methodologies to which the applied methodology(ies) refers:
- “Tool for the demonstration and assessment of additionality” (version 06.0.0)<sup>5</sup>.
  - “Tool to calculate the emission factor for an electricity system” (version 02.2.1)<sup>6</sup>.

No standardized baseline has been applied for this project activity.

#### A.5. Crediting period of project activity

Information regarding the type, start date and length of the crediting period corresponding to this monitoring period are provided below.

**Table 3. Information on crediting period and monitoring period of the project activity**

Description	Information		
Crediting period type:	<input checked="" type="checkbox"/> Renewable	<input type="checkbox"/> Fixed	
Crediting period length:	<input checked="" type="checkbox"/> 7 years (if Renewable)	<input type="checkbox"/> 10 years (if Fixed)	
Crediting period (if Renewable):	<input checked="" type="checkbox"/> 1 <sup>st</sup> C.P.	<input type="checkbox"/> 2 <sup>nd</sup> C.P.	<input type="checkbox"/> 3 <sup>rd</sup> C.P.
Crediting period start and end dates:	Starting Date: 01/07/2014	Ending Date: 30/06/2021	
Monitoring period under verification:	1 <sup>st</sup> Monitoring Period		
Monitoring period start and end dates:	Starting Date: 01/07/2014	Ending Date: 28/02/2015	

#### A.6. Contact information of responsible persons/entities

Contact information of the persons/entities responsible for completing the CDM-MR-FORM is provided below.

**Table 4. Contact information of persons/entities responsible for completing the CDM-MR-FORM**

Company	ESBR <sup>7</sup>	GSELA <sup>8</sup>
Name	Isac Teixeira	Philipp Hauser
Function	Operation Director	VP Carbon Markets
Phone	+55 (69) 3533-9505	+55 (21) 3974 5443
E-mail	<a href="mailto:isac.teixeira@energiasustentaveldobrasil.com.br">isac.teixeira@energiasustentaveldobrasil.com.br</a>	<a href="mailto:philipp.hauser@br.engie.com">philipp.hauser@br.engie.com</a>
Is the entity also a project participant as per the Appendix 1?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Is the person also a project participant as per the Appendix 1?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

JHPP is a run-of-river hydropower project with variable reservoir to mimic the Madeira River's natural hydrology and was designed to minimize environmental impacts while maximizing energy

<sup>5</sup> As approved by EB 65, Annex 21. Available at: <http://cdm.unfccc.int/EB/index.html>.

<sup>6</sup> As approved by EB 63, Annex 19. Available at: <http://cdm.unfccc.int/EB/index.html>.

<sup>7</sup> ESBR is the acronym for Energia Sustentável do Brasil S.A.

<sup>8</sup> GSELA is the acronym for GDF SUEZ Energy Latin America Participações Ltda.

generation in a situation of high, but variable flow volumes, low dam, and low head height. The project comprises the run-of-river reservoir, the dam, the turbines, generators and other electromechanical equipment, as well as the substations and transmission lines to connect the project activity to the national Interconnected Grid System (SIN)<sup>9</sup>.

The project activity implies the installation of 3,750 MW new hydro power generation capacity with a Total Water Surface that varies according to the operational quota as measured at the dam. The maximum Operational Quota is limited to 90 m.a.s.l., which corresponds to a maximum Total Water Surface of 361.60 km<sup>2</sup>. This includes the Average River Surface of 153.86 km<sup>2</sup> as determined previously to the implementation of the project activity. Consequently, the Flooded Surface Area, as defined by EB 23 (Annex 5)<sup>10</sup>, is limited to 207.74 km<sup>2</sup> by the maximum operational quota of 90 m.a.s.l. and decreases during periods when JHPP is operated at lower Operational Quota as summarized in the table below.

**Table 5. Annual variation of reservoir water level and area**

Operational level according to seasons	Operational Quota at the dam (m)	Total Water Surface (km <sup>2</sup> )	Flooded Surface Area <sup>11</sup> (km <sup>2</sup> )	Power Density for Flooded Surface Area (W/m <sup>2</sup> )
Minimum (dry season)	82.5	174.90	21.04	178.23
Average / Regular	85.0	229.29	75.43	49.71
Maximum (wet season)	90.0	361.60	207.74	18.05

Now if considering the maximum Total Water Surface of 361.60 km<sup>2</sup> in the wet season and the nominal capacity of 3,750 MW, the JHPP has a minimum power density of 10.37 W/m<sup>2</sup>, while the Brazilian average power density is around 1.96 W/m<sup>2</sup><sup>12</sup>. In the dry season the Total Water Surface is much smaller and close to the average surface of the original river bed, which results in a notably higher power density value.

JHPP has two power houses, one at each riverbank. The power house on the right side of the river has a total of 28 installed Bulb Turbines where the generator is located in the horizontal turbine. The power house on the left side is being completed with a total of 22 installed turbines.

In both powerhouses, the Bulb Turbines, which are designed to operate in low head/high flow rivers, are situated directly in the river bed, at the toe of the dam, which allows the generation of electricity without deviation or flow alteration of the river and thus minimizing environmental impacts. To achieve these benefits, the state of art 75 MW Bulb Turbines have been specially designed for JHPP and represent a significant progress in Bulb turbine technology and engineering.

JHPP is connected to the Interconnected Grid System through a substation in Porto Velho. Project transmission installations include a step-up substation to increase voltage from 13.8 kV to 500 kV,

<sup>9</sup> From the Portuguese "Sistema Interligado Nacional – SIN".

<sup>10</sup> Additional clarification on the calculation of the Flooded Surface Area was provided by the response to the request for clarification AM\_CLA\_0049 from 13 July 2007. Available at: [http://cdm.unfccc.int/EB/023/eb23\\_repan5.pdf](http://cdm.unfccc.int/EB/023/eb23_repan5.pdf).

<sup>11</sup> The maximum Total Water Surface of 361.60 km<sup>2</sup> at the maximum Operational Quota, the Total Water Surface for other applicable Operational Quota as defined by the regulator and the Average River Surface of 153.86 km<sup>2</sup> are referenced by the topographic study prepared by Topocart.

<sup>12</sup> Bezerra et al, 2010, *Measuring the Hydroelectric Regularization Capacity of the Brazilian Hydrothermal System*, available at: <http://www.psr-inc.com/publications/scientific-production/papers/?current=t597>, last access on 28 March 2016. Figure 9 of the article provides the Flooded area / Installed Capacity of all Brazilian hydropower plants in 2007 (0.51 m<sup>2</sup>/W) and can easily be converted into MW/km<sup>2</sup>.

as well as three 500 kV transmission lines with 94 km of extension, which connect the power plant to the collecting Porto Velho substation.

The main design characteristics of Jirau Hydro Power Plant are summarized in the table below.

**Table 6. Jirau HPP Technical Details**

<b>JHPP Project – Technical details</b>	
Maximum Total Water Surface at maximum Operational Quota, including Original River Surface	361.60 km <sup>2</sup>
Maximum Flooded Surface Area at maximum Operational Quota, net of the Original River Surface	207.74 km <sup>2</sup>
Installed capacity	3,750 MW
Turbine type	Bulb
Individual turbine capacity	75 MW
Quantity of turbines	50
Transmission line	94 km / 3 x 500 kV

As referenced in section A.1, JHPP started its commissioning phase on 09/08/2013 and its commercial operation phase on 06/09/2013<sup>13</sup>. Initially only some few turbines were installed and the Project Participants decided to postpone the start date of the project's crediting period by one year, to 01/07/2014. As a consequence of this change, the first monitoring period was defined to cover the period from 01/07/2014 to 28/02/2015, which accounts for a total of 1,699,285 tCO<sub>2</sub>e emission reductions. During this period, there were no events or situations that could have impacted the applicability of the methodology. Emission reductions generated previous to the start date of the first monitoring period are estimated to be a total of 405,822 tCO<sub>2</sub>e<sup>14</sup>, but will not be verified and issued, thus representing a net contribution to global GHG mitigation.

## **B.2. Post-registration changes**

### **B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

Applicable /  Not applicable

*Justification:* No temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline have occurred.

