

# Validation Report

Report for:  
Energia Sustentável do Brasil S.A.  
and  
GDF SUEZ Energy Latin America  
Participações Ltda.

## Validation of CDM project for Jirau Hydro Power Plant

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## 1 Executive Summary

Lloyd's Register Quality Assurance Limited has been contracted by Energia Sustentável do Brasil S.A., representing the project participants (PP), to undertake validation of the proposed project activity "Jirau Hydro Power Plant". The validation has been performed through a process of document review based on the project design document and its Annexes, version 01, dated 18 April 2012, submitted for validation and the subsequent revisions; the request and analysis of applicable and complementary references to validate the content, arguments and variables of the PDD and its Annexes; on site Audit and interviews with the PPs to cross-check and verify the information provided; interviews with the local stakeholders; definition of Corrective Action and Clarification Requests; the research and validation of independent references for cross-checking of the information received; the resolution of Corrective Action and Clarification Requests and outstanding issues; preparation and technical review and subsequent issuance of the validation report.

Jirau Hydro Power Plant is a greenfield project entirely located in the municipality of Porto Velho, state of Rondônia, Brazil. The project will generate electricity by installing and operating 50 bulb turbines with a nominal capacity of 75 MW each, totalling a nominal capacity of 3,750 MW. 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, as reflected in the combined margin (CM) calculations described in the tool to calculate the emission factor for an electricity system. The project activity will promote GHG emission reductions by displacing fossil fuel-based electricity generation that would otherwise have occurred.

The fulfilment of the requirements as set forth in Article 12 of the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC), the modalities and procedures for a CDM (CDM M&P) and relevant decisions of the Conference of the Parties, serving as meeting of the Parties to the Kyoto Protocol (COP/MOP) and the Executive Board of the CDM (CDM-EB), as well as the specific host country requirements as established by the Brazilian DNA; have been evaluated and conformance to the validation requirements were confirmed based on the given information. A risk based approach was taken to conduct the validation, and corrective action requests (CARs) and clarification requests (CLs) were raised for relevant actions by the PP (CDM VVS, version 02.0, paragraphs 147 and 148).

The validation team has found through the validation process 9 CARs and 20 CLs. The PP has taken actions and submitted to LRQA all necessary additional explanations, evidences and document revisions and all findings have been satisfactorily addressed and closed out. The validation team is of the opinion that the proposed project activity as described in the project design document version 03 dated 05 September 2012 and its Annexes meet all the relevant UNFCCC requirements for the CDM as well as the host country's national requirements and, if implemented as designed, is likely to achieve the emission reductions and contribute to the sustainable development of the host country. LRQA therefore requests the registration of "Jirau Hydro Power Plant" to the CDM Executive Board as a CDM project activity.

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## Abbreviations

ABRACE	Brazilian association of large industrial energy consumers and free energy consumers
ACL	Free Contracting Environment ( <i>Ambiente de Contratação Livre</i> )
ACR	Regulated Contracting Environment ( <i>Ambiente de Contratação Regulada</i> )
AID	Project's Direct Influence Area
AMF	French financial markets authority ( <i>Autorité des Marchés Financiers</i> )
ANA	National Water Agency, is a federal agency under the Ministry of Environment, responsible for the implementation of water management in Brazil.
ANEEL	Host country's electric energy regulatory agency
ANTAq	National Waterway Transportation Agency
APA	Environmental Protection Area
BE	Baseline emissions
BNDES	National Bank of Economic and Social Development (Brazilian Development Bank)
BRL	Brazilian Reais
CAPM	Capital Asset Pricing Model
CARs	Corrective action requests
CAPEX	Capital Expenditures
CCEE	Brazilian Electric Energy Commercialization Chamber
CDM	Clean development mechanism
CDM-EB	Executive board of clean development mechanism
CDM M&P	Modalities and procedures of the clean development mechanism
CDM VVS	CDM Validation and Verification Standard
CEPEL	ELETROBRAS's Research Center for Electric Power
CER	Certified emission reductions
CIMGC	Brazilian Interministerial Commission on Global Climate Change
CLs	Clarification requests
CNPE	National Council for Energy Policy (CNPE - Conselho Nacional de Política Energética)
COP/MOP	Conference of the Parties serving as meeting of the Parties to the Kyoto Protocol
CSLL	Social contribution on net profit
DHESCA	Brazilian Platform for Economic, Social, Cultural and Environmental Human Rights
DNA	Designated national authority
DOE	Designated operational entity
DSCR	Debt service coverage ratio (the ratio of operational cash available for debt servicing to interest and principal payments)
EF	Emission factor
EIA	Environmental impact assessment
ELETROBRAS	Publicly traded company controlled by the Brazilian government, which operates in the areas of generation, transmission and distribution of electricity
EPE	National energy research company, under the Brazilian Ministry of Mines and Energy, which aims to provide studies and researches to support the Brazil's energy sector planning
EPC	Engineering, procurement and construction
ERP	Equity Risk Premium
ERPA	Emissions reduction purchase agreement

ESBR	The PP's name, <i>Energia Sustentável do Brasil</i>
EU ETS	European Union Emissions Trading System
FAR	Forward action requests
FSR	Feasibility Study Report as submitted to the Brazilian Development Bank on 24 June 2008
FUNAI	Brazilian National Foundation for the Indigenous People
GHG	Greenhouse gas
GSP	Global stakeholders' consultation process
Ha	Hectares, 10,000 square metres
HDI	Human Development Index
HPP	Hydro Power Plant
IBAMA	Brazilian Institute of the Environment and Natural Resources (Brazilian federal environmental agency)
IGPM	General Index of Market Prices, calculated monthly by Getúlio Vargas Foundation
IPA	Annual Parasite Index, index used by the Brazilian Information System of Epidemiological Surveillance
IPCA	National General Index of Consumer Prices, calculated by the Brazilian Institute of Geography and Statistics
IPCC	Intergovernmental panel on climate change
IPEA	Brazilian Institute for Applied Economic Research
IRENA	International Renewable Energy Agency
IRR	Internal rate of return
KP	Kyoto Protocol of the United Nations Framework Convention on Climate Change
kW / kWh	Kilowatt / Kilowatt hour
LCA	Life Cycle Assessment
LE	Leakage emissions
LoA	Letter of approval
LR	Lloyd's Register
LRQA	Lloyd's Register Quality Assurance Limited
LUC	Land Use Change
MBRL	Million Brazilian Reais
MMA	Brazilian Ministry of Environment
MME	Brazilian Ministry of Mines and Energy
MW / MWh	Megawatt / Megawatt hour
NGO	Non-governmental organization
ODA	Official development aid
ONS	National Electric System Operator, responsible for coordinating and controlling the operation of generation and transmission of electricity in the National Interconnected System (SIN)
OPEX	Operational Expenditures
PBA	Environmental Basic Plan
PPA	Power Purchase Agreement
PDD	Project design document
PE	Project emissions
PIS/COFINS	Social contribution tax, payable by legal entities, in order to finance the payment of unemployment insurance and allowance for workers
PP	Project participant
PROINFA	Brazilian Incentive Program for Alternative Sources of Electric Energy
RIMA	Simplified Environmental Impact Assessment Report which is used to present the content of the EIA in accessible language to the broader public and project stakeholders

SG&A	Service, General and Administration costs
SIN	National Interconnected Electric Energy Generation and Transmission System
STP	Fish Transposition System ( <i>Sistema de Transposição de Peixes</i> )
tCO <sub>2</sub> e	Tonnes of carbon dioxide equivalent
TAR	Updated Reference Tariff
TFSEE	Inspection Fee of Electric Energy Services
TJLP	Long term interest rate, determined by the National Monetary Council
TUST	Tariff paid for the use of the electric energy transmission system
UBP	Utility of Public Good, a fee to be paid for the use of the hydro resource, also referred to as “concession fee”
UC	Environmental Conservation Unit
UNFCCC	United Nations Framework Convention on Climate Change

## 2 Introduction

The project participant (PP) represented by Energia Sustentável do Brasil S.A. has contracted with Lloyd's Register Quality Assurance Limited (LRQA) to undertake validation of the proposed project activity "Jirau Hydro Power Plant". This report summarises the findings of the validation process that has been conducted on the validation requirements of the CDM.

The validation has been undertaken by the team formed of the qualified personnel of LRQA as follows:

<b>Iuri de A. Barroso</b>	External Lead Validator	CDM Lead Validator / Host country expert
<b>Hilton Carvalho</b>	External sector expert	Sector expert
<b>Talita Beck</b>	External TR	Technical reviewer
<b>Javier Vallejo Drehs</b>	LRQA UK	Technical reviewer / Decision Maker after LoA issuance
<b>Steve Ross</b>	External sector expert	Tech Review Expert
<b>Andrew Ritchie</b>	LRQA UK	Decision maker

Personnel being engaged in a CDM project validation are qualified based on the established procedures of LRQA to assure the resource requirements satisfy all the requirements of competence criteria for an AE/DOE under CDM (CDM-Accreditation Standard version 04). LRQA is designated as an operational entity and holds the full responsibility of decision-making regarding the validation, in line with the accreditation requirements of the CDM-EB. The certificate of appointment of the team personnel is attached to this report.

### 2.1 Objective

Validation is the process of an independent third party evaluation of a project activity on the basis of the PDD, against the requirements of the CDM as set out in Article 12 of the Kyoto Protocol, the CDM M&P, subsequent decisions made by the COP/MOP and CDM-EB, and other rules applicable to the proposed project activity including the host country's legislation and its specific requirements for sustainable development. The validation follows the requirements of the current version of the CDM validation and verification standard (CDM VVS) and the CDM Project Standard (PS) to ensure the quality and consistency of the validation work and the report.

### 2.2 Scope

The scope of validation is an independent and objective review of the project design. Review of the PDD is conducted against the requirements of the Kyoto Protocol, the CDM M&P and relevant decisions of the COP/MOP and the CDM-EB. LRQA follows a risk-based approach in the validation focusing on the identification of significant risks for project implementation and generation of CERs. Validation is not meant to provide any consulting towards the PP, however, the corrective actions requests (CARs) and clarifications (CLs) might provide input for improvement of the project design. A validation conclusion shall become final subject to the decision maker's review by LRQA Ltd.

## 2.3 GHG Project Description

Jirau Hydro Power Plant is a greenfield grid-connected renewable run-of-river hydro power plant located in the municipality of Porto Velho, state of Rondônia, Brazil. The project will generate electricity by installing and operating 50 bulb turbines with a nominal capacity of 75 MW each, totalling a nominal capacity of 3,750 MW. 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, 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. Therefore, the project activity will promote GHG emission reductions by displacing fossil fuel-based electricity generation that would otherwise have occurred.

The electricity generation in Brazil is mostly based on firm forward sales arrangements of electricity defined on the basis of the results of centralised governmentally regulated auctions. The Jirau Hydro Power Plant Project, located in the Madeira River, had its energy auctioned on 19 May 2008, when the PP made the winning bid.

The project’s starting date, 22 July 2008, is the date of the homologation of the auction of 19 May 2008, which confirms that the proposal from the PP was valid, that all subsequent habilitation documents provided by the PP were accepted and that the rights to the concession were effectively granted by ANEEL, the host country’s electric energy regulatory agency, to the PP. At the time of the auction, the government proposal considered a configuration of 44 turbines of 75 MW each, totalling a nominal capacity of 3,300 MW and a plant location at a place called “Cachoeira do Jirau”, located about 9 km upstream of the site of the project activity.

Since the project’s viability studies though, the PP envisaged a more competitive approach with a location at “Ilha do Padre” and with a 46-turbine configuration (3,450 MW of nominal capacity), among other changes. This solution, for confidentiality reasons, was only revealed after the auction. Based on this proposal, on 23 July 2008, immediately after having been awarded with the rights to the concession, the PP officially requested the installation license to initiate the implementation of the Jirau Hydro Power Plant project activity at the Ilha do Padre. This configuration defines the project activity at the project starting date and is named the “Base Case”.

Later, during the construction of the Jirau HPP, further optimisation opportunities were identified which made the PP take the steps for the revision of the project engineering and design, as well as for the regulatory approval by the responsible governmental entities, to seek the implementation of an additional 6 turbines instead of only 2, increasing the installed capacity to a total of 3,750 MW, based on 50 turbines of 75 MW each. This configuration is referred to as the “Optimised Project”.

The PP requested ANEEL, on 11 August 2010, for the approval of the capacity expansion to the total of 3,750 MW, which was granted on 29 July 2011. This surplus energy was sold, as defined by the regulator, in an auction held on 17 August 2011, which had its results ratified on 18 October 2011. After the homologation of this second energy sale, the PP started the works towards the validation of the project activity under the CDM, on the basis of the definitive project design which is currently being implemented.

The estimated GHG emission reductions are 6,180,620 tCO<sub>2</sub>e per annum during the first renewable 7-year crediting period.

All sections of the PDD for the description of the project activity, including the purpose of the project activity, its contribution to sustainable development, applied technologies and/or measures, involved Party(ies) and project participants, estimated amount of reductions, and whether it receives public funding, are completed and in line with CDM Project Standard (version 01.0), paragraphs 30-34.

The description of the proposed project activity in the PDD is accurate, complete, and provides an understanding of the proposed CDM project activity (CDM VVS, version 02.0, paragraph 64).

The process undertaken to validate the accuracy and completeness of the project, as well as the opinion on the accuracy and completeness of the project description are described in the Appendix F, section 4 and in the Validation Opinion (CDM VVS, version 02.0, paragraph 69 (a) and (b)).

### 3 Methodology

#### 3.1 Review of documents

The validation is performed primarily based on the review of the project design document (PDD) and its Annexes, as well as of the applicable references, interviews with the PP and other project stakeholders, site visits and cross-check with information from independent sources, other supporting documentation and LRQA's sectoral expertise (CDM VVS, version 02.0, paragraph 22).

The PDD Version 01, dated 18 April 2012, was initially reviewed. Based on this review, LRQA requested the PP to present applicable references and supporting information and documents relating to the project design document. Such additional information and documents were also reviewed by LRQA as a basis for the preparation of the site visit and interviews with the PPs and local project stakeholders.

Through the validation process, the PDD and its Annexes and the supporting documents were evaluated to confirm their conformity with the CDM rules and applicable corrective action (CARs) and clarifications (CL) requests were addressed by the PP in response issues raised by LRQA. The documents reviewed by LRQA are listed in Appendix B. The CARs and CLs raised and addressed during the validation are listed in Appendix F: Validation Protocol and findings log. After resolution of all CARs and CLs and the respective adaptations to the PDD and its Annexes as summarised in section 4.10, LRQA reviewed the final version of the PDD version 03 dated 05 September 2012 to confirm that all required changes and clarifications and corrections provided were addressed and results had been incorporated.

#### 3.2 Site Visit and Follow-up interviews

A site visit and follow-up interviews with the stakeholders were conducted as detailed in the schedule as below (CDM VVS, version 02.0, paragraph 65-67):

Date	Location/ Address	Party Interviewed	Subjects Covered	Team Members on Site
21 May 2012	ESBR, (head office) – Rio de Janeiro-RJ	PP	Brief description, by the PP, of the project activity and its implementation status  Stakeholders consultation process	Iuri de A. Barroso – team leader  Hilton Carvalho – sector expert

			<p>and due account of comments received</p> <p>Environmental impacts and socio-environmental programs for their mitigation</p> <p>Global consultation process</p> <p>Determination of additionality: Prior CDM consideration, Identification of alternatives, Common practice analysis</p>	
22 May 2012	ESBR & GDF Suez (head office) – Rio de Janeiro-RJ	PP	<p>Brief presentation, by the PP, of the regulatory process for auction and granting of hydro power concessions.</p> <p>Determination of project's starting date as defined in the CDM Glossary.</p> <p>Determination of additionality (continuation): Investment analysis</p>	<p>Iuri de A. Barroso – team leader</p> <p>Hilton Carvalho – sector expert</p>
23 May 2012	City of Porto Velho – State of Rondônia Project activity's site and surrounding s) – district of Nova Mutum Paraná - State of Rondônia	Please refer to the right	<p>Interviews with:</p> <ul style="list-style-type: none"> <li>- City Office of Special Programs (SEMEPE), Porto Velho, RO</li> <li>- Secretary of State administration</li> <li>- Prosecutor of State Public Ministry</li> </ul>	<p>Iuri de A. Barroso – team leader</p> <p>Hilton Carvalho – sector expert</p>
24 May 2012	Project activity's site and surrounding s) – district of Nova Mutum Paraná - State of Rondônia	Please refer to the right	<p>Interviews with:</p> <ul style="list-style-type: none"> <li>- chief representative of the Uru-Eu-Wau-Wau indigenous people</li> <li>- representative of the Pilot Fish Farming and Organic Farming</li> <li>- representative of urban residents</li> <li>- representative of local farmers</li> <li>- representatives of local retailers</li> <li>- representatives of riverside population</li> </ul> <p>Free ride through the city of Nova Mutum Paraná and dialogues with the local population</p>	<p>Iuri de A. Barroso – team leader</p> <p>Hilton Carvalho – sector expert</p>
04 June 2012	GDF Suez, head office– Rio	PP	Determination of additionality: Prior consideration, Identification of alternatives, Common practice	Iuri de A. Barroso – team leader

	de Janeiro-RJ		<p>analysis</p> <p>Applicability of baseline and monitoring methodology / Project boundary</p> <p>Monitoring plan and QA/QC procedures</p> <p>CER calculations: Algorithms and formulae used to determine emission reductions</p> <p>Stakeholders consultation process and due account of comments received</p> <p>Global consultation process</p>	Hilton Carvalho – sector expert
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The follow-up interviews included:

- Interviews with relevant stakeholders in the host country, personnel with knowledge of the project design and implementation;
- Cross-checks between information provided by interviewed personnel (i.e. by checking sources or other interviews) to ensure that no relevant information has been omitted.

A full list of documents reviewed by the validation team is available in Appendix B.

A full list of persons interviewed is shown in Appendix C.

For details of all the findings of the desk review and site visit, please refer to the Validation Protocol and Findings in Appendix F.

### 3.3 Resolution of clarification and corrective action requests

LRQA applies the risk based approach aimed at focusing on high risk issues to the validation results while not omitting any part of the mandatory processes.

Findings identified in the process are indicated under the titles corrective action requests (CARs) and clarification requests (CLs) and forward action requests (FARs). CARs and CLs require the PP to take relevant actions. Criteria for judging items as CAR or CL are as follows:

#### **Corrective action request (CAR):**

- the project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions
- the CDM requirements have not been met, or
- there is a risk that emission reductions cannot be monitored or calculated.

#### **Clarification request (CL):**

- information is insufficient or not sufficiently clear to determine whether the applicable CDM requirements have been met.

FARs are to be raised to highlight issues related to project implementation that require review during the first verification of the project activity. FARs do not relate to CDM requirements for registration.

CARs and CLs are to be resolved or closed out if the PP modifies the project design, rectifies the PDD or provides adequate additional explanations or evidence that satisfies the concerns. If this is not completed, the project activity cannot be recommended for registration to the CDM Executive Board.

For details of the nature of the issues raised, the nature of the responses provided, the means of validation of such responses and the resulting changes in the PDD or supporting annexes please refer to the Validation Protocol and Findings in Appendix F.

### **3.4 Internal quality control**

A technical review by a qualified person independent from the validation team and a review by an authorised decision maker were conducted before the submission of the validation report to the PP and before requesting the registration of the project activity (CDM VVS, version 02.0, paragraph 148 (f)).

## **4 Validation protocol and conclusions**

This section provides an overview of the validation activities undertaken by LRQA in order to arrive at the final validation conclusions and opinion. It includes general conclusions based on the Clean Development Mechanism Validation and Verification Standard (VVS) version 02.0. Further details in relation to each element of the protocol and each finding are shown in the Validation Protocol and Findings – Appendix F.

The protocol is structured based on the main validation requirements as follows:

- Approval by the Parties involved
- Authorization requirements
- Contribution to sustainable development
- Modalities of communications
- Project design document
- Description of project activity
- Application of the selected baseline and monitoring methodology
  - Applicability of the selected baseline and monitoring methodology to the project activity
  - Deviation from an approved methodology
  - Clarification on the applicability of an approved methodology
  - Project boundary
  - Baseline scenario identification and description
  - Relevant national and/or sectoral policies (E+ / E-)
  - Algorithms and/or formula used to determine emission reductions
- Additionality of a project activity
  - Assessment of prior consideration of the CDM
  - Identification of alternatives
  - Investment analysis
  - Barrier analysis
  - Common practice analysis
- Monitoring plan
- Environmental impacts
- Local stakeholder consultation.
- Comments by parties, stakeholders and NGOs
- Summary of changes
- Validation Opinion

#### 4.1 **Approval**

A CDM project shall be approved by the Parties involved.

The host Party of the proposed project is Brazil.

Brazil ratified the Kyoto Protocol on 23 August 2002. The Designated National Authority (DNA) is the Interministerial Commission on Global Climate Change (CIMGC).

The project has currently been proposed as a unilateral CDM project and the Annex I Party has not yet been identified. In line with the provision of paragraph 57 of the 18<sup>th</sup> meeting of the CDM-EB, registration of a project activity can take place without an Annex I party being involved at the stage of registration.

According to the Brazilian DNA's rules, the issuance of the Letter of Approval is conditional to the presentation of the DOE's validation report by the PP to the DNA (Resolution No. 1 of 11<sup>th</sup> September 2003).

This Validation Report has been updated to reflect the receipt of the LoA and any requirements specified therein. The LoA acknowledgement and some few typo corrections are the only changes that were made to the version referred to in the letter of approval.

For details relating to this section, please refer to the Validation Protocol in Appendix F section 1.

#### 4.2 **Authorisation requirements**

Energia Sustentável do Brasil S.A. and GDF SUEZ Energy Latin America Participações Ltda. are private entities having their registered offices in Brazil.

The project has currently been proposed as a unilateral CDM project and the Annex I Party has not yet been identified.

The contact details of the PPs are correctly provided in Appendix 1 of the PDD.

The participation of the PPs in the project activity has been authorised and confirmed in the LoA issued by the Brazilian DNA (CIMGC). The validation team has confirmed that no entities other than the authorised entities are indicated as project participants in the PDD.

For details relating to this section, please refer to the Validation Protocol in Appendix F section 2.

#### 4.3 **Contribution to sustainable development**

The content and veracity of the project's contribution to local sustainable development was verified against the referenced provided in the PDD and cross-checked with the content and conclusions of interviews and research of secondary references.

The host Party's DNA has confirmed the contribution of the project activity to the sustainable development of the host Party.

For details relating to this section, please refer to the Validation Protocol in Appendix F section 1 and section 5.

#### 4.4 **Modalities of communications**

LRQA validated the corporate identity of all project participants and focal points included in the Modalities of Communication (MoC) statement, as well as the personal identities, including specimen signatures and employment status, of their authorised signatories.

For details relating to this section, please refer to the Validation Protocol in Appendix F section 3.

#### **4.5 Project design document**

The PDD was checked and confirmed as complete against the “Guidelines for completing the project design document form (CDM-PDD) version 01.0”, referring to the latest version applicable.

A valid form of the F-CDM-PDD - Project Design Document Form version 04.1 is used, being the current form as available on the CDM website.

For details relating to this section, please refer to the Validation Protocol in Appendix F section 4.

#### **4.6 Description of project activity**

The project activity will be installed around the following coordinates:

Latitude 9° 15' 17.96" S; Longitude 64° 38' 40.13 W

Jirau Hydro Power Plant is a greenfield project located in the municipality of Porto Velho, state of Rondônia, Brazil. The project will generate electricity by installing and operating 50 bulb turbines with a nominal capacity of 75 MW each, totalling a nominal capacity of 3,750 MW. 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, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”. Consequently, the project activity will promote GHG emission reductions by displacing fossil fuel-based electricity generation that would otherwise have occurred.

LRQA confirms that the project description included in the PDD is accurate and complete. This description provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation.

The PDD's project description as well as the accuracy and completeness of relevant elements were confirmed through the assessment of documented evidence. Information such as: number of turbines and installed capacity; characteristics of dam and transmission line, implementation timeline; investor identity and ownership; reservoir surface and Power Density were assessed, cross-checked and validated through document review including EPC proposals, Feasibility Study Report, technical studies (engineering studies and topographical surveys), official documents, studies and licenses of the Ministry for Mines and Energy, regulatory documents issued by the electric energy regulatory agency ANEEL, environmental licenses issued by IBAMA, regulatory documents issued by ANA, interviews and the on-site visit (CDM VVS, version 02.0, paragraph 69 (a) and (b)).

#### **4.7 Application of the selected baseline and monitoring methodology**

##### **Applicability of the selected baseline and monitoring methodology to the project activity**

The project activity applies the methodology ACM0002 - “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, version 13.0.0, as well as the “Tool for the demonstration and assessment of additionality” version 6.0.0 and the “Tool to calculate the emission factor for an electricity system” version 2.2.1, both referenced in the methodology.

It was confirmed and validated during the site visit that the project activity is the installation of a new run-of-river hydro power plant, at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant), the project activity results in a new single reservoir and the power density of the reservoir is greater than 4 W/m<sup>2</sup>.

LRQA confirms that the selected methodology is applicable to this project activity. The project applicability was confirmed against each condition in the approved methodology selected. Appendix F includes the list of each applicability condition, the steps taken to validate each one and the conclusions about its applicability to the proposed project activity.

For details relating to this section, please refer to the Validation Protocol in Appendix F section 6.

#### **Deviation from an approved methodology**

Through the assessment of the PDD, relevant documentation and evidence, as well as interviews with project participants and site visit, the validation team confirmed that the project participants did not need to request a deviation before the publication of the PDD when applying the approved methodology ACM0002 (version 13.0.0) to the proposed project activity. In addition, the validation team has verified that the project participants did not deviate from the approved methodology or applicable tools, and considers that there is no need for deviation due to any project-specific issue or a revision of the methodology that could be required to address any particular issue and/or that could require the acceptability of the deviation from the Board prior to requesting registration of the proposed project activity.

#### **Clarification on the applicability of an approved methodology**

Through the assessment of the PDD, relevant documentation and evidence, as well as interviews with project participants and site visit, the validation team confirmed that the project activity complies with all applicability conditions of the selected methodology ACM0002 (version 13.0.0). Therefore, LRQA confirms that there is no need to request any clarification of the methodology ACM0002 (version 13.0.0).

#### **Project boundary**

The project boundary was described in the PDD, section B.3, figure 5, as the hydro power plant facility and the entire National Interconnected System. This is in accordance with the adopted methodology ACM0002 (version 13.0.0).

The project boundary has been validated on the basis of a review of the official documentation and licenses (such as auction notice, technical and environmental studies and reports), interviews with the PPs and stakeholders and the on-site visit and field survey. By the time of the site visit, the construction of the dam was advanced and installation of electromechanical equipment on the left side of the dam had started. This implied the pre-assembly and erection of the first parts for the first of the 22 turbines and generators of the left margin, which connect the turbines to the civil structure. Draft tubes erection for most of the turbines had also started.

All sources and GHGs required by the methodology have been included within the project boundary (CO<sub>2</sub> from the grid for the baseline and CH<sub>4</sub> emissions from the reservoir for the project activity).

Emissions related to the construction, transportation of employees and supporting facilities (e.g. restaurant) were identified and ignored, according to the approved methodology ACM0002, version 13.0.0. No other significant emission sources related to the project activity other than those addressed by the selected approved methodology were identified.

On the basis of these detailed auditing processes, the validation team confirmed that the identified project boundary, the selected greenhouse gases and emission sources as defined by the PDD are justified for the project activity and meet the requirements of the approved methodology. During the documentation review or the site visit, no GHG emissions occurring within the proposed CDM project activity boundary were identified, besides those addressed by the applied methodology, which are expected to contribute more than 1% of the overall expected average annual emissions reductions.