### **B.2.2. Corrections**

Applicable /  Not applicable

*Justification:* No corrections have occurred.

### **B.2.3. Changes to start date of crediting period**

Applicable /  Not applicable

<sup>13</sup> As authorized by the Brazilian Electricity Regulatory Agency ("Agência Nacional de Energia Elétrica – ANEEL"), through the ANEEL's Dispatch N° 2.824/2013 and ANEEL's Dispatch N° 3.087/2013.

<sup>14</sup> Calculated in accordance to the same methodology and parameters used in this Monitoring Report, based on the generation period from 09/08/2013 to 30/06/2014.

*Justification:* Project Participants requested to postpone the start of the crediting period from 01/07/2013 to 01/07/2014 to account for some delays in the construction, as well as the low number of generation units at the beginning of the commissioning period. The request to change the start date of the crediting period has been submitted to the UNFCCC Secretariat on 15/12/2015 and it was approved on 16/12/2015 as referenced by the project's webpage at the UNFCCC website (Project 9226 : Jirau Hydro Power Plant)<sup>15</sup>.

**B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration**

Applicable /  Not applicable

*Justification:* The monitoring plan remains the same as the one contained in the registered PDD.

**B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline**

Applicable /  Not applicable

*Justification:* No permanent changes from registered monitoring plan, applied methodology or applied standardized baseline have occurred.

**B.2.6. Changes to project design of registered project activity**

Applicable /  Not applicable

*Justification:* No changes to project design of registered project activity have occurred.

**B.2.7. Types of changes specific to afforestation or reforestation project activity**

Applicable /  Not applicable

*Justification:* The project activity "Jirau Hydro Power Plant" is not an "afforestation or reforestation project activity".

**SECTION C. Description of monitoring system**

The monitoring system follows the applicable provision of the monitoring system as contained and described in the "Monitoring plan" section of the registered PDD.

**1. Management Structure and Responsibility**

Overall responsibility for daily monitoring and reporting lies with the project owner (ESBR). ESBR's operational staff was trained and instructed to carry out operation and monitoring activities. Training comprised instructions for all relevant procedures required for a Type I generation unit<sup>16</sup>

<sup>15</sup> Available at: <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1356533361.56/view>.

<sup>16</sup> Type I includes all generation units that have a centralized programme and dispatch.

as well as the requirements established by ACM0002 (version 13.0.0) and the Validation and Verification Standard (VVS)<sup>17</sup>.

### **1.1. Management Responsibility**

The project manager holds the overall responsibility for the aspects of the monitoring process, including

- the follow-up of daily operations;
- definition of personnel involved with the monitoring work;
- revision of the monitored results/data;
- quality assurance of measurements;
- training operational staff.

### **1.2. Responsibility of the personnel directly involved**

Other relevant CDM monitoring activities are delegated to operational staff. These activities comprise:

- Supervise and verify metering and recording: Staff coordinates with other departments to ensure adequate metering and recording of data, including electricity delivered to the grid, in accordance with national procedures defined by the Electric System National Operator (Operador Nacional do Sistema – ONS);
- Collection of additional data, sales/billing receipts: Staff collects sales receipts and additional data such as daily operational reports on the projects generation and reservoir data;
- Calibration: Staff coordinates internally to ensure that calibration of the metering instruments is carried out in accordance with national regulations and/or equipment supplier specifications;
- Data Archives: Staff is responsible for keeping all monitoring data, and making it available to the DOE for the verification of the emission reductions.

### **1.3. Support and Third Parties Participation:**

ESBR can retain CDM consultants / experts (internal and/or external) to address the following actions:

- Train responsible and operational Staff in CDM monitoring and applicable procedures;
- Develop calculation templates and assessments of emission reduction results;
- Follow-up of the monitoring plan and continuous advice to the staff;
- Compilation of the monitored data and preparation of the monitoring report;
- Review of monitoring reports;
- Coordination with DOEs for the preparation of periodical verifications.

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<sup>17</sup> Validation and Verification Standard (VVS), version 02.0, dated 25 November 2011, available at: [http://cdm.unfccc.int/Reference/Standards/accr\\_stan02.pdf](http://cdm.unfccc.int/Reference/Standards/accr_stan02.pdf), accessed on 15 February 2012.



## 2. Measurements Recording and Archiving

### 2.1. Power Generation

The measurement of the generated energy and its dispatch to the grid are established in accordance with Grid Procedure 12 (also called Measurement System for Invoicing Purposes – MSIP<sup>18</sup>) defined by ONS. This Procedure provides technical specifications for energy measurements as basis for commercial procedures (such as liquidation of energy sales), the overall control of generation and compensation by the CCEE (the Electric Power Commercialization Chamber), as well as operational planning and dispatch decisions by the ONS.

Still according to ONS, the objective of the Grid Procedure Module 12 is to establish responsibilities, systematics and deadlines for the preparation and approval of the design, installation and commissioning of the MSIP, for the maintenance and inspection of this measuring system, as well as for metering readings and for the certification of MSIP working standards.

The Measurement System for Invoicing Purposes (MSIP) comprises two meters (the main meter and the backup meter)<sup>19</sup>, transformers, communication channels between the ESBR and the CCEE as well as data collection systems. Moreover, Procedure 12 defines a sequence of other important operational aspects:

- Minimum standards for the main and backup meters are defined by Sub-Module 12.2, Annex 1)
- Data Collection procedures are defined by Sub-Module 12.4
- Storage and backup requirements are defined by Sub-Module 12.2, Annex 1, paragraphs 1.2.1.5 and 1.2.1.7.

Results on the measurement of the energy generated by the project activity are transmitted from the meters to the Project's Supervision Room. The data is then stored in the project's database where it can be easily extracted in spreadsheet format. To assure high quality, accurate standards and independent oversight, the project's energy meters have a life link to the CCEE and data can be assessed on its database. This is defined by Procedure 12 (Sub-Module 12.1, paragraph 1.7) which defines that the data generated by the meters are remotely and automatically collected by the "Energy Data Collection System - EDCS" of CCEE, through a direct access with "Measurement Collection Unit" used by the agent. The data collected by EDCS are the basis for quantifying and invoicing the energy produced by the project activity.

Therefore, the adoption of Procedure 12 allows for a proper recording and archiving of measured data and assures that all the data generated throughout the crediting period is maintained in at least three databases (ESBR, CCEE and ONS). For the emission reductions calculation purposes, data from CCEE is used as the main source of information for determining the net amount of electricity dispatched to the grid by the project activity.

This means that the amount of net electricity dispatched by the project activity to the national grid (SIN) is constantly monitored by the power meters which are monitored online and regularly checked by the CCEE. This is warranted because CCEE has direct and continuous access to the raw / primary data from the monitoring devices (power meters) at the point in which the project activity is connected to the interconnected grid system (SIN) and thus net electricity is dispatched to the national grid (SIN). The raw / primary data obtained from the monitoring devices (power meters) is stored / recorded in CCEE internal database and its access is restricted to the accredited agents of the electricity sector, such as: electricity suppliers, electricity consumers, utilities, transmission companies, governmental entities, regulators, etc.

In addition, by accessing the CCEE database, it is possible to obtain different kind of electricity generation reports. However, as these reports are derived from the same and unique source (CCEE database), the cross-checking practice becomes redundant and useless being, therefore,

<sup>18</sup> "SMF - Sistema de Medição para Faturamento" in Portuguese.

<sup>19</sup> The installation of two meters (main and backup meters) is mandatory only for the net electricity measurement in the Transmission Lines. For the gross electricity measurement, there is no such obligation, as per item 5.3 of Annex I from Sub-Module 12.2 of the Grid Procedure from ONS.

not possible to be done. On the other hand, the electricity invoices and/or sales receipts are not suitable for cross-checking purposes, as these documents refer to the values established in the electricity supply contracts or PPAs (Power Purchase Agreements), with a fiscal balance or correction that usually happens after the end of each year as a matter of compensate possible divergences or differences between the amount of electricity contracted and the effective amount of electricity delivered. Hence, the electricity invoices and/or sales receipts may not reflect the accurate amount of electricity dispatched to the grid by the project activity.