For details on how the project boundary has been validated or about any shortcoming and discrepancy identified and the corrective actions taken, e.g. the issuing and resolution of CARs and CLs before completion of the validation, please refer to the Validation Protocol in Appendix F section 6a.

### **Baseline scenario identification and description**

In accordance to the ACM0002, the project activity is the installation of a new grid-connected renewable power plant/unit and, therefore, the baseline scenario is the following:

*“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, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.*

No other plausible and credible alternatives to the project activity were identified, which are economically attractive and technically feasible.

The electricity delivered to the grid by the project would necessarily, in the baseline scenario, be produced by the operation of grid-connected power plants under SIN.

The baseline scenario identified in the PDD has been assessed against the requirements in the approved methodology ACM0002, version 13.0.0. LRQA can confirm that the procedure included in this methodology to identify the most reasonable baseline scenario has been correctly applied (CDM VVS, version 02.0, paragraphs 91-95).

The steps taken to assess the baseline identification are described in the Validation protocol in Appendix F.

LRQA confirms that:

- All the assumptions and data used by the project participants are listed in the PDD or its Annexes, including their references and sources;
- All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD;
- Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
- Relevant national and/or sectoral policies and circumstances are explicitly considered and listed in the PDD;
- The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

### **Relevant national and/or sectoral policies (E+ / E-)**

As per CDM VVS, version 02.0, paragraphs 93 (a), no E+ policies have been identified related to the baseline scenario.

However, as per CDM VVS, version 02.0, paragraphs 93 (b), different E- policies that provide comparative advantages to the implementation of the project activity when compared to GHG intensive technologies were identified. These policies were established to promote the Jirau hydro power plant implementation and other renewable energies and have accurately been described in the PDD and taken into account for identification of the baseline scenario. The policies generate a comparative advantage for the project activity and renewable energy in general as they offer preferential financing conditions when compared to more GHG intensive technologies and therefore they promote the financial viability of the project activity and improve its competitiveness in relation to GHG intensive fossil fuelled thermal power plants.

The validation team concluded that the policies mentioned were enacted post 11 November 2001 and give comparative advantages to less emissions-intensive over more emissions-intensive technologies and, according to the guidance of CDM EB22 Annex 3 as well as the CDM VVS v02, paragraph 93, need not to be taken into account in developing a baseline scenario. As a result, the comparative advantages which are generated by reduced interest rates, extended loan payback periods and higher share of financing when compared to GHG intensive technologies were not considered by the PP in the project's financial analysis. This approach is deemed correct to eliminate the comparative advantage offered by the BNDES to the Jirau HPP from the financial analysis and thus to conduct the additionality analysis under baseline conditions, i.e. in a hypothetical situation without the national and/or sectoral E- policy for differentiation of financing cost in place.

For further details about how the relevant national and/or sectoral policies (E+ / E-) have been validated, please refer to the Validation Protocol in Appendix F section 6b.

#### **Algorithms and/or formula used to determine emission reductions**

LRQA has confirmed that the steps taken and the equations applied to calculate project emissions, baseline emissions and emission reductions comply with the requirements of the approved methodology ACM0002, version 13.0.0.

According to the methodology ACM0002, version 13.0.0, for new reservoirs, the area of the reservoir measured on the surface of the water before the implementation of the project ( $A_{BL}$ ) is zero.

The installed capacity of the hydro power plant before the implementation of the project activity ( $Cap_{BL}$ ) is zero, as the project activity consists in the implementation of a new hydro power plant. This has been confirmed by the validation team during the site visit.

The value of  $A_{PJ}$  (area of the single reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full) at 90 m (maximum operational water level) adopted by the PP, corresponds to an area of 361.60 Km<sup>2</sup>, which was validated from a topographical map produced by the subcontracted consulting company Topocart (2012\_07\_03), which specialises in topographic studies.

The total installed capacity ( $Cap_{PJ}$ ) has been validated on the basis of the site visit, the Basic Design Study (2010) and by official approval from the Brazilian Ministry for Mines and Energy (MME, Portaria 26, 2011\_08\_01).

Therefore, based on  $A_{PJ}$  and  $Cap_{PJ}$ , the power density is  $3,750 \text{ MW}/361.60 \text{ Km}^2 = 10.4 \text{ W/m}^2$ . Hence, as per ACM0002, the project emissions can be regarded as zero ( $PE_{HP,y} = 0$ ), as the power density of the project is greater than  $10 \text{ W/m}^2$ .

Still according to ACM0002 the baseline emissions are  $BE_y = EG_{PJ,y} * EF_{grid, CM,y}$ , where

$EG_{\text{facility},y}$  corresponds to 19,967,544 MWh/yr (Firm Energy = 2,279.4 MW x 8760 hours/year), as confirmed through the assessment of the EPE's Studies for the expansion of generation (EPE, 2011\_11\_07).

The grid emission factor ( $EF_{\text{grid,CM},y}$ ) has been estimated using the latest data calculated and published by the Brazilian DNA according to the latest version of the "Tool to calculate the emission factor for an electricity system" (version 02.2.1). Option I was chosen for the project activity (only grid power plants are included in the calculation), as the operating margin and build margin emission factor calculated by the Brazilian DNA or alternatively calculated by the project developer are based on the data of plants connected to the grid. The calculation of the Operating Margin emission factor ( $EF_{\text{grid,OM},y}$ ) was based on the Dispatch data analysis OM method ( $EF_{\text{grid,OM-DD},y}$ ) and its calculation is currently conducted by the Brazilian DNA, in accordance with the dispatch data provided by the National Interconnected Power System Operator (ONS). The monthly average  $EF_{\text{grid,OM-DD},2010}$  has been used for emission reductions estimates only and will be yearly updated. The Brazilian DNA is also responsible for calculating the build margin emission factor in Brazil ( $EF_{\text{grid,BM},y}$ ) and the option 1 was chosen by the project participants in terms of data vintage for the proposed project. The Build Margin emission factor for 2010, as published by the Brazilian DNA, was determined to be ex-ante for estimating the CERs to be generated as a result of project's implementation. Therefore, the BM is fixed for the first crediting period. The 2010 data vintage was adopted for build margin calculation as it is the latest data available until the beginning of the validation process. The Combined Margin emission factor was calculated using the default weights:  $w_{\text{OM}} = 0.50$  and  $w_{\text{BM}} = 0.50$ . In case the Brazilian DNA discontinues the publication of these data during the monitoring period, the required data will be calculated by the project participants.

The equations and parameters have been correctly applied, and all estimates can be replicated using the data and parameter values provided in the PDD. The justifications of the choice for equations and parameters have been properly provided (CDM VVS, version 02.0, paragraphs 97, 99 (d) and (e)).

LRQA has verified and confirmed the justification of the choice of data used: i) for data and parameters fixed throughout the crediting period, the sources of data and assumptions are appropriate and these result in an accurate and conservative estimation of the emission reductions; and ii) for those that are monitored, the values applied are reasonable (CDM VVS, version 02.0, paragraphs 98, 99 (a), (b) and (c) and 100).

The steps taken to assess the algorithms and/or formula used to determine emission reductions are described in the Validation protocol in Appendix F section 6.c.

LRQA confirms that:

- All assumptions and data used by the project participants are listed in the PDD or its Annexes, including their references and sources;
- All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD;
- All values used in the PDD are considered reasonable in the context of the proposed CDM project activity;
- The methodology has been correctly applied to calculate project emissions, baseline emissions, leakage and emission reductions;
- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD and its Annexes;
- All estimates of the grid emission factor can be replicated using the data and parameter values provided by the Brazilian DNA.

## 4.8 **Additionality of a project activity**

LRQA has assessed and verified the reliability and credibility of all data, rationales, assumptions, justifications and documentation provided by project participants to support the demonstration of additionality. LRQA critically assessed the evidence presented, using local knowledge and sectoral and financial expertise (CDM VVS, version 02.0, paragraph 102).

The project additionality was demonstrated by the PP using the “Tool for the demonstration and assessment of additionality”, Version 6.0.0 (CDM VVS, version 02.0, paragraph 103).

LRQA took all steps to cross-check the information given in the PDD, as well as confirmed the credibility of the evidence used (CDM VVS, version 02.0, paragraphs 104 and 161).

Further information and all steps taken to assess the additionality of the project activity are summarised below and detailed described in the Validation protocol in Appendix F section 7.

### **Assessment of prior consideration of CDM**

The Starting Date of the project activity, 22 July 2008, is the date of the homologation of the rights to the concession granted by ANEEL, the host country’s electric energy regulatory agency, to the PP. The determination of the starting date is in accordance with the definition of the starting date of a CDM project activity given in the Glossary of CDM Terms.

The validation team confirms that no implementation or construction activities occurred before 22 July 2008, and that this was the date on which the PP achieved official recognition of the validity and conformity of its bid from 19 May 2008 and that the subsequent habilitation process was successfully concluded. As a consequence, the PP was declared the effective winner of the concession auctioning process, and was granted with the rights and obligations related to the concession.

The validation team agrees that the homologation of the concession, 22 July 2008, defined in the PDD as the project’s starting date, is reasonably the earliest date at which the implementation of the project activity began as it provided the PP with the legal ground to proceed with the effective real action that was necessary to fully approve the construction of the project activity at the proposed location. Since the proposal presented by the project participants at the bid included the construction of the project activity in a revised configuration at Ilha do Padre, it was only after the homologation of the concession that project participants had the first confirmation of the government to proceed with project implementation. This is illustrated by the fact that the PP, immediately after the homologation awarded the right to do so, requested the installation license to start construction of the project activity at the chosen location “Ilha do Padre”. The request was submitted to the environmental regulatory agency IBAMA on 23 July 2008 and as a consequence the preliminary installation license for the work site was granted on 14 November 2008, the date which marked the effective construction start of the project activity. Based on these facts, the validation team concludes that the definition of the project starting date is in compliance with the Glossary of CDM terms (CDM VVS, version 02.0, paragraphs 106 (b) and 112 (a)).

The project’s starting date is prior to 2 August 2008. The PP has sufficiently demonstrated: a) the awareness of the CDM before the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project; and; b) that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation.

In summary, the PPs have demonstrated that the CDM and the resulting revenues from the sale of CERs had been considered already in the project's preliminary environmental licensing phase and that a strategy for the assessment and evaluation of CDM feasibility and revenue streams took place alongside the project implementation process. Furthermore, CER revenues were referenced in early presentations to the banks and considered as revenues in the Feasibility Study Report (FSR) presented to the Brazilian Development Bank and thus for the calculation of the project's financial return and leverage.

The steps taken to validate the choice of the project starting date and to assess and validate the prior serious consideration of the CDM, as well as the continuing and real actions for the project activity are described in the Validation protocol in Appendix F section 7a. (CDM VVS, version 02.0, paragraph 112 (b)).

It is the opinion of LRQA that the choice of the project starting date and the prior serious consideration of CDM complies with all applicable requirements. The validation team also confirms that real and continuous actions have been taken to secure CDM status in line with CDM requirements.

### **Identification of alternatives**

The Validation Protocol – Appendix F section 6.b, shows the assessment of the baseline scenario and the conformity of the alternatives given in the PDD, as per ACM0002, and clearly states how LRQA has validated whether these alternatives are credible and complete (CDM VVS, version 02.0, paragraph 116). The provision of equivalent amount of energy by the grid system was considered a credible and feasible alternative that satisfies the requirement of the methodology ACM0002 (version 13.0.0) and the “Tool for the demonstration and assessment of additionality” (version 6.0.0). This has been reiterated in the Validation Protocol, Appendix F, section 7b (CDM VVS, version 02.0, paragraph 113).

It is the opinion of LRQA that the list of alternatives provided in the PDD are credible and complete considering the technology and circumstances of the proposed Project activity as well as the investors business (CDM VVS, version 02.0, paragraphs 89-90).

### **Investment analysis**

The Investment analysis option has been used to demonstrate the additionality of the proposed project activity. LRQA confirms that the PDD has provided evidence that this project activity is not economically or financially feasible without the revenue from the sale of certified emission reductions (CERs), according to the requirements, rules and criteria of the “Tool for the demonstration and assessment of additionality” (version 6.0.0) and the “Guidelines on the assessment of investment analysis” (version 05), as well as EB guidance on the consideration of national/local/sectoral policies and measures for baseline setting, (i.e. EB 22 Annex 3) as referenced by the “Additionality Tool” (CDM VVS, version 02.0, paragraphs 103, 117 - 119).

The PPs have shown that the project activity is additional by demonstrating that the financial returns of the proposed CDM project activity under baseline conditions and without revenues from the sale of CER would be insufficient to justify the required investment as demonstrated by a benchmark analysis which compares the equity IRR against an appropriate and market standard investment benchmark which is compatible with the investment analysis presented, as required by the “Tool for the demonstration and assessment of additionality” (version 6.0.0) and the “Guidelines on the assessment of investment analysis” (version 05).

The IRR calculation considers 2 different scenarios: a “Base Case” scenario, which considers the installation of 46 turbines; and an “Optimized Project” scenario, which considers the installation of 50 turbines.

For the Base Case scenario (46 turbines), the main source of reference for all investment assumptions is the Feasibility Study Report (FSR, 2008), which was submitted by the PP to the Brazilian Development Bank (BNDES) on 24 June 2008 in order to address its requirements for assessing and approving the financing request for the project activity. This documentary evidence confirms the PP's business model and is compatible with the project starting date, which occurred less than one month after the official registration of the FSR by the Brazilian Development Bank. Therefore, the FSR is compatible with the project starting date and is the key reference for the characteristics and assumptions assumed for the "Base Case" configuration, which considered the installation of 46 turbines and a total installed capacity of 3,450 MW. LRQA was also able to validate the project's firm energy generation capacity, based on the FSR and, as a result, the plant load factor calculation was also confirmed. This is in line with the provisions of the "*Guidelines for the reporting and validation of plant load factors*" version 1 as it fulfils the criteria to be "*The plant load factor provided to banks [...] while applying the project activity for project financing*". The FSR also defines that, due to gradual progress in construction, the effective firm energy will grow in parallel to the implementation of the turbines and generators.