Nevertheless, this does not affect the monitoring of this parameter or compromise the quality of data, as the purpose of CCEE is to carry out the wholesale transactions and commercialization of electric power within the National Interconnected System, for both Regulated and Free Contracting Environments and for the spot market. In addition, CCEE is in charge of financial settlement for the spot market transactions. These activities form the Energy Accounting and Financial Settlement Process, which is entirely audited by outside auditors, according to ANEEL's Normative Resolution nº 109, dated 26 October 2004 (Electric Power Commercialization Convention). The Commercialization Rules and Procedures that govern the activities performed by CCEE are defined and approved by ANEEL.

## **2.2. Reservoir Data**

The measurement and monitoring of the Operational Quota and thus the related Total Water Surface follows the requirements established by the ANA (the National Water Resources Agency), through its Resolution N° 269 from 27 April 2009, as well as those established by the ONS (the Electric System National Operator) in the "Grid Procedures" (Procedimentos de Rede), Sub-module 10.8 – Hydraulic Operation of Reservoir Systems (Operação Hidráulica dos Sistemas de Reservatórios) as approved by ONS on 18 June 2010 and ANEEL on 15 September 2010 through its Dispatch SRT/ANEEL N° 2744/10.

Following these procedures, the Operational Quota is monitored and reported to the ONS on a daily basis. With the measured Operational Quota data at hand, the Total Water Surface as well as the Flooded Surface Area can be determined with a Quota x Area x Volume curve, as approved by ANA. With the Operational Quota and thus the Flooded Surface Area determined on a daily base, the adherence to the criteria of demonstrating a power density above 10 W/m<sup>2</sup> can be confirmed daily.

As determined by Resolution No. 269/2009 ANA, annual monitoring of bathymetric sections shall be performed and reported in order to monitor effects of sedimentation that might affect the Quota x Area x Volume curves. Monitoring results are submitted to ANA through annual reports.

The respective information and reports are kept and archived by the project's operational staff and will be made available to the DOE. Other physical documents such as paper-based maps, diagrams and environmental assessments are maintained in a central place, together with the monitoring plan and reports. In order to facilitate auditors' reference of relevant literature relating to the project, the project material and monitoring results are indexed. All paper-based information is stored by the project owner and all data including calibration records are kept until 2 years after the end of the project's total CDM crediting period.

## **3. Quality Assurance and Quality Control**

Quality Assurance and Quality Control (QA/QC) of the data generated by the project activity are done in accordance with regulatory requirements for energy projects connected to the national grid. In order to assure high quality standards, procedures for installation of metering equipment, calibration and quality review are foreseen and undertaken by the project activity.

After the conclusion of the project implementation and starting of operations, the raw data and primary information related to the net electricity dispatched to the grid specifically by Jirau HPP, which is available in CCEE internal database, can be accessed (read only) by ESBR through a web based dedicated interface by using a specific access code (named "Cryptocard"). The information available in CCEE internal database is encrypted and, therefore, protected against any

kind of data manipulation or tentative of fraud. Thus, there is no risk for loss or impact on data quality. This is why the CCEE database is the official, primary and the most credible source of information for the purpose of effectively monitoring the amount of net electricity supplied by the project activity to the grid.

### 3.1. Installation of Meters

The installation of JHPP metering devices follows Procedure 12 (Sub-Module 12.2). This procedure provides guidelines for the location, commissioning and integration of energy meters to the grid. Technical information on the accepted meters – in order to fulfill national standards for grid-connected projects – are also included in this procedure.

### 3.2. Calibration and Periodical Maintenance

The metering equipment are properly configured and installed as defined in Procedure 12 (Sub-Module 12.2). Calibration is carried out based on the relevant national or industrial standard by a testing facility accredited under the Brazilian law for the required type of meters determined by ONS.

According to the “Grid Procedures” (Procedimentos de Rede), Sub-module 12.3 – Maintenance of the measurement system for billing/invoicing (Manutenção do sistema de medição para faturamento), Annex 1, revision 2.0, issued on 11 November 2011, the power meter should be calibrated or verified with a frequency or interval of 2 years.

All Grid Procedures established by ONS (the operator of the Brazilian national electricity grid system), which are mentioned in this monitoring report, are public available at ONS website<sup>20</sup>.

Maintenance procedures are also foreseen by the Brazilian grid regulations. The Project Developer elaborates annually a Maintenance Plan that is verified by ONS as foreseen in Procedure 16 (Sub-Module 16.2). This procedure provides guidelines for reporting to ONS the maintenance activities undertaken by the Project Developer for the equipment described in the Annex 1<sup>21</sup>.

### 3.3. Quality Review of Data

As mentioned on Section 2 of this monitoring plan, the quality of data generated (avoidance of erroneous data measuring) by this project is assured by the implementation of an overarching monitoring system, as required by ONS in the relevant Procedure 12. This system allows for double-checking of the generated data by accessing project’s internal database as well as CCEE’s database. In addition to this efficient measurement system design, the data generated by the project activity is periodically revised by the project manager before being submitted to the third parties (CDM consultants and other relevant actors involved in the project activity).

## 4. Corrective actions

Procedures for corrective actions can be proposed in the aim of the Annual Maintenance Plan. These procedures aim to provide coordinated solutions to any inconsistency detected during JHPP operation and are made available for the DOE for the first verification.

<sup>20</sup> Available at: <http://www.ons.org.br/procedimentos/index.aspx>. Note: the installation and/or update of specific “add-ons” may be required by the website in order to allow proper visualization of its content.

<sup>21</sup> Annex 1 specifies the equipment whose maintenance activities shall be reported to ONS. For further information, please refer to Procedure 16 (Sub-Module 16.1, Annex 1), available at: [http://apps05.ons.org.br/procedimentorede/procedimento\\_rede/procedimento\\_rede.aspx](http://apps05.ons.org.br/procedimentorede/procedimento_rede/procedimento_rede.aspx).

## 5. Verification and Monitoring Results

The verification of the monitoring results of the project is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD.

The responsibilities for verification of the projects are as follows:

- Sign a verification service agreement with specific DOE and agree to a time framework for carrying out verification activities. The project developer makes the arrangements for the verification and prepares for the audit and verification process to the best of its abilities;
- The project owner will facilitate the verification through providing the DOE with all required necessary information, before, during and, in the event of queries, after the verification;
- The project owner will fully cooperate with the DOE and instruct its staff and management to be available for interviews and respond honestly to all questions from the DOE.

### SECTION D. Data and parameters

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

All tables below are presented using the format in accordance with the table template provided in the Monitoring Report Form (CDM-MR-FORM) (version 05.1) and are based on the data and parameters fixed ex ante, as per Section B.6.2 of the registered PDD.

<b>Data/parameter:</b>	$EF_{grid,BM,2010}$
Unit	tCO <sub>2</sub> / MWh
Description	Build margin emission factor of the Brazilian Interconnected Grid System (SIN).
Source of data	Brazilian DNA.
Value(s) applied	0.1404 <sup>22</sup>
Choice of data or measurement methods and procedures	The build margin emission factor of the Brazilian electricity grid system is calculated by the Brazilian DNA by applying all steps, data and variables required by the latest version of the "Tool to calculate the emission factor for an electricity system". This data will be archived electronically and according to internal procedures, until 2 years after the end of the crediting period.
Purpose of data	As per the Attachment "Instructions for filling out the monitoring report form" of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen: <input checked="" type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks; <input type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks; <input type="checkbox"/> (c) Calculation of leakage.
Additional comments	Ex-ante Build Margin emission factor. This data/information will be used for the emission reductions calculation. This value shall be used for the first crediting period. The build margin emission factor is based on data from the year 2010 and it has been defined as ex-ante by the project participants. For more details, see Annex 3 of the registered PDD.

<sup>22</sup> Available at: <http://www.mct.gov.br/index.php/content/view/327813.html#ancora>.