The optimized scenario consists of an increase of the project's total installed and Firm Energy generation capacity. The potential for the optimisation was identified by the PP in March 2010 and its implementation was effectively decided in October 2011, when the sales of a part of the incremental Firm Energy was homologated and approved by the regulator (ANEEL, 2011\_10\_18). In order to address this change in project configuration, the validation team considered that the application of the "Guidelines on Assessment of Different Types of Changes from the Project Activity as described in the Registered PDD" (CDM EB 48 Annex 67), although meant to be applied in situations of project changes identified after the project registration, is also adequate in situations of changes occurred during the development of the project activity. In the case of the project activity and in order to demonstrate the impacts of these modifications on the additionality, the PP had also considered, in a new specific scenario of the investment analysis, the possible knowledge of the increase of the project's output already at the project's starting date, by only changing the energy generation capacity, with the inclusion of the three parameters described as follows: 1) Incremental Firm Energy sold to the Regulated Market, as well as Maximum Incremental Firm Energy for sales to the Free Market; 2) The price of the Firm Energy sold to the regulated market in the second auction (auction 02/2011 of 17 August 2011, homologated on 22 October 2011); and 3) The incremental Investment necessary to finance the additional generation capacity. For all other figures, such as energy price for the Free Market, the percentage of Secondary Energy or the energy price for the Free Market, the original assumptions have been maintained as required by CDM EB 48 Annex 67.

The financial calculations and all references were audited by analysis of the investment analysis worksheet and all variables were validated against the respective references.

The suitability of parameters used in the financial calculation has been assessed and considered reasonable by the validation team (CDM VVS, version 02.0, paragraphs 120-123 (a)). The validation team has checked the accuracy of financial calculations in the investment analysis.

It was explained by the PPs during the site visit that, although the references and assumptions were defined between May and June 2008, all monetary values are defined in real terms as of 30 April 2008. This reference date was adopted in order to bring a common and consistent reference for all parameters in the investment analysis. This practice, confirmed by the validation team during the site visit and desk review, has been accepted by the validation team as it is in line with the operational practices of the BNDES and the FSR submitted on 24 June 2008 (FSR, 2008).

The validation team confirms that the standard sensitivities of +/- 10 % as presented in the PDD are accurately calculated and that none of the scenarios reach the standard market benchmark of 12.46% as defined by the PP, as well as the default benchmark of 11.75% provided by the “Guidelines on the assessment of investment analysis” (version 05) Annex A, which is more conservative. The more conservative default benchmark was used for cross-checking purposes by the validation team.

For this purpose, the validation team has re-calculated and validated, from the investment analysis model provided by the PP, the necessary variation of each of the five relevant parameters in order for the IRR to reach the default benchmark value of 11.75%, as follows:

CAPEX: The original CAPEX as estimated by the PP before the project’s starting date 22 July 2008 (9 billion BRL) is reliable and defined by the FSR presented to BNDES when applying for the project’s financing (FSR, 2008). A reduction of 13% of the CAPEX (Base case) or 12% (Optimized case) compared to the validated estimation on the project’s start date would be necessary to reach the default benchmark of 11.75%. However, the validation team considers that this would have been unlikely scenario to occur considering the project owner’s perspective on the project’s starting date. In addition, documented evidence (BNDES\_ESBR, 2011) have been assessed by the validation team, which confirms that the current costs are considerably higher than the ones considered before.

OPEX: The analysis shows that even significant reductions of Operational Expenditures by 43% do not allow achievement of the benchmark. Moreover, the transmission fee TUST, which represents the biggest amount of the operational costs, is fixed and therefore no changes are expected.

Revenues from change in electricity prices: As can be seen in the validation of the parameters “Electricity Price in the Regulated Market (ACR1)” and “Electricity Price in the Regulated Market (ACR2)”, the energy price for the energy sold to the regulated market (most of the energy to be generated by the project) is fixed under a 30 year PPA and cannot change. Consequently, it is considered appropriate that the sensitivity analysis only considers variations in the ACL and the Spot market prices, which have not been fixed and thus are subject to variations. This approach is considered reasonable and acceptable by the validation team. The sensitivities and their validation are detailed in Appendix F.

Revenues from change in Firm Energy: The Firm Energy in Brazil is ultimately defined by the regulator. However, due to the possibility of change in the project designed by the PP at the project starting date, an estimate above the value defined by the regulator was used. This was validated on the basis of the FSR (FSR, 2008). As a Firm Energy above the approved amount was considered by the PP, the validation team considers this approach as conservative, reasonable and appropriate in the terms of the CDM. In spite of this, standard sensitivities have been calculated for changes in the firm energy and thus the load factor. These, together with the fact that such significant changes are unlikely to occur, indicate that it is unlikely that the benchmark is reached due to changes in firm energy.

Interest rate: The interest rates necessary for the IRR to reach the default benchmark of 11.75% are negative, which is unlikely to occur and is not a realistic scenario.

Benchmark calculation: The PP presented two different and independent references for the benchmark:

- a. The default value of 11.75%, from the “Guidelines on the assessment of investment analysis” (version 05), Annex A.

- b. The calculation of a standard market based benchmark value from government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, with the application of the Capital Asset Pricing Model (CAPM).
  - i. The validation team reviewed and confirmed the appropriateness of the benchmark model chosen, CAPM, as its usage is widespread in the financial market.
  - ii. The parameters' sources have all been verified as shown below. The time period chosen by the PP for the estimation of each parameter was also appraised. In line with the approach considered by the Meth Panel in its Information Note (Annex 8, MP 50, 2012) the Risk-Free Rate (United States) was determined based on the long term average (January 1928 to 31 December 2007) on the basis of an appropriate reference. The Brazilian Country Risk Premium, which is more specific and variable, was based on the recent period, from Jan/2005 to May 2007, preceding the project starting date. This is considered appropriate and conservative as it is based on the recent stable Brazilian economic circumstances, which differ significantly from the period before 2005 and thus from the mean behaviour in the long term historical data. Furthermore it is in line with the historic inflation and basic interest (TJLP) data period used for the calculation of the applicable interest rate in real terms.
  - iii. All other variables, such as beta and Equity Risk Premium have been derived from well known and publicly available standard references and sources, while the financial leverage is project specific and defined on the basis of the indicative support conditions as published by the BNDES in April 2008, as well as the assumptions and results documented in the Feasibility Study Report (FSR, 2008).
  - iv. The validation team considers the benchmark calculation of 12.46% as adequate and in accordance with the Tool for the demonstration and assessment of additionality, version 6.0.0, paragraph 30.

The validation team has validated the benchmark of 12.46% as suitable to the type of financial indicator (equity IRR after taxes). The return risks in the benchmark are compatible with the risks in the project's sector. The risk premiums applied in determining the benchmark reflect the risks associated with the specific project type or activity. It is reasonable to assume that no investment would be made at a rate of return lower than the benchmark. The equity benchmark in real terms was calculated according to best financial practice and the periods determined for all risk premiums have been validated to be adequate and correct.

For assessing the additionality of this project activity, LRQA has complied with the latest version of the "CDM Validation and Verification Standard" to assess the project document's compliance with the rules and requirements of the latest version of the "Additionality Tool" and the "Guidance on the Assessment of Investment Analysis", as well as with other relevant guidance and clarifications, including the latest guidelines on plant load factors "Guidelines for the reporting and validation of plant load factors" and the "Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios", as provided by the CDM Executive Board (EB 22 Annex 3) (CDM VVS, version 02.0, paragraph 118).

For details about the validation of the parameters used in the financial calculations and assessment of the benchmark applied, please refer to the Validation protocol in Appendix F section 7c.

LRQA confirms that the PDD and its Annexes list all relevant assumptions such as the

financial indicator, input values, benchmark and the results of the investment analysis, including sensitivity analysis. In addition, the PDD and the investment analysis spreadsheet are in line with the “Guidelines on the assessment of investment analysis” (version 5) and the CDM Project Standard (version 01.0), paragraph 48 (a).

LRQA confirms the appropriateness of the underlying assumptions and the accuracy of financial calculations carried out in the investment analysis (CDM VVS, version 02.0, paragraphs 120-123 (c)).

### **Barrier analysis**

According to the “Tool for the demonstration and assessment of additionality” (version 06.0.0), the project participants may choose to apply Step 2 (Investment analysis) or Step 3 (Barrier analysis) to demonstrate the additionality of the project activity. In this regard, the project participants opted for not implementing a Barrier Analysis in the PDD.

### **Common practice analysis**

LRQA confirms that the PDD contains a common practice analysis, which is in conformity with the “Tool for the demonstration and assessment of additionality” (version 06.0.0), the “Guidelines on common practice” and the CDM Project Standard (version 01.0), paragraph 49 (b).

LRQA assessed, confirmed and validated the geographical scope of the common practice analysis, considering the technology or industry type to which the project activity belongs, the assessment of the existence of similar projects, the assessment of the essential distinctions between the proposed project activity and any similar projects that are widely observed and commonly carried out and finally confirmed that the proposed project activity is not common practice (CDM VVS, version 02.0, paragraphs 129 and 130).

The geographical region that was considered for the analysis is the national (Brazil) scenario which is reasonable as the energy sector rules are the same for the whole country.

Paragraph 47 of the “Tool for the demonstration and assessment of additionality” – version 06.0.0 was applied to assess the common practice.

As the proposed project activity was conceived as a run-of-the river hydro power plant with an installed capacity of 3,450 MW (Base case) and, later, as consequence of optimisations identified by ESB, the installed capacity was increased to 3,750 MW (Optimized case), the output range for this project activity considered in the common practice analysis was between 1,725 MW (-50% over 3,450 MW of the Base case) and 5,625 MW (+50% over 3,750 MW of the Optimized case). The output range defined by the project participants is considered appropriate by the validation team, as it is wider than output range of +/- 50% applicable over the installed capacity of 3,450 MW (Base case) and the 3,750 MW (Optimized case) separately.

As per the information and data provided by ANEEL (Brazilian Electricity Regulatory Agency), from the 2,567 electricity plants in operation in Brazil (ANEEL, 2012), there are only 4 power plants with the installed capacity between 1,725 MW and 5,625 MW (+/- 50% of the installed capacity of the project activity) and all 4 of them are hydro power plants.

No other technology (i.e. wind power plants, solar power plants, fossil-fuelled thermal power plants, biomass, etc.) or other hydro power plants were identified as having an installed capacity within the established range.

Therefore, there are 4 electricity plants in operation in Brazil similar to project activity. So,  $N_{all} = 4$ .

The validation team was able to confirm that all these 4 large hydro power plants have been constructed by the Brazilian Government between the 70's and 90's and these are all owned and operated by governmental utilities under the State Owned Model (until 1995) and thus before the establishment of the Free Market Model (1995 – 2003) and the New Model (from 2004 onwards) which is applicable for the development and implementation of the present project activity.

Thus, it has been confirmed that  $N_{diff} = 4$ .

Finally, as  $F = 0$  (i.e. lower than 0.2) and  $N_{all} - N_{diff} = 0$  (i.e. lower than 3), the proposed project activity is not a common practice within the sector in the applicable geographical area.

This demonstrates that the project activity is not the common or prevailing practice.

LRQA confirms that projects that are similar to the proposed CDM project activity are not widely observed and commonly carried out in Brazil.

For details about the validation of the geographical scope, the assessment of the existence of similar projects and also the assessment of the essential distinctions between the proposed project activity and any similar projects if identified, please refer to the Validation protocol in Appendix F section 7e.

## 4.9 Monitoring Plan

The PDD includes a Monitoring Plan based on the approved monitoring methodology ACM0002, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 13.0.0 (CDM VVS, version 02.0, paragraph 132 (a)).

The following parameters will be monitored:

$EG_{facility,y}$ : The quantity of net electricity generation supplied by the project activity to the grid will be checked and confirmed through the assessment of the CCEE's database, which is the official and the most credible source of information for this purpose. The validation team has confirmed that the parameter " $EG_{facility,y}$ " will be continuously measured and at least monthly recorded;

$Cap_{PJ}$ : The Installed capacity of the hydro power plant after the implementation of the project activity will be confirmed through a visual inspection of the nameplates capacities of the power units installed at the project facility and their technical specification documents or manuals available on site. This procedure adequately addresses the monitoring plan determined by the methodology. No recognised standard is applicable for this purpose.

$A_{PJ}$ : The area of the single reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full, will be calculated based on a Quota x Area x Volume curve, being the quota directly measured on the reservoir. The water level will be measured by electronic sensors and specific rulers for this purpose.

$EF_{grid,OM-DD}$ : The operating margin emission factor adopted by the PP is a dispatch data analysis operating margin emission factor ( $EF_{grid,OM-DD,y}$ ) calculated and published by the DNA on a monthly basis. The annual operating margin emission factor, as stated in the PDD Appendix 4, will be calculated by the PP as the simple arithmetic average of the monthly  $EF_{grid,OM}$  values published by the Brazilian DNA. This calculation method is coherent with the DNA's practice, which calculates the monthly  $EF_{grid,OM}$  from the simple arithmetic average of the daily values, and was deemed appropriate by the validation team. In case the Brazilian DNA discontinues the publication of these data

during the monitoring period, the required data will be calculated by the project participants.

$EF_{grid,CM,y}$ : The  $EF_{grid,CM}$  will be calculated according to the “Tool to calculate the emission factor for an electricity system”:  $EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$ , where: i) the build margin emission factor is determined ex-ante ( $EF_{grid,BM,2010} = 0.1404 \text{ tCO}_2/\text{MWh}$ ); ii) the operating margin emission factor will be applied as described above and; iii) using the default weights:  $w_{OM} = 0.50$  and  $w_{BM} = 0.50$  for the first crediting period.

$TEG_y$ : The total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads will be continuous measurement and at least monthly recording. However, this parameter will be used for Project Emissions calculations purposes only if and when the Power Density is identified to be below  $10 \text{ W/m}^2$ .