<b>Data/parameter:</b>	<b>EF<sub>Res</sub></b>
Unit	kgCO <sub>2</sub> /MWh
Description	Default emission factor for emissions from reservoirs.
Source of data	Decision by EB23.
Value(s) applied)	90 kgCO <sub>2</sub> /MWh
Choice of data or measurement methods and procedures	This is a default value to be applied in the project emissions' equation to be used only if at any time the power density should fall below the minimum level of 10 W/m <sup>2</sup> . Then, the appropriate calculation and consideration of Project Emissions will be taken into account.
Purpose of data	As per the Attachment "Instructions for filling out the monitoring report form" of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen: <input type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks; <input checked="" type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks; <input type="checkbox"/> (c) Calculation of leakage.
Additional comments	This is a default value to be applied to calculate project emissions (PE <sub>HP,y</sub> ) related to the hydropower reservoir in case a power density <10 W/m <sup>2</sup> is observed. Given the fact that Power Density is calculated from the Flooded Surface Area in addition to the original average river surface, a minimum of 18 W/m <sup>2</sup> is obtained and project emissions are not expected to occur. The continuous monitoring of Operational Quota allows to confirm this condition on a daily base and in case Power Densities lower than 10 W/m <sup>2</sup> are observed for specific time periods, the project developer will calculate and deduct the project emissions accordingly.

<b>Data/parameter:</b>	<b>CAP<sub>BL</sub></b>
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data	Project site.
Value(s) applied)	0 (zero)
Choice of data or measurement methods and procedures	-
Purpose of data	As per the Attachment "Instructions for filling out the monitoring report form" of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen: <input type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks; <input checked="" type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks; <input type="checkbox"/> (c) Calculation of leakage.
Additional comments	As per ACM0002 (version 13.0.0), for new (greenfield) hydro power plants, which is the case of JHPP, the value for CAP <sub>BL</sub> is 0 (zero). This data/information will be used in the power density calculation.

<b>Data/parameter:</b>	<b>A<sub>BL</sub></b>
Unit	m <sup>2</sup>
Description	Area of the single or multiple reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full.
Source of data	Project site.
Value(s) applied)	0 (zero)

Choice of data or measurement methods and procedures	As per ACM0002 (version 13.0.0), for new hydro power plants, this value is 0 (zero).
Purpose of data	As per the Attachment "Instructions for filling out the monitoring report form" of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen: <input type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks; <input checked="" type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks; <input type="checkbox"/> (c) Calculation of leakage.
Additional comments	This data/information will be used in the power density calculation. The methodology ACM0002 (version 13.0.0) states that for new reservoirs, this value is zero, which reflects that, in the absence of the project, there is no Increased Flooded Area.

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

All the tables below are presented using the format in accordance with the table template provided in the Monitoring Report Form (CDM-MR-FORM) (version 05.1) and are based on the data and parameters monitored, as per Section B.7.1 of the registered PDD.

Data/parameter:	$EG_{\text{facility},y} = EG_{\text{PJ},y}$																				
Unit	MWh/yr																				
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year <i>y</i> .																				
Measured/calculated/default	<input checked="" type="checkbox"/> Measured; <input type="checkbox"/> Calculated; <input type="checkbox"/> Default:																				
Source of data	Electricity meters.																				
Value(s) of monitored parameter	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="background-color: #008000; color: white;">PERIOD</th> <th style="background-color: #008000; color: white;"><math>EG_{\text{facility},y} = EG_{\text{PJ},y}</math></th> </tr> </thead> <tbody> <tr> <td>July-14</td> <td>387,306.96</td> </tr> <tr> <td>August-14</td> <td>355,436.35</td> </tr> <tr> <td>September-14</td> <td>307,060.34</td> </tr> <tr> <td>October-14</td> <td>358,377.84</td> </tr> <tr> <td>November-14</td> <td>522,049.73</td> </tr> <tr> <td>December-14</td> <td>816,408.03</td> </tr> <tr> <td>January-15</td> <td>983,323.22</td> </tr> <tr> <td>February-15</td> <td>977,393.34</td> </tr> <tr> <td><b>Total</b></td> <td><b>4,707,355.80</b></td> </tr> </tbody> </table>	PERIOD	$EG_{\text{facility},y} = EG_{\text{PJ},y}$	July-14	387,306.96	August-14	355,436.35	September-14	307,060.34	October-14	358,377.84	November-14	522,049.73	December-14	816,408.03	January-15	983,323.22	February-15	977,393.34	<b>Total</b>	<b>4,707,355.80</b>
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January-15	983,323.22																				
February-15	977,393.34																				
<b>Total</b>	<b>4,707,355.80</b>																				

Monitoring equipment	<p>There are 6 electricity meters (1 main and 1 back-up for each of the 3 transmission lines) which continuously monitor the net electricity generation supplied by the project to the grid. All electricity meters are model ION8600A, "bi-directional" type, possess an accuracy class of 0.2% and are calibrated or verified with a frequency or interval of up to 2 years.</p> <p>Key information on net electricity meters is summarized below:</p> <table border="1" data-bbox="570 346 1403 588"> <thead> <tr> <th>Power Meter</th> <th>Descr.</th> <th>Serial Number</th> <th>Calibration History</th> <th>Date of Last Calibration</th> <th>Validity</th> </tr> </thead> <tbody> <tr> <td>MFPLT01</td> <td>Main 1</td> <td>PT-1101B061-01</td> <td>22/10/2013</td> <td>22/10/2013</td> <td>21/10/2015</td> </tr> <tr> <td>MFALT01</td> <td>Back-up 1</td> <td>PT-1102A154-01</td> <td>22/10/2013</td> <td>22/10/2013</td> <td>21/10/2015</td> </tr> <tr> <td>MFPLT02</td> <td>Main 2</td> <td>PT-1102A137-01</td> <td>02/04/2014</td> <td>02/04/2014</td> <td>01/04/2016</td> </tr> <tr> <td>MFALT02</td> <td>Back-up 2</td> <td>PT-1102A179-01</td> <td>02/04/2014</td> <td>02/04/2014</td> <td>01/04/2016</td> </tr> <tr> <td>MFPLT03</td> <td>Main 3</td> <td>PT-1102A173-01</td> <td>27/11/2012 31/10/2014</td> <td>31/10/2014</td> <td>30/10/2016</td> </tr> <tr> <td>MFALT03</td> <td>Back-up 3</td> <td>PT-1102A133-01</td> <td>27/11/2012 31/10/2014</td> <td>31/10/2014</td> <td>30/10/2016</td> </tr> </tbody> </table> <p>Notes: Initial calibration has been performed by the power meters' manufacturer through CAM Endesa, while further calibrations have been performed by Eletronorte. All power meters were duly calibrated before their installation and before the project's transmission lines started to operate. The project participants can confirm that the power meters were properly calibrated covering this monitoring period as per the monitoring plan contained in the registered PDD. All calibration certificates are made available to the verification team of the DOE.</p>	Power Meter	Descr.	Serial Number	Calibration History	Date of Last Calibration	Validity	MFPLT01	Main 1	PT-1101B061-01	22/10/2013	22/10/2013	21/10/2015	MFALT01	Back-up 1	PT-1102A154-01	22/10/2013	22/10/2013	21/10/2015	MFPLT02	Main 2	PT-1102A137-01	02/04/2014	02/04/2014	01/04/2016	MFALT02	Back-up 2	PT-1102A179-01	02/04/2014	02/04/2014	01/04/2016	MFPLT03	Main 3	PT-1102A173-01	27/11/2012 31/10/2014	31/10/2014	30/10/2016	MFALT03	Back-up 3	PT-1102A133-01	27/11/2012 31/10/2014	31/10/2014	30/10/2016
Power Meter	Descr.	Serial Number	Calibration History	Date of Last Calibration	Validity																																						
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MFALT01	Back-up 1	PT-1102A154-01	22/10/2013	22/10/2013	21/10/2015																																						
MFPLT02	Main 2	PT-1102A137-01	02/04/2014	02/04/2014	01/04/2016																																						
MFALT02	Back-up 2	PT-1102A179-01	02/04/2014	02/04/2014	01/04/2016																																						
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MFALT03	Back-up 3	PT-1102A133-01	27/11/2012 31/10/2014	31/10/2014	30/10/2016																																						
Measuring/reading/recording frequency:	Continuously measured, hourly recorded and monthly aggregated.																																										
Calculation method (if applicable):	Not applicable.																																										
QA/QC procedures:	<p>Electricity supplied by the project activity to the grid.</p> <p>The quantity of net electricity generation supplied by the project plant/unit to the grid needs to be checked through the CCEE (Electric Power Commercialization Chamber) database, which is the official and the most credible source of information for this purpose.</p> <p>CCEE is in charge of financial settlement for the spot market transactions. These activities form the Energy Accounting and Financial Settlement Process, which is entirely audited by outside auditors, pursuant ANEEL's Normative Resolution nº 109, dated 26 October 2004 (Electric Power Commercialization Convention). The Commercialization Rules and Procedures that govern the activities performed by CCEE are defined and approved by ANEEL.</p>																																										
Purpose of data:	<p>As per the Attachment "Instructions for filling out the monitoring report form" of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen:</p> <p><input checked="" type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks;</p> <p><input type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks;</p> <p><input type="checkbox"/> (c) Calculation of leakage.</p>																																										
Additional comments:	To quantify the net amount of renewable electricity dispatched to the grid by the project activity. This data/information will be used for the emission reductions calculation.																																										