LRQA has reviewed documented procedures from ONS and interviewed relevant personnel from the operations department and has confirmed the feasibility of the monitoring plan (CDM VVS, version 02.0, paragraph 132 (b)).

LRQA confirms that the Monitoring Plan described in the PDD complies with the requirements in the Monitoring Methodology and that the PPs will be able to apply this Monitoring Plan following the monitoring arrangements described in it.

For details about the validation of the Monitoring Plan please refer to the Validation protocol in Appendix F section 8.

#### 4.10 Environmental impacts

LRQA has confirmed that the project was subject to an environmental impact assessment according to the Brazilian regulation and rules. The environmental impact assessment was prepared by a Consortium of Furnas and Odebrecht, but with the technical support of Leme Engineering, a company of the GDF SUEZ group. The public consultation of the environmental impact assessment and its approval as a basis for the installation license is an authority of Brazil's federal environmental agency IBAMA (Brazilian Institute of the Environment and Natural Resources). Based on this EIA, the PP have developed the Environmental Basic Plan to request and obtain the installation license from the IBAMA and all procedures and requirements have been fulfilled according to the Brazilian regulation (CDM VVS, version 02.0, paragraph 137).

The project activity, as verified during the site visit, is in the Installation phase. The concession of the preliminary and installation environmental licenses by IBAMA attests its agreement regarding the compliance to the legal requirements.

The validation team concluded that the project activity was duly licensed on the basis of a valid Environmental Impact Assessment in accordance with the procedures required by the host Party. This is also demonstrated by the fact that an installation license is only granted if a valid Preliminary License on the basis of a valid EIA is in place and once the Basic Environmental Plan can demonstrate that all conditions of the EIA are effectively and continuously being met and required Socio-Environmental programs have been established.

The validation team confirms that all significant environmental impacts and the corresponding mitigation measures, which are implemented by the environmental programs, are duly described in the PDD section D.2.

The PPs have submitted documentation to LRQA on the analysis of the environmental impacts of this project activity and the applicable mitigation measures in line with paragraph 37 (c) of the CDM modalities and procedures.

For details about the document review and determination of whether the PPs have undertaken the analysis of environmental impacts, please refer to the Validation protocol in Appendix F section 10.

#### **4.11 Local stakeholder consultation**

As part of the Brazilian Environmental Licensing process, the Jirau hydro power project and its Environmental Impact Assessment (EIA), as well as the simplified Environmental Impact Assessment Report (RIMA) were submitted to local stakeholder consultation by the Brazilian Institute of the Environment and Natural Resources (IBAMA - Brazilian federal environmental agency). The EIA/RIMA provides a full overview of all project's impacts as well as mitigation programs and also includes a reference to the objective of GHG mitigation and the CDM. This official local stakeholder consultation conducted by the Brazilian federal environmental agency took place in October 2006, before the publication of the PDD on the UNFCCC website, before issuing the preliminary license, and before offering the hydro power concession to potential investors. Four public hearings were held, in the cities of Abunã, Mutum Paraná, Jaci Paraná and Porto Velho. Copies of the attendance lists were provided to the DOE. Please refer to the Appendix B, List of documents reviewed.

A second and specifically CDM related local stakeholder consultation, which took place after the project starting date, was conducted on 7 January 2010, when the project activities CDM file was presented in the first meeting of Jirau's Sustainability Committee, where all relevant stakeholders are represented.

A third CDM related local stakeholder consultation, following the rules and requirements of the Brazilian DNA, was initiated with another presentation to Jirau's Sustainability Committee on 28 March 2012 and with publication of the PDD in Portuguese on ESB's company website. Letters to invite comments had been sent to the list of stakeholders as defined on the basis of the Brazilian DNA's requirements and had a minimum of two weeks to submit any comment before the global stakeholder consultation started on 24 April 2012. LRQA confirms that the local stakeholder consultation process targeted all relevant stakeholders and was appropriate for identifying stakeholders' opinions about the project and collecting their views (CDM VVS, version 02.0, paragraph 140).

From the evidence found through document review, site visit and interviews with stakeholders, the validation team concluded that the whole process of consultation to stakeholders followed by the PP, which encompassed the compliance to the DNA's and the federal environmental agency's (IBAMA) requirements, is lawful and sufficient. The consultation procedure was sufficiently comprehensive and complied with the host country legal requirements, including the taking of due account of all comments received.

For details about the steps taken to assess the adequacy of the Stakeholder consultation, please refer to the Validation protocol in Appendix F section 9.

#### **4.12 Comments by parties, stakeholders and NGOs**

In line with the requirement of the Procedures for Processing and Reporting on Validation of CDM project activities, the PDD is to be made publicly available for 30 days subject to confidentiality provisions agreed with the PP, to enable comments to be received from Parties, stakeholders, and UNFCCC accredited NGOs on the validation and registration requirements.

The PDD was made publicly available in line with the requirements of the procedure for the period of 24 April 2012 to 23 May 2012 as per

<http://cdm.unfccc.int/Projects/Validation/DB/M4OO2XA6U9D8X8CASOJDWPFTIZ2Z3H/view.html>.

During the 30 day global stakeholder consultation process, three parties submitted comments about different aspects of the project activity, such as additionality, sustainability, inadequacy of the project's licensing process, lack of adequate stakeholder engagement and socio-environmental impacts. As a result of these comments, LRQA defined a set of specific interviews with representatives of affected stakeholder communities, representatives and prosecutors of the state and municipal government, as well as random interviews. In addition to that, the information and responses developed by the PPs to address the comments that were received under the stakeholder consultation process were assessed

The comments received have been taken into consideration as detailed in Appendix D of this report (CDM VVS, version 02.0, paragraph 148 (e) and (g)).

#### 4.13 Summary of Changes

Significant changes made to the original PDD published for Global Stakeholder Consultation Process are summarised below. The PDD version 01, dated 18 April 2012 was modified and several changes occurred due to the result of the validation process. The PDD version 03 dated 05 September 2012 includes all these changes.

For details about the responses to CARs and CLs, discussions on revisions to project documentation and the detailed changes to the PDD resulting from the validation process, please refer to the Validation Findings Log in the Validation Protocol in Appendix F (CDM VVS, version 02.0, paragraph 29).

##### a. Investment analysis

- An amendment was made to correct the forecast of the project's commercially available firm energy in the month September 2012 to make it compatible with the project's Feasibility Study Report (FSR). This led to a small increase in the Equity IRR. See CAR 01.
- A typo error was corrected in the financial analysis worksheet to correct the participation of civil works in the total capital expenditures to make it compatible with the project's Feasibility Study Report (FSR). This resulted in a minor change of the calculation of capital depreciation. See CAR 02.
- Some small adjustments were made to the investment analysis calculations, related to mistakes in the accounting of debt interests and the investment leverage. See CAR 04.
- Investment benchmark: corrections were requested to address inconsistencies and lack of reference for some parameters used in the benchmark's calculation (equity risk premium and the country risk premium). See CAR 05.
- The references for the benchmark values have been reviewed. Another benchmark reference, from the Guidelines on the Assessment of Investment Analysis Annex A, has been included in the PDD. See CAR 08.
- The investment analysis model and the PDD were amended to correct an undue inflation adjustment applied over the UBP (concession fee). See CAR 06.
- Additional explanation was included in the PDD to clarify the elements and composition of the Additional Firm Energy projected for sales to the Free Market (ACL). See CL 04.
- The PDD was amended regarding the reference given for the value of the tariff for use of transmission system - TUST. See CL 07.

- The sensitivity analysis was amended to include considerations on variations of the debt costs (interest rate), as well as the calculation of parameter changes which yield a return equivalent to the benchmark (the breakeven point). See CL 10.
- b. Application of the selected methodology and emissions reduction calculation
  - A correction was made in the PDD sections B.6 and B.7, with respect to the calculation of the area of the surface of the reservoir surface before the project activity. There were no impacts on the methodology's applicability or in the ex-ante emission reductions calculation. See CAR 03.
- c. Monitoring plan
  - The monitoring plan was changed for the parameters  $A_{PJ}$  (measurement procedure) and  $Cap_{PJ}$  (QA/QC procedures). See CAR 07.
- d. Local stakeholder consultation
  - The PDD has been amended by the PP in the sections D.2 and D.3, with the inclusion of a detailed description of the comments received and the considerations made with respect to the comments received during the IBAMA licensing process. See CL 14.
- e. The PDD was amended to conform to the new version of the methodology, 13.0.0. See CL 15.

## 5 Validation Opinion

LRQA has undertaken the validation of the proposed project activity “Jirau Hydro Power Plant” based on the requirements of CDM as set out in Article 12 of the Kyoto Protocol, the CDM M&P, the present annex, subsequent decisions made by the COP/MOP and CDM-EB, and the other rules applicable to the proposed project activity including the host country’s legislation and its specific requirements for stakeholder consultation and contribution to sustainable development.

Jirau Hydro Power Plant is a greenfield project located in the municipality of Porto Velho, state of Rondônia, Brazil. The project will generate electricity by installing and operating 50 bulb turbines with a nominal capacity of 75 MW each, totalling a nominal capacity of 3,750 MW. 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, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” and as defined by the baseline methodology ACM0002. Accordingly, the project activity will promote GHG emission reductions by displacing fossil fuel-based electricity generation that would otherwise have occurred.

The estimated GHG emission reductions are 6,180,620 tCO<sub>2</sub>e per annum during the first renewable 7-year crediting period.

To arrive at the final validation conclusions and opinion, LRQA carried out a desk review, a visit to location of the future project’s premises, interview with the PP’s staff involved as well as with relevant project stakeholders and independent research of alternative information sources in order to cross-check and validate the information, assumptions, calculations and statements presented in the PDD.

The validation team concluded that the description of the project activity in the PDD version 03 dated 05 September 2012 is accurate and complete and that all applicability criteria of the methodology ACM0002 Version 13.0.0 are met; the baseline scenario has been correctly identified and the assumptions adopted are sound; the monitoring plan complies with the applicable methodology, with feasible arrangements and sufficient means of implementation to ensure that the emission reductions resulting from the proposed CDM project activity can be reported ex-post and verified.

The LoA from the Brazilian DNA has been issued.

The Project Activity is additional as demonstrated by the prior CDM consideration and the financial and common practice analysis; all parameters used in the emission reduction calculations had their sources verified, were correctly interpreted and are conservative choices.

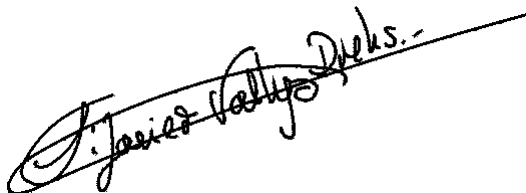
It is positively demonstrated that the project is not a probable baseline scenario and that emission reductions attributable to the project are additional to any that would have occurred in the absence of the project activity.

There was no project component or issues excluded from the validation.

Through the validation process, the validation team identified 9 CARs and 20 CLs. The PP has taken action on the raised issues and submitted to LRQA the revised PDD and other supporting evidence such as revised investment analysis, emission calculations and explanations on responses to stakeholder concerns.

The validation team is of the opinion that the proposed project activity conforms to all the relevant UNFCCC requirements for the CDM as well as the host country's national requirements and, if implemented as designed, is likely to achieve the validated emission reductions of 6,180,620 tCO<sub>2</sub>e per annum and contribute to the sustainable development of the host country. Therefore, LRQA requests the registration of "Jirau Hydro Power Plant" to the CDM Executive Board as a CDM project activity.

**Decision Maker**



Andrew Ritchie  
CDM Quality Manager  
24/12/2012

## 6 Appendices

### 6.1 Appendix A: Letter of approval for the project by the host and investing country DNA

Letter of Approval from the Interministerial Commission on Global Climate Change (*Comissão Interministerial de Mudança Global do Clima*) has been received.