<b>Data/parameter:</b>	<b>Cap<sub>PJ</sub></b>
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity

Measured/calculated/default	<input type="checkbox"/> Measured; <input checked="" type="checkbox"/> Calculated; <input type="checkbox"/> Default:
Source of data	Project site.
Value(s) of monitored parameter	3,750,000,000 W
Monitoring equipment	Not applicable. Visual inspection of nameplate capacities and/or technical documents.
Measuring/reading/recording frequency:	Constant.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Can be cross-checked through the inspection of the technical specification documents or manuals of the power units at the project site.
Purpose of data:	As per the Attachment "Instructions for filling out the monitoring report form" of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen: <input type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks; <input checked="" type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks; <input type="checkbox"/> (c) Calculation of leakage.
Additional comments:	The installed capacity of JHPP can be confirmed by consulting the ANEEL's website (link: <a href="http://www2.aneel.gov.br/scq/Consulta_Empreendimento.asp">http://www2.aneel.gov.br/scq/Consulta_Empreendimento.asp</a> ). Then, type "Jirau" in the field named "Nome empreendimento (opcional)." and press "BUSCAR" button. A new page will show the installed capacity ("Potência Instalada") as 3,750,000.00 kW.

<b>Data/parameter:</b>	<b>A<sub>PJ</sub></b>
Unit	m <sup>2</sup>
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Measured/calculated/default	<input checked="" type="checkbox"/> Measured; <input checked="" type="checkbox"/> Calculated; <input type="checkbox"/> Default:
Source of data	Project site.
Value(s) of monitored parameter	361,600,000
Monitoring equipment	The Reservoir Area defined as the Flooded Surface Area is proportional to the Operational Quota of the reservoir. Hydropower plants dispatched by ONS have to monitor their Operational Quota and in case of the JHPP it is limited to a maximum of 90 m.a.s.l., which corresponds to 361.60 km <sup>2</sup> of Total Water Surface and 207.74 Flooded Surface Area
Measuring/reading/recording frequency:	Any new authorization related to a modification in the reservoir area will be tracked, on a yearly basis.
Calculation method (if applicable):	Calculated based on a Quota x Area x Volume curve, being the quota directly proportional to the Flooded Surface Area. The water level is measured by electronic sensors and specific rulers for this purpose.
QA/QC procedures:	In Brazil, every modification at hydropower plants has to be authorized and be publicly available by the competent regulatory agency.
Purpose of data:	As per the Attachment "Instructions for filling out the monitoring report form" of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen: <input type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks; <input checked="" type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks; <input type="checkbox"/> (c) Calculation of leakage.



Additional comments:	<p>The Flooded Surface Area <math>A_{PJ}</math> can be calculated from the Total Water Surface, which is measured as a function of the Operational Quota, by subtracting the value of the original average River Surface Area. Daily monitoring of the Operational Quota at the dam allows continuous monitoring.</p> <p>Further information and references about the annual variation of reservoir water level and area are available in Table 5 located in Section B.1 of this Monitoring Report.</p>
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Data/parameter:	$EF_{grid,OM-DD,y}$																																																																																																																																		
Unit	tCO <sub>2</sub> / MWh																																																																																																																																		
Description	Operating margin emission factor of the Brazilian grid.																																																																																																																																		
Measured/calculated/default	<input type="checkbox"/> Measured; <input checked="" type="checkbox"/> Calculated; <input type="checkbox"/> Default:																																																																																																																																		
Source of data	Brazilian DNA website <sup>23</sup> .																																																																																																																																		
Value(s) of monitored parameter	<p>The values of the monitored parameter “<i>Operating margin emission factor of the Brazilian grid</i>” (<math>EF_{grid,OM-DD,y}</math>) are calculated by the Brazilian DNA and made public available at its website, through the following link: <a href="http://www.mct.gov.br/index.php/content/view/307492.html">http://www.mct.gov.br/index.php/content/view/307492.html</a>.</p> <p>The OM values for the years 2014 and 2015, used for this monitoring period (from 01/07/2014 to 28/02/2015), are provided below, respectively.</p> <div style="text-align: center; border: 1px solid black; padding: 5px;"> <p><b>OPERATIONAL MARGIN</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="13">Average Emission Factor (tCO<sub>2</sub>/MWh) - MONTHLY</th> </tr> <tr> <th colspan="13">2014</th> </tr> <tr> <th></th> <th colspan="12">MONTH</th> </tr> <tr> <th></th> <th>January</th> <th>February</th> <th>March</th> <th>April</th> <th>May</th> <th>June</th> <th>July</th> <th>August</th> <th>September</th> <th>October</th> <th>November</th> <th>December</th> </tr> </thead> <tbody> <tr> <td></td> <td>0.6155</td> <td>0.5989</td> <td>0.5699</td> <td>0.5772</td> <td>0.5605</td> <td>0.5678</td> <td>0.5674</td> <td>0.5862</td> <td>0.5994</td> <td>0.5901</td> <td>0.5885</td> <td>0.5825</td> </tr> </tbody> </table> </div> <div style="text-align: center; border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>OPERATIONAL MARGIN</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="13">Average Emission Factor (tCO<sub>2</sub>/MWh) - MONTHLY</th> </tr> <tr> <th colspan="13">2015</th> </tr> <tr> <th></th> <th colspan="12">MONTH</th> </tr> <tr> <th></th> <th>January</th> <th>February</th> <th>March</th> <th>April</th> <th>May</th> <th>June</th> <th>July</th> <th>August</th> <th>September</th> <th>October</th> <th>November</th> <th>December</th> </tr> </thead> <tbody> <tr> <td></td> <td>0.5755</td> <td>0.5784</td> <td>0.5767</td> <td>0.5465</td> <td>0.5469</td> <td>0.5785</td> <td>0.5686</td> <td>0.5545</td> <td>0.5308</td> <td>0.5434</td> <td>0.5513</td> <td>0.5450</td> </tr> </tbody> </table> </div>	Average Emission Factor (tCO <sub>2</sub> /MWh) - MONTHLY													2014														MONTH													January	February	March	April	May	June	July	August	September	October	November	December		0.6155	0.5989	0.5699	0.5772	0.5605	0.5678	0.5674	0.5862	0.5994	0.5901	0.5885	0.5825	Average Emission Factor (tCO <sub>2</sub> /MWh) - MONTHLY													2015														MONTH													January	February	March	April	May	June	July	August	September	October	November	December		0.5755	0.5784	0.5767	0.5465	0.5469	0.5785	0.5686	0.5545	0.5308	0.5434	0.5513	0.5450
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Monitoring equipment	Not applicable. Values are made public available at the Brazilian DNA website.																																																																																																																																		
Measuring/reading/recording frequency:	Published by the Brazilian DNA on a regular basis.																																																																																																																																		
Calculation method (if applicable):	The operating margin emission factor of the Brazilian electricity grid system is calculated by the Brazilian DNA by applying all steps, data and variables required by the latest version of the “Tool to calculate the emission factor for an electricity system”.																																																																																																																																		
QA/QC procedures:	Apply procedures in the “Tool to calculate the emission factor for an electricity system”.																																																																																																																																		
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Additional comments:	The Operating Margin emission factor shall be used as ex-post during the verifications. This data/information will be used for the emission reductions calculation.																																																																																																																																		

<sup>23</sup> Available at: <http://www.mct.gov.br/index.php/content/view/307492.html>.

<b>Data/parameter:</b>	<b>EF<sub>grid,CM,y</sub></b>																																	
Unit	tCO <sub>2</sub> / MWh																																	
Description	Combined margin CO <sub>2</sub> 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”.																																	
Measured/calculated/default	<input type="checkbox"/> Measured; <input checked="" type="checkbox"/> Calculated; <input type="checkbox"/> Default:																																	
Source of data	Brazilian DNA.																																	
Value(s) of monitored parameter	<p>The values of the monitored parameter “<i>Combined margin CO<sub>2</sub> emission factor</i>” (<math>EF_{grid,CM,y}</math>) are calculated using the “Build margin emission factor” (<math>EF_{grid,BM,2010}</math>), which was defined as ex-ante for the whole 1<sup>st</sup> crediting period (based on data from the year 2010) and the “<i>Operating margin emission factor of the Brazilian grid</i>” (<math>EF_{grid,OM-DD,y}</math>), both calculated by the Brazilian DNA and made public available at its website, through the following link: <a href="http://www.mct.gov.br/index.php/content/view/307492.html">http://www.mct.gov.br/index.php/content/view/307492.html</a>.</p> <p>The Combined Margin (CM) is calculated in the last column of the table below by the sum of the Operating Margin (OM) and Build Margin (BM) multiplied by their respective weighting values (<math>W_{OM} = 0.5</math> and <math>W_{BM} = 0.5</math>) as demonstrated below.</p> <table border="1"> <thead> <tr> <th>PERIOD</th> <th>EF<sub>grid,OM, y</sub></th> <th>EF<sub>grid,BM, 2010</sub></th> <th>W<sub>OM</sub></th> <th>W<sub>BM</sub></th> <th>EF<sub>grid,CM,y</sub></th> </tr> </thead> <tbody> <tr> <td>July-14</td> <td>0.5674</td> <td rowspan="9">0.1404</td> <td rowspan="9">0.50</td> <td rowspan="9">0.50</td> <td>0.3539</td> </tr> <tr> <td>August-14</td> <td>0.5862</td> <td>0.3633</td> </tr> <tr> <td>September-14</td> <td>0.5994</td> <td>0.3699</td> </tr> <tr> <td>October-14</td> <td>0.5901</td> <td>0.3653</td> </tr> <tr> <td>November-14</td> <td>0.5885</td> <td>0.3645</td> </tr> <tr> <td>December-14</td> <td>0.5825</td> <td>0.3615</td> </tr> <tr> <td>January-15</td> <td>0.5755</td> <td>0.3580</td> </tr> <tr> <td>February-15</td> <td>0.5784</td> <td>0.3594</td> </tr> </tbody> </table>	PERIOD	EF <sub>grid,OM, y</sub>	EF <sub>grid,BM, 2010</sub>	W <sub>OM</sub>	W <sub>BM</sub>	EF <sub>grid,CM,y</sub>	July-14	0.5674	0.1404	0.50	0.50	0.3539	August-14	0.5862	0.3633	September-14	0.5994	0.3699	October-14	0.5901	0.3653	November-14	0.5885	0.3645	December-14	0.5825	0.3615	January-15	0.5755	0.3580	February-15	0.5784	0.3594
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Monitoring equipment	Not applicable. Calculated based on data provided by Brazilian DNA website.																																	
Measuring/reading/recording frequency:	Calculated using data published by the Brazilian DNA on a monthly basis.																																	
Calculation method (if applicable):	The emission factor is calculated ex-post, as the weighted average of the dispatch data analysis OM (Operating Margin) and the BM (Build margin), as described in B.6.3.																																	
QA/QC procedures:	Apply procedures of “Tool to calculate the emission factor for an electricity system”.																																	
Purpose of data:	As per the Attachment “Instructions for filling out the monitoring report form” of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen: <input checked="" type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks; <input type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks; <input type="checkbox"/> (c) Calculation of leakage.																																	
Additional comments:	To calculate the emission reductions achieved by the project activity during the monitoring and crediting periods.																																	

<b>Data/parameter:</b>	<b>TEG<sub>y</sub></b>
Unit	MWh/yr
Description	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y.

Measured/calculated/default	<input checked="" type="checkbox"/> Measured; <input type="checkbox"/> Calculated; <input type="checkbox"/> Default:																				
Source of data	Project activity site.																				
Value(s) of monitored parameter	<table border="1" data-bbox="732 306 1235 695"> <thead> <tr> <th style="background-color: #00b050; color: white;">PERIOD</th> <th style="background-color: #00b050; color: white;">TEG<sub>y</sub></th> </tr> </thead> <tbody> <tr> <td>July-14</td> <td>393,383.12</td> </tr> <tr> <td>August-14</td> <td>361,514.25</td> </tr> <tr> <td>September-14</td> <td>312,547.54</td> </tr> <tr> <td>October-14</td> <td>364,791.53</td> </tr> <tr> <td>November-14</td> <td>530,359.60</td> </tr> <tr> <td>December-14</td> <td>829,947.56</td> </tr> <tr> <td>January-15</td> <td>999,610.63</td> </tr> <tr> <td>February-15</td> <td>995,298.28</td> </tr> <tr> <td><b>Total</b></td> <td><b>4,787,452.51</b></td> </tr> </tbody> </table>	PERIOD	TEG <sub>y</sub>	July-14	393,383.12	August-14	361,514.25	September-14	312,547.54	October-14	364,791.53	November-14	530,359.60	December-14	829,947.56	January-15	999,610.63	February-15	995,298.28	<b>Total</b>	<b>4,787,452.51</b>
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Monitoring equipment

All generating units of the plant are equipped with gross electricity meters, which continuously monitor the total electricity produced by the project activity. The gross electricity meters are calibrated or verified with a frequency or interval of 2 years. All gross electricity meters possess a precision class of 0.2%.