### 6.2 Appendix B: List of documents reviewed

#### Category A documents (documents prepared by the PP or identified for Cross checking)

Abbud and Tancredi, 2010	Omar Alves Abbud; Marcio Tancredi – Centro de Estudos da Consultoria do Senado: “ <i>Transformações recentes da matriz brasileira de geração de energia elétrica – causas e impactos principais</i> ” (“ <i>Recent transformation of the Brazilian energy generation matrix – main causes and impacts</i> ”), March 2010; available from <a href="http://www.senado.gov.br/senado/conleg/textos_discussao/TD69-OmarAbbud_MarcioTancredi.pdf">http://www.senado.gov.br/senado/conleg/textos_discussao/TD69-OmarAbbud_MarcioTancredi.pdf</a> .
ABCM, 2010	“ <i>As energias que dispomos e as políticas públicas</i> ” (“ <i>The available energies and the public policies</i> ”), 14 December 2010. Available at: <a href="http://www.satc.edu.br/abcm/ver.asp?codigo=601&amp;tipo=L">http://www.satc.edu.br/abcm/ver.asp?codigo=601&amp;tipo=L</a> .
ABRACE	Booklet on the charges of the electricity sector, file “ <i>Cartilha ABRACE Encargos Setoriais.pdf</i> ”, available from <a href="http://www.abrace.org.br/download/cartilha%20de%20encargos.pdf">www.abrace.org.br/download/cartilha%20de%20encargos.pdf</a>
Agência Brasil 2005	“ <i>Comissão do Trabalho da Câmara quer tratamento igual para operários de grandes hidrelétricas</i> ” (“ <i>Working Commission Chamber wants equal treatment for operators from large hydro power plants</i> ”), dated 5 May 2012. Available at: <a href="http://agenciabrasil.ebc.com.br/noticia/2012-05-05/comissao-do-trabalho-da-camara-quer-tratamento-igual-para-operarios-de-grandes-hidreletricas">http://agenciabrasil.ebc.com.br/noticia/2012-05-05/comissao-do-trabalho-da-camara-quer-tratamento-igual-para-operarios-de-grandes-hidreletricas</a> .
Agencia Brasil, 2012	Agencia Brasil, “ <i>Incêndio em alojamento da Usina Jirau foi criminoso, diz presidente de confederação de trabalhadores</i> ” (“ <i>Fire in lodgment of Jirau Power Plant was criminal, said the workers confederation president</i> ”), 3 April 2012, available from <a href="http://agencia-brasil.jusbrasil.com.br/noticias/3077315/incendio-em-alojamento-da-usina-jirau-foi-criminoso-diz-presidente-de-confederacao-de-trabalhadores">http://agencia-brasil.jusbrasil.com.br/noticias/3077315/incendio-em-alojamento-da-usina-jirau-foi-criminoso-diz-presidente-de-confederacao-de-trabalhadores</a> .
Ambiente Brasil, 2006	“ <i>Tolmasquim denies risk for energy crises until 2015</i> ”, dated 29 August 2006. Available at: <a href="http://noticias.ambientebrasil.com.br/clipping/2006/08/29/26519-tolmasquim-descarta-risco-de-crise-energetica-ate-2015.html">http://noticias.ambientebrasil.com.br/clipping/2006/08/29/26519-tolmasquim-descarta-risco-de-crise-energetica-ate-2015.html</a> .
ANA Resolution 269, 2009	Resolution of the National Water Agency ANA to grant the rights for the use of the Jirau water resource and to impose operational conditions and quota, file “ <i>2009_04_27 Resolução ANA 269-2009 - Outorga de Direito de Uso dos Recursos Hídricos.pdf</i> ”, also available from <a href="http://arquivos.ana.gov.br/resolucoes/2009/269-2009.pdf">http://arquivos.ana.gov.br/resolucoes/2009/269-2009.pdf</a> .
ANA, Resolução 555, 2006	ANA, Agencia Nacional de Águas, Resolution Nº 555, from 19 December 2006, available from <a href="http://www.aneel.gov.br/arquivos/PDF/DHJirau.pdf">http://www.aneel.gov.br/arquivos/PDF/DHJirau.pdf</a> .
Andritz, 2008	Low Head Hydro Turbines, available from <a href="http://www.engineering.lancs.ac.uk/lureg/nwhrm/project/Joule%20Centre%20conf%2008/krompholz.pdf">http://www.engineering.lancs.ac.uk/lureg/nwhrm/project/Joule%20Centre%20conf%2008/krompholz.pdf</a> .
ANEEL 68, 2007	ANEEL’s Technical Note No 68/2007-SRE/ANEEL, dated 21 March 2007. Available at: <a href="http://www.aneel.gov.br/cedoc/nren2007259.pdf">http://www.aneel.gov.br/cedoc/nren2007259.pdf</a> ;
ANEEL Annex XII, 2008	Reference values of TUST, file “ <i>2007_06_05 JIRAU - ANEEL - Leilão 052008 - ANEXOXII – TUST.pdf</i> ”, also available from <a href="http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-">http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-</a>

	ANEXO%2012%20-%20Conjunto%20de%20TUST.pdf.
ANEEL, 2007_12_11	"Aneel Resolução Homologatoria 586 de 11 de Dezembro 2007" ("ANEEL's Homologatory Resolution 586, from 11 December 2007"), file "2007_12_11 ANEEL Resolução 586 para definir TAR em 60.04 RS" or from <a href="http://www.aneel.gov.br/cedoc/reh2007586.pdf">http://www.aneel.gov.br/cedoc/reh2007586.pdf</a> .
ANEEL, 2007_12_27	"Aneel Despacho 3.731 de 27 de Dezembro 2007" ("ANEEL's Dispatch 3,731, from 27 December 2007"), file "2007_12_27 ANEEL DESPACHO Nº 3.731 TFSEE" or from <a href="http://www.aneel.gov.br/cedoc/dsp20073731.pdf">http://www.aneel.gov.br/cedoc/dsp20073731.pdf</a> .
ANEEL, 2008	Auction Notice 05/2008, Process nº. 48500.000175/2008-78, file "2008_05_12 Edital Leilão Jirau", also available from: <a href="http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Edital%20_10-4_%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf">http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Edital%20_10-4_%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf</a> .
ANEEL, 2008_06_20	ANEEL, Report on Analysis of the Documentation for Inscription and habilitation, File 08_06_20 ANEEL Relatorio Habilitação, available from <a href="http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/Relatorio%20Habilita%C3%A7%C3%A3o-UHE%20Jirau_16-6%20(sem%20gabriel).pdf">http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/Relatorio%20Habilita%C3%A7%C3%A3o-UHE%20Jirau_16-6%20(sem%20gabriel).pdf</a>
ANEEL, 2008_06_27	"Receita Anual Permitida e tarifas de transmissão são atualizadas - 27/06/2008" ("Annual Revenue and transmission tariffs are updated"), file "Atualização TUST e IGPM", also available under <a href="http://www.aneel.gov.br/aplicacoes/noticias_boletim/?fuseaction=boletim.detalharNoticia&amp;idNoticia=12">http://www.aneel.gov.br/aplicacoes/noticias_boletim/?fuseaction=boletim.detalharNoticia&amp;idNoticia=12</a>
ANEEL_2008_07_22	Note on homologation and adjudication ("Aviso de adjudicação e homologação") available at: <a href="http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Aviso%20de%20Homologa%C3%A7%C3%A3o%20e%20Adjudica%C3%A7%C3%A3o%20n%20%2005-2008%2018-7.pdf">http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Aviso%20de%20Homologa%C3%A7%C3%A3o%20e%20Adjudica%C3%A7%C3%A3o%20n%20%2005-2008%2018-7.pdf</a>
ANEEL, 2011_10_18	Auction 02/2011, auction approval, file "2011_10_18 HOMOLOGAÇÃO Processo 48500.000589 2011-01.pdf". Available at: <a href="http://www.aneel.gov.br/cedoc/alel2011002hom.pdf">http://www.aneel.gov.br/cedoc/alel2011002hom.pdf</a>
ANEEL, 2012	ANEEL (Brazilian Electricity Regulatory Agency), "Capacidade Geração Brasil" (Brazilian Generation Database), provides data and information on power plants in operation in Brazil. Available at: <a href="http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp">http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp</a> .
Annex 8, MP 50, 2012	CDM Meth Panel, file "Default values for equity return for CDM projects_mp50_an08.pdf", dated 15 July 2012, also available on <a href="http://cdm.unfccc.int/Panels/meth/meeting/11/050/mp50_an08.pdf">http://cdm.unfccc.int/Panels/meth/meeting/11/050/mp50_an08.pdf</a> .
Banco Central, 2012	"Histórico de Metas para a Inflação no Brasil", ("History of Brazilian Inflation target"), available from <a href="http://www.bcb.gov.br/Pec/metast/TabelaMetaseResultados.pdf">http://www.bcb.gov.br/Pec/metast/TabelaMetaseResultados.pdf</a> .
Basic Design Study 2010_08_31	Technical Specification sheet of the revised Basic Design Study, file 2010_08_31 Projeto Básico Revisado _-ANEEL_ agosto 2010.
Bezerra et al, 2010	Bezerra et al, 2010, "Measuring the Hydroelectric Regularization Capacity of the Brazilian Hydrothermal System", available from <a href="http://www.psr-inc.com.br/portal/psr_pt_BR/iframe.html?altura=4000&amp;url=/app/publicacoes.aspx">http://www.psr-inc.com.br/portal/psr_pt_BR/iframe.html?altura=4000&amp;url=/app/publicacoes.aspx</a> .
BIC, 2010	"Para a GDF Suez, leilão da energia de Jirau serviu como teste de mercado" (For GDFSUEZ, energy auction served as market test), published on 13 November 2010, available at <a href="http://www.bicusa.org/es/Article.12251.aspx">http://www.bicusa.org/es/Article.12251.aspx</a>
BNDES Decision 798, 2012	BNDES decision 798 to approve loan supplement for the installation of the Jirau HPP with installed capacity of 3.750 MW. The document defines (page 37 / 38) that part of the total financing is related to the CDM registration process. File: "BNDES decisão 798 (Financ Suplementar – UHE Jirau)".
BNDES	Financing Contract between the Brazilian Development Bank, the intermediating Banks

Financing, 2009	and ESBR, signed on 29 June 2009 files: "2009_06_29 JIRAU – CONTRATO DE FINANCIAMENTO Annex III (Total Capex)" "2009_06_29 JIRAU – CONTRATO DE FINANCIAMENTO DIRETO.pdf"; 2009_06_29 JIRAU – CONTRATO DE REPASSE 29 06 2009.pdf
BNDES FINEM, 2012	BNDES financing conditions for electricity generation activities: file "www.bndes.gov.br - Condições financeiras.pdf", also available from: <a href="http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energia_eletrica_geracao.html">http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energia_eletrica_geracao.html</a>
BNDES Loan Composition, 2012	Summary about BNDES financing rates, costs and composition: file "www.bndes.gov.br - Condições financeiras.pdf", also available from: <a href="http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Ferramentas_e_Normas/Custos_Financeiros/Composicao">http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Ferramentas_e_Normas/Custos_Financeiros/Composicao</a>
BNDES, 2006	BNDES Press release about financing conditions in 2006, file "2006_09_26 www.bndes.gov.br – Press release from BNDES on 26 September 2006.pdf", also available from: <a href="http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2006/20060926_not185_06.html">http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2006/20060926_not185_06.html</a> .
BNDES, 2008	BNDES disclosure of the supporting conditions for Jirau plant on the Madeira River, <a href="http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2008/20080428_not068_08.html">http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2008/20080428_not068_08.html</a> (also in the file "2008_04_28 www bndes gov br – BNDES divulga condições de apoio para usina Jirau no rio Madeira.pdf")
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UNFCCC, 2007	UNFCCC, 2007: F-CDM-AM-Clar_Respon ver 01.1 - AM_CLA_0049, available at: <a href="http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_T74PW4LBX5ZQSRV57CR6RIKBALHHE">http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_T74PW4LBX5ZQSRV57CR6RIKBALHHE</a> .
UNFCCC, 2009	UNFCCC 2009 Decision 2/CMP.5. "Further Guidance relating to the clean development mechanism". Available at:

### 6.3 Appendix C: List of persons interviewed

Mr. Manoel P. Silva	Representative of local farmers
Ms. Maria P. da S. Botelho	Representative of riverside population
Mr. Emídio V. da Silva	Representative of urban residents
Mr. Puruí Uru-Eu-Wau-Wau	Leader of the indigenous ethnic group Uru-Eu-Wau-Wau
Mr. Claudenir Oliveira and Mrs. Euza L. Oliveira	Representatives of local retailers
Mr. Pedro Beber	City Office of Special Programs, municipality of Porto Velho
Mr. Aluildo de Oliveira Leite	Prosecutor of the Public Ministry of the State of Rondônia
Mr. Philipp Hauser	GDF Suez – Vice-president Carbon Markets
Ms. Anamelia Medeiros	GDF Suez – CDM Project Manager
Mr. Antônio Jorge	ESBR – Environmental Director
Mr. Maciel Paiva	ESBR – Engineering Director
Ms. Thais Soares	ESBR – Environmental Coordinator
Ms. Viviane Béghin	ESBR – Socio-Economic Analyst
Mr. Maurício de Castro	GDF Suez – Financial Manager
Mr. Marc Claassen	GDF Suez – Financial Manager
Ms. Bruna R. Paes	ESBR – Socio-Economic Coordinator
Anderson S. Imolesi	ESBR – Socio-Economic Coordinator
Mr. Luiz Antônio M. da Silva	ESBR – Socio-Economic Manager
Silas M. Ferreira	CNEC Worley Parsons – Biologist
Mr. Nicholas Morassutti	LEME Engineering - Civil Engineer / Hydro power
Mr. David Freire da Costa	GDF Suez – CDM Participation Manager
Anna Paula Pacheco	ESBR – Operations Department
Hélio Gonçalves	ESBR – Operations Department

### 6.4 Appendix D: How due account has been taken to the public input made to the validation requirements

The PDD was made publicly available in accordance with the requirements of the Procedures for processing and reporting on validation of a CDM project activity for the period of 24 April 2012 to 23 May 2012 as per <http://cdm.unfccc.int/Projects/Validation/DB/M4OO2XA6U9D8X8CASOJDWPFTIZ2Z3H/view.html>.