Power Meter	Commiss. Date	Serial Number	Calibration History	Date of Last Calibration	Validity
MGB29	19/07/2013	PT-1101B062-01	16/03/2011	29/10/2014	28/10/2016
			28/11/2012		
			29/10/2014		
MGB40	18/12/2013	PT-1102A151-01	16/03/2011	29/10/2014	28/10/2016
			29/11/2012		
			29/10/2014		
MGB30	07/11/2013	PT-1101B111-01	16/03/2011	29/10/2014	28/10/2016
			29/11/2012		
			29/10/2014		
MGB01	07/11/2013	PT-0912A344-01	28/01/2010	23/10/2013	22/10/2015
			23/10/2013		
MGB02	18/12/2013	PT-1008A500-01	27/09/2010	23/10/2013	22/10/2015
			23/10/2013		
MGB39	18/12/2013	PT-1102A155-01	16/03/2011	29/10/2014	28/10/2016
			29/11/2012		
			29/10/2014		
MGB31	05/03/2014	PT-1008A497-01	24/09/2010	23/10/2013	22/10/2015
			23/10/2013		
MGB03	05/03/2014	PT-1007A409-01	10/09/2010	23/10/2013	22/10/2015
			23/10/2013		
		PT-1009A260-01	21/10/2010	30/10/2014	29/10/2016
MGB04	28/04/2014	PT-1101B114-01	16/03/2011	01/04/2014	31/03/2016
			01/04/2014		
MGB32	28/04/2014	PT-1102A148-01	16/03/2011	01/04/2014	31/03/2016
			01/04/2014		
MGB05	27/06/2014	PT-1007A415-01	10/09/2010	01/04/2014	31/03/2016
			01/04/2014		
MGB38	21/08/2014	PT-1101B115-01	16/03/2011	01/04/2014	31/03/2016
			01/04/2014		
MGB07	21/08/2014	PT-1007A411-01	10/09/2010	02/04/2014	01/04/2016
			02/04/2014		
MGB06	21/08/2014	PT-0912A343-01	01/02/2010	01/04/2014	31/03/2016
			01/04/2014		
MGB33	21/08/2014	PT-1102A144-01	16/03/2011	02/04/2014	01/04/2016
			02/04/2014		
MGB08	21/08/2014	PT-1009A254-01	21/10/2010	02/04/2014	01/04/2016
			02/04/2014		
		PT-1009A259-01	21/10/2010	30/10/2014	29/10/2016
			30/10/2014		
PT-1009A252-01	21/10/2010	30/10/2014	29/10/2016		
	30/10/2014				
MGB34	20/10/2014	PT-1102A169-01	16/03/2011	01/04/2014	31/03/2016
			01/04/2014		
MGB37	21/08/2014	PT-1101B116-01	16/03/2011	01/04/2014	31/03/2016
			01/04/2014		
MGB36	24/10/2014	PT-1102A170-01	16/03/2011	02/04/2014	01/04/2016
			02/04/2014		
MGB35	19/11/2014	PT-1009A251-01	21/10/2010	30/10/2014	29/10/2016
			30/10/2014		
MGB09	19/11/2014	PT-1007A410-01	10/09/2010	28/10/2014	27/10/2016
			28/10/2014		
MGB10	14/01/2015	PT-0912A357-01	26/01/2010	28/10/2014	27/10/2016
			28/10/2014		
MGB14	14/01/2015	PT-0912A373-01	26/01/2010	30/10/2014	29/10/2016
			30/10/2014		
MGB13	21/01/2015	PT-1009A259-01	21/10/2010	30/10/2014	29/10/2016
			30/10/2014		
MGB28	21/01/2015	PT-0910A516-01	09/12/2009	30/10/2014	29/10/2016
			30/10/2014		
MGB12	21/01/2015	PT-1106A968-01	04/08/2012	28/10/2014	27/10/2016
			28/10/2014		

Notes:  
Initial calibration has been performed by the power meters' manufacturer

	<p>through CAM Endesa, while further calibrations have been performed by Eletronorte.</p> <p>Where power meters have more than one Serial Number (e.g. MGB03 and MGB08), this means that power meters have been replaced somewhere in time. However, information regarding substitutions are properly recorded and can be tracked.</p> <p>All power meters were duly calibrated before their installation and prior to their operations.</p> <p>The project participants can confirm that the power meters were properly calibrated covering this monitoring period as per the monitoring plan contained in the registered PDD.</p> <p>All calibration certificates are made available to the verification team of the DOE.</p>
Measuring/reading/recording frequency:	Continuous measurement and at least monthly recording.
Calculation method (if applicable):	Not applicable.
QA/QC procedures:	Not applicable.
Purpose of data:	<p>As per the Attachment “Instructions for filling out the monitoring report form” of the CDM-MR-FORM (version 05.1), one of the following options has to be chosen:</p> <p><input type="checkbox"/> (a) Calculation of baseline emissions or baseline net GHG removals by sinks;</p> <p><input checked="" type="checkbox"/> (b) Calculation of project emissions or actual net GHG removals by sinks;</p> <p><input type="checkbox"/> (c) Calculation of leakage.</p>
Additional comments:	<p>This value will be applied in the project emissions’ equation for calculating the emission from reservoirs of hydro power plant (<math>PE_{HP,y}</math>) just in case project emissions occur, i.e. if power density of the project activity (PD) is between <math>4 W/m^2</math> and <math>10 W/m^2</math>.</p> <p>Applicable to hydro power project activities with a power density of the project activity (PD) greater than <math>4 W/m^2</math> and less than or equal to <math>10 W/m^2</math>.</p> <p>However, as the power density was greater than <math>10 W/m^2</math> for the whole period covered by this monitoring report, then the use of “TEG<sub>y</sub>” for calculating the emission from reservoir of JHPP is not applicable, as no project emissions have occurred.</p>

**D.3. Implementation of sampling plan**

Applicable /  Not applicable

*Justification:* No sampling plan is applied.

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

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

As per the registered PDD and according to methodology ACM0002 (version 13.0.0), the emission reductions ( $ER_y$ ) are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

- $ER_y$  = Emission reductions in year y (tCO<sub>2</sub>e);
- $BE_y$  = Baseline emissions in year y (tCO<sub>2</sub>e);
- $PE_y$  = Project emissions in year y (tCO<sub>2</sub>e).

## Baseline emissions

Baseline emissions include only CO<sub>2</sub> emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology ACM0002 (version 13.0.0) assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Where:

BE<sub>y</sub> = Baseline emissions in year y (tCO<sub>2</sub>/yr);  
 EG<sub>PJ,y</sub> = 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<sub>grid,CM,y</sub> = Combined margin CO<sub>2</sub> 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” (tCO<sub>2</sub>/MWh).

JHPP is a Greenfield project, thus, as per the methodology ACM0002 (version 13.0.0), the calculation of EG<sub>PJ,y</sub> for (a) Greenfield plants is described below:

(a) Greenfield renewable energy power plants

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

Where:

EG<sub>PJ,y</sub> = 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);  
 EG<sub>facility,y</sub> = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr).

The combined margin emission factor is calculated according to the following equation:

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

Where:

EF<sub>grid,BM,y</sub> = Build margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/ MWh);  
 EF<sub>grid,OM,y</sub> = Operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/ MWh);  
 W<sub>OM</sub> = Weighting of operating margin emissions factor (%);  
 W<sub>BM</sub> = Weighting of build margin emissions factor (%).

The “Tool to calculate the emission factor for an electricity system” recommends that the following default values should be used for W<sub>OM</sub> and W<sub>BM</sub>:

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

Accordingly, the following default values apply for JHPP: W<sub>OM</sub> = 0.50 and W<sub>BM</sub> = 0.50.

Therefore, for the calculation of the emission reductions achieved during this monitoring period, the following equation and values have been applied:

$$EF_{grid,CM,y} = W_{BM} * EF_{grid,BM, 2010} + W_{OM} * EF_{grid,OM, y}$$

Hence:

PERIOD	EF <sub>grid,OM, y</sub>	EF <sub>grid,BM, 2010</sub>	W <sub>OM</sub>	W <sub>BM</sub>	EF <sub>grid,CM,y</sub>	EG <sub>facility,y</sub> = EG <sub>PJ,y</sub>	ER <sub>y</sub>
July-14	0.5674	0.1404	0.50	0.50	0.3539	387,306.96	137,068
August-14	0.5862	0.1404	0.50	0.50	0.3633	355,436.35	129,130
September-14	0.5994	0.1404	0.50	0.50	0.3699	307,060.34	113,582
October-14	0.5901	0.1404	0.50	0.50	0.3653	358,377.84	130,898
November-14	0.5885	0.1404	0.50	0.50	0.3645	522,049.73	190,261
December-14	0.5825	0.1404	0.50	0.50	0.3615	816,408.03	295,091
January-15	0.5755	0.1404	0.50	0.50	0.3580	983,323.22	351,981
February-15	0.5784	0.1404	0.50	0.50	0.3594	977,393.34	351,275
<b>TOTAL</b>						<b>4,707,355.80</b>	<b>1,699,285</b>

NOTE: Although the Build Margin CO<sub>2</sub> emission factor ( $EF_{grid,BM, 2010}$ ) is determined as fixed (ex-ante) for the first crediting period of 7 years ( $EF_{grid,BM, 2010} = 0.1404$  tCO<sub>2</sub>e/MWh<sup>24</sup>), the Operating Margin CO<sub>2</sub> emission factor ( $EF_{grid,OM,y}$ ) and the resulting Combined Margin CO<sub>2</sub> emission factor ( $EF_{grid,CM,y}$ ) are updated based on data and calculations provided by the Brazilian DNA<sup>25</sup>.