Comments were received during this period from 3 sources, namely:

- Philip M. Fearnside (National Institute for Research in Amazonia, INPA)
- Zachary Hurwitz (International Rivers)
- Jorge Molina (Universidad Mayor de San Andres, La Paz, Bolivia)

The comments and responses are shown below *ipsis litteris*, in excerpts grouped by subject. This report is intended to reproduce the whole content of the comments received. For clarity reasons, some excerpts considered redundant or not relevant

have not been reproduced in the sections 1 to 4 below. The excerpts not included in these sections have been fully included in the section 5, "Excerpts not included in the comments above"

## 1. ENVIRONMENTAL AND SOCIAL IMPACTS

### 1.1. Change on sedimentation, raise of water levels, and their impacts

#### 1.1.1. Change of sedimentation pattern and raise of water levels in the reservoir's upstream areas. Transborder impacts

Comments	<p><u>Philip Fearnside, page 2:</u></p> <p>"Flooding in Bolivia is not mentioned as an impact. Sedimentation and consequent raising of water levels in the "backwater stretch" is expected to result in flooding in Bolivian territory both along the Madeira River and the Abunã River. Impacts of flooding would include effects on a protected area on the Bolivian side of the Madeira above the town of Abunã.</p> <p>The EIA considers the reservoir to be shorter in length at any given water level during the high-water period than during the low-water period (FURNAS, CNO &amp; Leme Engenharia, 2005, Tomo A, p. VII-8). To prevent flooding in Bolivia, the planned operation of the dam in the PDD (p. 9) would keep the water level at the dam at 90m above sea level for four months (January-April), at 85 m for four months (May, June, November &amp; December), and at 82.5 m for four months (July-October). The calculated effect is only for the length of the reservoir per se, not for the backwater stretch. The planned management of the water level will not prevent a mound of sediment from forming at the top of the reservoir and consequent flooding in Bolivia by the water that is held back by this impediment. The Madeira River has one of the highest sediment loads in the world, accounting for about half of all of the sediment in the Amazon River (Meade, 1994)."</p> <p><u>Zachary Hurwitz, page 4:</u></p> <p>"The Jirau HPP will cause transboundary impacts in upstream areas of neighboring Bolivia and Peru. Technical studies have illustrated that the Jirau reservoir will increase water levels in areas of confluence between the Madeira River and the Abunã River, Beni River, and Mamoré River located on binational territory between Bolivia and Brazil. The increasing water levels would extend beyond the Area of Influence considered by the project EIA, which terminates exactly before the Brazil-Bolivia border."</p> <p>"By considering only the environmental impacts discussed in the project EIA, the PDD violates Decision 4/CMP.1, which foresees the inclusion of transboundary issues in its discussion of environmental and social impacts."</p> <p><u>Jorge Molina, pages 1, 2 and 3:</u></p> <p>"The Jirau HPP will cause transboundary impacts in upstream areas of neighboring Bolivia and Peru. The PDD ignores these impacts. However, feasibility and EIA studies (Furnas, Odebrecht, 2004) already identified cross-border impacts, often without mentioning them explicitly as such. One of the most important impacts is the effect on the water levels along the binational stretch of the Madera River, stretch that extends from the confluence with the Abuna River at its downstream end to the confluence of the Beni and Mamoré rivers upstream. Contrary to what the PDD mentions (page 8), the feasibility study (Chapter 7) shows that even operating the Jirau reservoir with varying levels (table 2 of the PDD), water levels in the Madera River near the city of Abuna will increase, at least for medium and low flows. The city of Abuna is</p>
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	<p>located on the Brazilian side of the binational stretch. Water levels in the binational stretch would be increased further as a result of the sedimentation induced by the reservoir (Chapter 7 of the EIA, Switkes, 2008). The main consequences of the increase of the river water levels in the binational stretch would be the loss of potential energy in that stretch and the increase in the frequency and duration of floods in Bolivian territory. The loss of potential energy can be estimated readily in monetary terms.”</p> <p>“Resolution ANA 555/2006, referred to in the PDD, adopted as the stage-discharge curve in Abuna (curve ANA-ESBR of figure 1 of Annex) the curve (Jirau Furnas in figure 1 of the Annex) which according to the feasibility studies, is the one modified by the operation of the Jirau reservoir. The original natural curve was the ANA curve of figure 1. Furthermore, the ESBR consortium in charge of developing Jirau submitted the technical note ESBR UHE JIRAU/ANEEL 001-2008, which reduces, arbitrarily and without technical support, friction losses in the future reservoir, in order to further reduce modified water levels in the binational stretch. This was observed by the Bolivian delegation, at the binational technical meeting held on 30 and 31 October 2008, while the Brazilian delegation could not give a reply. Moreover, a study (Molina et al, 2008) showed that the use of the original friction coefficients of the feasibility study significantly increase water levels in Abuna in relation to natural levels (Figure 2).”</p>
Response submitted by the PP	<p>Water levels in Abuna have been defined by Resolutions 555/2006 and 269/2009 which have been issued by the National Water Agency (ANA). The aim of Resolution ANA 555/2006 was to guarantee the necessary hydro availability for Jirau HPP to operate, and Resolution ANA 269/2009 grants the Project the right to use hydro resources and defines the conditions of its operation in keeping Abunã's water level on its historically observed levels. When Jirau HPP starts to operate, these water levels, the outflow, inflow and down flow will be monitored daily. Solid discharges upstream and downstream will be monitored monthly. Besides, the topo-bathymetric sections will be monitored annually, in order to update estimates of silted up volume and the curve level-area-volume. Based on this monitoring, the guide curve will be assessed annually to guarantee the natural variation of water levels in Abunã is maintained. This means there will be no possibility of project related transboundary water level elevation even as the result of a sediment formation caused by the reservoir.”</p> <p>It is important to highlight that Abuna is a Brazilian village, located in Rondonia State, next to the border between Brazil and Bolivia. Therefore, as the water levels in Abuna are monitored and maintained, as defined by by the National Water Agency (ANA), flooding in Bolivian territory is not expected to occur as a result of the project activity implementation.</p> <p>Since the definition of the Madeira hydro power inventory, the Madeira hydro power complex was defined to exploit only the Brazilian hydro power potential of the Madeira River and designed to limit any social and environmental impacts to the Brazilian territory. In any case, there were many bilateral discussions with Bolivia and Peru's representatives, not only about the project itself, but about the larger concept to establish the discussions about cross-border impacts which occurred in parallel to the licensing were used to define the operational rule and all environmental mitigation programs in a way which can effectively prevent any impacts. Most important to this understanding is that the operational guide curve is not just a theoretic guideline, but that the operator has to effectively monitor the quota in Abunã and adjust the operation accordingly. This implies that no increased flooding in Abunã is possible, even</p>

	<p>considering the backwater stretch. By the EIA and supplementary studies it was also shown that the high flows of the Madeira River eliminate the accumulation of sediments, especially beyond Abunã, where the river will flow in undisturbed manner. Now in the hypotheses that sediment would accumulate this would lead to a reduction of the operational level and thus increase flood rate in Abunã and thus eliminate the sediments that had accumulated.</p> <p>Finally, the hypothesis that the investor had speculated about monetary benefits related to a possible agreement between Bolivia and Brazil which would allow raising the operational quota to a constant 90 m throughout the year is against ANEELs (2008) guidance which confirms that the firm energy of the Jirau HPP is strictly defined by the operational rule established by ANA and therefore not applicable under Jirau's HPP hydro power concession contract.</p>
Evaluation of the response	<p>The validation team has confirmed from the ANA Resolution 269 (2009), article 5 that "the normal water level of the reservoir shall vary following the natural conditions of the river Madeira, and that the operator shall effectively monitor the quota in Abunã and adjust the operation accordingly". Still according to the resolution, "the water levels, the outflow, inflow and downflow will be monitored daily", and "solid discharges upstream and downstream will be monitored monthly". The resolution determines that "topo-bathymetric sections shall be monitored annually, in order to update estimates of silted up volume and the curve level-area-volume". The monitoring data shall be reported annually to ANA, for the control and monitoring of compliance with the conditions set out in the concession of rights of exploitation of the water resources. The compliance with the operational and monitoring rules defined by ANA is a requirement for the issuance and maintenance of the project's installation and operation environmental licences granted by IBAMA.</p> <p>The validation team concludes that, once the project's operation is adjusted as to maintain the natural levels in Abunã, based on measured levels and not on theoretical assumptions, the discussion on the friction losses becomes immaterial in this context. If monitored as prescribed by the legislation, the project is not expected to cause abnormal sedimentation or increased flooding in Abunã. As a result, there will be no loss of potential energy at the project's upstream.</p> <p>The validation team has confirmed during the site visit and from maps (Google Earth) that Abunã is located on the frontier between Brazil and Bolivia. As the natural conditions of the river will be preserved in Abunã, as per ANA resolution 269 (ANA, Resolução 269, 2009), no flooding in the Bolivian territory is expected as result of the project activity.</p> <p>Regarding the project's impacts on the Brazil's neighboring countries, the validation team has confirmed that any project's transborder aspect is expected to be considered by the DNA. The administrative rule No. 212 of 30/04/2008 / MFA – from the Ministry of Foreign Affairs approved the Internal Rules of the Secretary of State of Foreign Affairs (<a href="http://www.diariodasleis.com.br/busca/exibmlink.php?numlink = 1-91-29-2008-04-30-212">http://www.diariodasleis.com.br/busca/exibmlink.php?numlink = 1-91-29-2008-04-30-212</a>), article 57 item VI: "It is for the Division of Environmental Policy and Sustainable Development ... to monitor and participate in meetings of the ... Interministerial Commission on Global Climate Change (CIMGC)."</p> <p>Regarding the issue that "the PDD violates Decision 4/CMP.1, which foresees the inclusion of transboundary issues in its discussion of environmental and social impacts", the validation team notes that the term <u>transboundary</u>, in all the contexts where it is used in CMP1, refers to the project activity's boundaries, not the country's borders. The CMP.1 makes no reference to <u>transborder</u> impacts.</p>

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### 1.1.2. Impact on fish reproduction

Comments	<p><u>Philip Fearnside, page 2:</u>          “One of the major impacts not mentioned in the PDD is blockage of fish migration. Readers of the PDD will have no idea of the dam’s major expected impact (together with the Santo Antônio Dam) in wiping out the fishery of the giant Madeira River catfish, not only in the Brazilian portion of the Madeira but also in Peru and Bolivia (e.g., Barthem &amp; Goulding, 1997; Fearnside, 2006; 2009a,b). These catfish have, until now, been a major source of income and food for the local people in the Madeira Basin in these three countries, and the dam projects do not even admit, let alone compensate for, the loss of livelihoods.”</p> <p><u>Zachary Hurwitz, page 4:</u>          “The resulting increase in water level increases the risk of flooding, sedimentation, and impacts on fish species reproduction within Bolivian territory. IBAMA technical report 014/2007 stated that the resulting impacts on fishing activities and viability of migratory fish reproduction further upstream in Bolivia as well as in Peru warrant the creation of a new EIA that considers transboundary impacts, as well as new public consultations.”</p> <p><u>Jorge Molina, pages 1, 2 and 3:</u>          “The IBAMA technical report No. 014/2007 was clear: “The extension of direct and indirect environmental impacts to other countries is feasible in relation to the over-elevation of water levels. There is no doubt in relation to the productivity of fishing activity and viability of fish stocks (especially the migratory fish as the dourada) and to the proliferation of malaria. These impacts affect the other two countries in the basin: Bolivia and Peru. It is concluded that there is an imperative for the realization of a new, more comprehensive environmental impact study, both on national (Brazilian) and foreign territories, including the realization of new public hearings. Therefore, we recommend the non-issuance of the preliminary license”. However, the license was issued a few months after a removal of IBAMA authorities.          Impacts on migratory fish, that spawn at the Andean foothills in Bolivia and Peru after a long journey from the Lower Amazon and Lower Madera rivers, have been studied in Bolivia by Van Damme et al (2008). Before that, the complementary studies of the EIA (2006), mentioned the following, to justify the construction of a system of fish passage (STP): “Fish passage systems do not guarantee the passage upstream of adult fish and have no effect on the passage downstream of eggs and larvae. The fact that there exist two consecutive reservoirs (Santo Antônio and Jirau) increases the uncertainties. Fish passage systems can act as introducers of alocton species in the subsystems upstream and downstream of the cachuelas (rapids and low waterfalls). Despite these doubts, there are technical and political reasons to build fish passage systems, because the impact on fish migration extrapolates the limits of Brazilian territory and interferes in transnational stocks and fisheries production, both in Brazil and Bolivia and Peru”.          Van Damme et al (2008) showed that commercial fishing in Bolivia, which depends for the most part on migratory catfish, would be most likely affected by the dams’ barrier effect. The most affected population in Bolivia would be indigenous people and poor riparian populations that depend on fishing for most of the proteins they eat.”</p>
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	<p>The EIA states that the eggs and larvae passing through the weirs would suffer little or no damage. The PDD and the EIA do not cite any prior reference nor provide any technical support to show that bulb turbines will not cause a great mortality of eggs and larvae. A recent study (Van Damme et al, 2011) showed that the majority of eggs and larvae will pass through the turbines and that all the concerns expressed in the complementary studies of the EIA are real.”</p>
Response submitted by the PP	<p>Evaluation of the efficiency of the STP is being implemented by the Monitoring Subprogram of the Fish Passage System foreseen in the Conservation Program of Ichthyofauna of Jirau HPP (item 4. 17 of the Basic Environmental Project – PBA).</p> <p>Additionally, it is noteworthy that features which favor ichthyofauna conservation were already defined and incorporated to the basic and detailed design of the project; these include a change in the geometry of the dam axis to prevent the formation of backwater areas that could work like traps to eggs, larvae and juvenile fish that swim down the river along the current. Results obtained by the Subprogram of Ichthyoplankton indicate a lack of vertical or horizontal stratification in the distribution of eggs, larvae and juvenile fish along the stretch of rapids in the Madeira River, which points their dispersal.</p> <p>Thus, experimental designs to evaluate mortality-survival of eggs, larvae and juvenile fish of ichthyofauna during their passage through different stretches of the Madeira River were foreseen in the Conservation Program of ichthyofauna of Jirau HPP (item 4.17 of the Basic Environmental Project – PBA), operating since 2009, including passage through the spillway and turbine. The comparison of data obtained before and after the filling of the reservoir will lead to a better understanding and handling of this component of the biota.</p> <p>Another favorable design feature is the use of bulb turbines as questioned by Molina. In fact, comparative analyses of bulb and Kaplan turbines show the favorable features of bulb turbines (Pavlov DS, Lupandin AI, Kostin VV. 2002; Godinho and Boyd Kynard 2008; Andritz, 2008; Odeh M., 1999). As presented in the Feasibility Study, these turbines are fish friendly because they have fewer blades, low turning speed and have larger runner diameters.</p> <p>Several studies on pressure variation, blades friction etc., suggest that mortality associated to the passage through turbines can be relatively low in low head plants with Kaplan or Bulb turbines.</p> <p>In addition, ESBR has investigated for additional solutions to increase even further their fish-friendly characteristics. Among others: turbines are water-cooled to prevent water pollution; large, but slow turning turbines (the biggest bulb turbines in the world) with relatively small blade dimension decreases further the risk of mortality; creative technical solutions for zero fish mortality during units’ outages; Jirau’s specific design, developed for fish transport systems, enhances the selective passage of fish and allows migratory fish passage, but restricts the passage of those fishes who would not have naturally swam up the river. One system is in rock and the other in metal, to guarantee the spawning and genetic flux of all concerned species.</p> <p>Moreover, since 2009 the Fishing Activity Support and Monitoring Program (item 4.30 of the PBA) follows-up of commercial, craftwork and subsistence activities among riparian communities in the project’s area of influence. This Program is to be active before, during and after the project’s implementation and aims at contributing to the sustainability of fishing activities in the Madeira river basin and monitoring possible impacts of the project’s implementation and reservoir’s formation.</p>