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

As per the methodology ACM0002 (version 13.0.0), for most renewable energy project activities, the project emissions are zero ( $PE_y = 0$ ). However, for hydro power plants that result in new reservoir (the JHPP case), the project emissions shall be calculated as follows:

$$PE_y = PE_{HP,y}$$

Where:

$PE_y$  = Project emissions in year y (tCO<sub>2</sub>e/yr);

$PE_{HP,y}$  = Project emissions from water reservoirs of hydro power plants in year y (tCO<sub>2</sub>e/yr).

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH<sub>4</sub> and CO<sub>2</sub> emissions from the reservoir, estimated as follows:

- (a) If the power density (installed power generation capacity divided by the flooded surface area) of the single or multiple reservoirs (PD) of power plant is greater than 4 W/m<sup>2</sup> and less than or equal to 10 W/m<sup>2</sup>:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:

<sup>24</sup> As published by the Brazilian DNA. Available at: <http://www.mct.gov.br/index.php/content/view/327813.html#ancora>.

<sup>25</sup> Available at: <http://www.mct.gov.br/index.php/content/view/307492.html>.

$PE_{HP,y}$  = Project emissions from water reservoirs (tCO<sub>2</sub>e/yr);

$EF_{Res}$  = Default emission factor for emissions from reservoirs of hydro power plants (kgCO<sub>2</sub>e/MWh);

$TEG_y$  = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

(b) If the power density (PD) of the power plant is greater than 10 W/m<sup>2</sup>:

$$PE_y = 0$$

The power density of the project activity is calculated as follows:

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

Where:

PD = Power density of the project activity, in W/m<sup>2</sup>;

Cap<sub>PJ</sub> = Installed capacity of the hydro power plant after the implementation of the project activity (W);

Cap<sub>BL</sub> = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero;

A<sub>PJ</sub> = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m<sup>2</sup>);

A<sub>BL</sub> = Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m<sup>2</sup>). For new reservoirs, this value is zero.

In addition, as stated in the registered PDD, the rule to calculate the Power Density as a basis for the definition of Project Emissions was established in EB 23 and defined in Annex 5<sup>26</sup> of the meeting. The decision defines Power Density as “*installed power generation capacity divided by the flooded surface area*”. The fact that the surface of the natural river is not to be considered “*flooded surface area*” was later reinforced by the response to the request for clarification AM\_CLA\_0049<sup>27</sup> which makes reference to the definition of “*flooded surface area*” and requests to know if it is equivalent to the reservoir area without the original river surface. The answer to this request was clear by defining that the real issue to be considered is “*whether or not new areas are flooded because of the implementation of the project hydro power plant*”. Based on this principle the response to the request for clarification was clear by determining that the calculation of the Power Density should be calculated on the basis of the: “*increased flooded area measured in the water surface*”.

Accordingly, A<sub>PJ</sub> is defined as the “*increased flooded area measured in the water surface*” which can be measured by subtracting the average Original River Area of 153,860,000 m<sup>228</sup> from the Total Water Surface which is proportional to the Operational Quota at the Jirau Dam, which is subject to on-going measurement and daily monitoring. As a result of technical and regulatory limitations, the Operational Quota is limited to a maximum of 90 m, a fact that limits the Total Water Surface to 361,600,000 m<sup>2</sup> and the Increased Flooded Area to 207,740,000 m<sup>2</sup>.

Therefore, considering that Jirau HPP is a Greenfield project (Cap<sub>BL</sub> = 0), with an installed capacity of 3,750,000,000 W (Cap<sub>PJ</sub>), an reservoir area of zero before the project implementation (A<sub>BL</sub> = 0) and a reservoir area defined as Increased Flooded Area A<sub>PJ</sub> can be calculated by subtracting the

<sup>26</sup> Available at [http://cdm.unfccc.int/EB/023/eb23\\_repan5.pdf](http://cdm.unfccc.int/EB/023/eb23_repan5.pdf)

<sup>27</sup> Available at: [http://cdm.unfccc.int/UserManagement/FileStorage/AM\\_CLAR\\_T74PW4LBX5ZQRSRV57CR6RIKBALHHE](http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_T74PW4LBX5ZQRSRV57CR6RIKBALHHE).

<sup>28</sup> As referenced by the topographic study prepared by Topocart.



original Average River Surface of 153,860,000 m<sup>2</sup> from the Total Water Surface of 361,600,000 m<sup>2</sup> (A<sub>PJ</sub>= 207,740,000 m<sup>2</sup>)<sup>29</sup>, its Power Density (PD) is 18.05 W/m<sup>2</sup>, as demonstrated below:

Cap <sub>PJ</sub> =	3,750,000,000 W
Cap <sub>BL</sub> =	0 (zero)
A <sub>PJ</sub> =	207,740,000 m <sup>2</sup> = 361,600,000 m <sup>2</sup> – 153,860,000 m <sup>2</sup>
A <sub>BL</sub> =	0 m <sup>2</sup>

Thus:

$$PD = \frac{3,750,000,000 - 0}{207.740.000} = 18.05 \text{ W/m}^2.$$

In complement to this calculation which reflects the most appropriate interpretation of the provisions documented in EB 23, Annex 5, as well as the response to the Request for Clarification (AM\_CLA\_0049), the Project Participants also calculate the minimum possible Power Density on the basis of the maximum Total Water surface, including the surface of the original river, as observed at the maximum Operational Quota of 90 m.a.s.l., as defined by the operational rules.

Under such an assumption, the Power Density can be calculated as:

$$PD = \frac{3,750,000,000 - 0}{361,600,000 - 0} = 10.37 \text{ W/m}^2.$$

Consequently, as the power density (PD) of the power plant is greater than 10 W/m<sup>2</sup> in both scenarios, then, the project emissions are zero (PE<sub>y</sub> = 0), which is in line with option (b) above. As a result, the equation presented in option (a) above is not applicable and no project emissions have occurred for this monitoring period.

### E.3. Calculation of leakage

As per the methodology ACM0002 (version 13.0.0), no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing and transport). These emissions sources are neglected.

Leakage = 0 (zero).

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (t CO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
<b>Total</b>	1,699,285	0	0	0	1,699,285	1,699,285

<sup>29</sup> The data for this calculation were elaborated by Topocart, an independent consulting company, specialized in this field, on the basis of topographic studies..Sources: Planilha Informações da Usina\_ANEEL\_24\_out\_2011 and topographic study prepared by Topocart.

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

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO <sub>2</sub> e)	Annual: 6,180,620 (365 days) Proportional: 4,114,769 (for this monitoring period from 01/07/2014 to 28/02/2015)	For this monitoring period: 1,699,285 (from 01/07/2014 to 28/02/2015)

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

As per the CDM Project Standard and the Attachment “Instructions for filling out the monitoring report form” of the CDM-MR-FORM (version 05.1), project participants are requested to “*explain the cause of any increase in the actual GHG emission reductions achieved during the current monitoring period based on the applicable provision for calculation of GHG emission reductions in the Project Standard*”. However, this is not applicable since no increase in the actual GHG emission reductions has been achieved or observed during the current monitoring period.

In fact, the volume of GHG emission reductions achieved in this first monitoring period is lower than estimated in the registered PDD which is justified by the fact that the project is still in its commissioning phase. Once fully completed, it is expected that the project’s generation of emission reductions will be in line with the original projections.

## Appendix 1. Contact information of project participants and responsible persons/entities

<b>Project participant and/or responsible person/ entity</b>	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Energia Sustentável do Brasil S.A.
<b>Street/P.O. Box</b>	Avenida Almirante Barroso, 52 – 2802
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<b>E-mail</b>	-
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<b>Contact person</b>	Isac Teixeira
<b>Title</b>	Operation Director
<b>Salutation</b>	Mr.
<b>Last name</b>	Teixeira
<b>Middle name</b>	Paulo
<b>First name</b>	Isac
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<b>Project participant and/or responsible person/ entity</b>	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
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### Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		