	Based on the EIA and supplementary studies from notable specialists an effective Fish Passage System is being implemented to guarantee the upriver migration of <i>Brachyplatystoma flavicans</i> (catfish) and to promote gene flow of other migrating species, while exotic species are being prevented from migration. In addition, we have provided references which show that bulb turbines allow down river migration of ichthyoplankton. This is also favored by the construction and reservoir configuration and both migration and downstream of ichthyoplankton is being monitored to guarantee efficiency.
Evaluation of the response	<p>A Clarification Request (CL 20) has been raised by the validation team with respect to the use of the term “fish friendly” in the PP’s response, relating to the turbines’ characteristics. The validation team has concluded from the PP’s response to the CL that, although the use of the term “fish-friendly” may not be the most appropriate, the studies referenced in the PP’s response to the comments received clearly indicate that the project’s turbines are the least harmful turbines available.</p> <p>The validation team has confirmed, from the Conservation Program of Ichthyofauna item 4.17.11 and as discussed during the site visit, that the evaluation of the efficiency of the fish passage system is being implemented by the Monitoring Subprogram of the Fish Passage System foreseen in the Fish Fauna Conservation Program (item 4.17 of the Basic Environmental Project – PBA 17, 2009).</p> <p>The validation team considers that all relevant aspects regarding the project’s impacts on the ichthyofauna have been appraised by IBAMA, the Brazilian federal environmental agency, which has approved the Basic Environmental Program and has granted the project the environmental license. The implementation of the Monitoring and Support Program for Fishing Activities (item 4.30 of the PBA 30, 2009) has been confirmed by the validation team during the site visit and interview with a representative of the riverside population.</p> <p>The validation team concludes that the issues raised by the comments received (negative impact on fish reproduction, effectiveness of fish passage systems to guarantee the transit of adult fish, eggs and larvae) have been duly dealt with by the PP as part of the requirements imposed by IBAMA during the process for granting the installation environmental permit. The continuous operation of the Basic Environmental Project, with all its programs, is subject to the control from IBAMA and is a requirement for the maintenance of the operation permit. Furthermore, the project activity will be subject to approval by the Brazilian DNA. The DNA’s confirmation of the project’s environmental sustainability is a CDM requirement for the project’s registration.</p>

### 1.1.3. Risk of proliferation of malaria

Comments	<p><u>Jorge Molina, page 2:</u></p> <p>“The IBAMA technical report No. 014/2007 was clear: “The extension of direct and indirect environmental impacts to other countries is feasible in relation to the over-elevation of water levels. There is no doubt in relation ... the proliferation of malaria.”</p>
Response submitted by the PP	ESBR recognizes that, if not correctly managed, there would be risk of increased incidence of malaria as a consequence of project activity, which was correctly identified on the EIA. This led to the design and implementation of

	<p>adequate and effective measures.</p> <p>“Malaria transmission determining factors are: i) susceptible population; ii) etiologic agent; and iii) presence of the vector. Conditioning factors for high incidence are related to the etiologic agent and point to the resistance to antimalarial drugs; delay in diagnosis and treatment; and weakness of epidemiological surveillance.</p> <p>Brazilian environmental licensing process has advanced considerably with respect to environmental obligations of projects in Amazonia regarding malaria, and if a projects’ activities increase the risk factors of malaria cases in endemic regions it must conduct epidemiological studies and programs to control the disease and its vectors. Accordingly, the Ministry of Health established standards and procedures for the implementation of projects subject to environmental licensing processes (CONAMA Resolutions 01/1986 and 237/1997).”</p> <p>By means of this legal provision ESBR, together with technicians from the Municipal Health Department of Porto Velho (SEMUSA), the State Health Department (SESAU) and the Ministry of Health (MS), has developed the Action Plan for Malaria Control (PACM) for the areas of direct and indirect influence of the project.</p> <p>“It is noteworthy that in the construction site there is a specific plan of prevention measures and disease control in the work fronts and housing sites, all in compliance with Brazilian legal provisions regarding occupational safety and health.”</p> <p>“The number of malaria cases has been declining since the implementation of hydro power projects on the Madeira River in 2008. For decades, the municipality of Porto Velho was considered a high risk of transmission zone. In 2011 the reduction in the number of cases was of 25%, and for the first time in its history the region became a zone with average risk of transmission.</p> <p>In the area of influence of Jirau HPP, the number of cases is smaller than prior to the implementation of the project in 2007. By the Bolivian border, in regions 4th and 6th, reduction was quite significant, 24.3% and 25.0% respectively in 2010 and 2011 (Annex 1, Figure 5 - Figure 8). Municipal, inter-municipal and international population movement along the frontiers of Rondônia and Bolivia has been monitored by technicians for vector control. Monitoring in Nova Mamoré and Guajará-Mirim (outside the project’s area of influence) in the Bolivian border also indicates a reduction in the number of cases. Between 2010 and 2011 the reduction in cases in Nova Mamoré was of 15.3% and in Guajará-Mirim of 45.5%.</p> <p>In addition to this, it is important to repeat that the natural conditions of the river will be preserved in Abunã, at the frontier between Brazil and Bolivia as required by ANA, Resolução 555, 2006 and ANA (ANA, Resolução 269, 2009). Thus, due to absence of any flooding or interference with the tributary rivers on Bolivian or Peruvian territory related to the Jirau HPP implementation, the concern that the project activity would lead to increased vector incidence in those regions does not have fundamentals. Consequently, the vector population will remain constant and is not influenced by the project activity.</p>
Evaluation of the response	<p>The Public Health Program, item 4.22 of the Basic Environmental Project – PBA, is part of the requirements imposed by IBAMA during the process for granting the installation environmental permit and for the maintenance of the</p>

	<p>environmental operation permit.</p> <p>The validation team has confirmed the reduction rates mentioned by the PP, from the official site of the Information System of Epidemiological Surveillance (SIVEP-MALÀRIA), <a href="http://portalweb04.saude.gov.br/sivep_malaria/default.asp">http://portalweb04.saude.gov.br/sivep_malaria/default.asp</a> (username and password are required) and from the final report about the status of the PBA submitted by the PP to IBAMA (ESBR, Final Report IBAMA, 2012), section 4.22 about Public Health, covering the period from June 2009 to February 2012. The Annual Parasite Index, IPA (number of confirmed cases per 1000 inhabitants in the geographical area) in the municipality of Porto Velho has fallen from around 60 in 2008 to less than 40 in 2011.</p> <p>The validation team concludes that the issues raised by the comments received have been duly dealt with by the PP as per the requirements imposed by IBAMA during the process for granting the installation environmental permit. The continuous operation of the Basic Environmental Project, with all its programs, is subject to the control from IBAMA and is a requirement for the maintenance of the operation permit. Furthermore, the project activity will be subject to approval by the Brazilian DNA. The DNA's confirmation of the project's environmental sustainability is a CDM requirement for the project's registration.</p> <p>Regarding the project's impacts on the Brazil's neighboring countries, the validator has confirmed that any project's transborder aspect is expected to be considered by the DNA. The administrative rule No. 212 of 30/04/2008 / MFA – from the Ministry of Foreign Affairs approved the Internal Rules of the Secretary of State of Foreign Affairs (<a href="http://www.diariodasleis.com.br/busca/exibmlink.php?numlink=1-91-29-2008-04-30-212">http://www.diariodasleis.com.br/busca/exibmlink.php?numlink=1-91-29-2008-04-30-212</a>), article 57 item VI: "It is for the Division of Environmental Policy and Sustainable Development ... to monitor and participate in meetings of the ... Interministerial Commission on Global Climate Change (CIMGC)."</p>
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## 1.2. Impacts on indigenous people

Comment	<p><u>Zachary Hurwitz, page 5:</u></p> <p>"Construction of the Jirau HPP has caused social and environmental impacts on federally protected indigenous territories as well as on nearby tribes living in voluntary isolation. The Federal Public Prosecutor of the state of Rondônia is currently investigating these impacts in order to measure how Enersus has complied with the indigenous peoples' mitigation plan developed as a condition of the project license."</p>
Response submitted by the PP	<p>In fact four federally delimited indigenous territories (Kaxarari, Igarapé Lage, Igarapé Ribeirão and Uru-Eu-Wau-Wau) are covered by the environmental license process of Jirau HPP and, consequently, in the programs and measures for assistance proposed by ESBR. In any case, it is important to observe that there are no indigenous territories in the project's Direct Influence Area (AID); therefore, Jirau HPP will have no direct impacts on them.</p> <p>Notwithstanding, ESBR is in permanent contact with FUNAI (Fundação Nacional do Índio), which is the authority in charge of protecting the rights of indigenous populations, to assess all actions being taken. The practice in this regard is that decisions of compensatory measures are to be carried out after being defined and ratified by FUNAI and the indigenous groups involved. In this sense, an Agreement was signed on Territorial Protection and Surveillance Plans of Indigenous Territories, including support to FUNAI for the protection and surveillance of these territories. Plans cover the construction and equipment of surveillance points; qualification and subsequent hiring of natives</p>

	<p>for surveillance; donation of equipment and vehicles for services.</p> <p>FUNAI and ESBR are aware of the possibility that isolated individuals might inhabit the region at a distance greater than 40 km from the project, which is now protected by the extended Mapinguari National Park. The extension and consolidation of this Park on the basis of the stringent federal protection and control is a significant measure to create an undisturbed environment and thus increases the level of protection of any possible isolated indigenous individuals in the long term. In addition, on the basis of the of LI No. 621/2009 issued by IBAMA as well as FUNAI's Technical Opinion No. 07/CGMAM/CGPIMA/2009, the implementation of an Emergency Protection and Surveillance Plan for Indigenous Peoples and Territories was defined to implement specific measures and actions in the benefit of possible isolated individuals among, other issues.</p> <p>Such plan defines ESBR as a financing company of interventions that should be performed by FUNAI itself. They include: hiring human resources for FUNAI expeditions to identify isolated Indians; acquiring materials, equipment and vehicles to carry out the expeditions; donating building materials for a support station, and providing maintenance and fuel. These actions are under development as stated in the Plan.</p> <p>A Sustainability Committee composed by local and public authorities, affected populations, development and technical teams of our social and environmental programs, was created to discuss Jirau HPP initiatives in this field. An Indigenous Working Group conducts discussions on the progress of these initiatives. The Working Group includes the main representatives of the indigenous territories and FUNAI and has already organized nine meetings.</p>
Evaluation of the response	<p>The validation team has confirmed:</p> <ol style="list-style-type: none"> <li>from the Environmental Impact Assessment (EIA, 2005), volume B-1 pages I-1 and I-2 and from the Basic Environment Program (PBA) item 4.23.1, that there are no indigenous territories in the project's Direct Influence Area (AID);</li> <li>from the notification and the technical report issued by FUNAI 139, 2009, that FUNAI, in its Technical Opinion No. 07/CGMAM/CGPIMA/2009, requested the implementation of an Emergency Protection and Surveillance Plan for Indigenous Peoples and Territories addressing specific actions referring to isolated individuals among other issues.</li> <li>from the Territorial Security Emergency Plans agreed between the PP and FUNAI (ESBR_FUNAI, 2010), that an Agreement was signed on the establishment of a Territorial Protection and Surveillance Plans of Indigenous Territories, including support to FUNAI for the protection and surveillance of these territories. Plans cover the construction and equipment of surveillance points; qualification and subsequent hiring of natives for surveillance; donation of equipment and vehicles for services.</li> </ol> <p>The realisation of the nine meetings of the Indigenous Working Group has been confirmed from the meeting minutes and attendance lists (GT Indígena 2010-2012)</p> <p>The validation team has interviewed a representative of the indigenous people Uru-Eu-Wau-Wau, who declared that a great threat to the maintenance of his people's culture has come from the conflicts over land occurred due to illegal occupation of land by miners and loggers.</p> <p>No irregular situation regarding the impacts on indigenous people has been</p>

	<p>raised by the Prosecutor of the Public Ministry of the State of Rondônia.</p> <p>Based on the documentation analysed and the interviews carried out, the validation team concludes that the PP is in compliance with the procedures as required by the host Party.</p> <p>The validation team concludes that the issues raised by the comments received have been duly dealt with by the PP as part of the requirements imposed by IBAMA during the process for granting the installation environmental permit. The continuous operation of the Basic Environmental Project, with all its programs, is subject to the control from IBAMA and is a requirement for the maintenance of the operation permit. Furthermore, the project activity will be subject to approval by the Brazilian DNA. The DNA's confirmation of the project's environmental sustainability is a CDM requirement for the project's registration.</p>
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### 1.3. Working conditions and Worker's uprisings

Comments	<p><u>Philip Fearnside, page 2:</u></p> <p>"... workers "hired locally" include migrant laborers who have traveled from other parts of Brazil to the construction site of their own accord before being hired. The social problems caused by massive migration to the construction site and surrounding area would better be described as an impact than as a benefit of the project (e.g., de Almeida, 2009; Instituto Pólis, 2006)."</p> <p>"The conditions at the construction site contrast with the PDD's description of the "eco-friendly district" built by the company at Mutum Paraná for the engineers (p.6). Although labor discontent is a common phenomenon, the uprisings at Jirau stand out among all of the hundreds of construction sites that have been established under the Program for the Acceleration of Growth (PAC), and they have shocked the government."</p> <p><u>Zachary Hurwitz, page 5:</u></p> <p>"The PDD ignores serious social impacts that have occurred throughout the implementation phase of the Jirau HPP. Violations of workers' rights to fair wages and living conditions led to labor unrest beginning in 2011, when 35 sites that serve as living quarters and 45 buses were set on fire. Further incidents have occurred in 2012, including when 30 dam structures were set on fire in protest over poor wages and conditions."</p>
Response submitted by the PP	<p>ESBR and its contractors are observing the applicable legislation and best practices for training, capacitating, contracting and assisting its work force and maintain several programs that promote the education and economic evolution of the region's population. Next to the economic impulse, which is guided to generate local demand and expansion of legally regulated work opportunities, the training and capacitating measures will empower the local and the migrating workforce and therefore society as a whole.</p> <p>In line with this concept, Nova Mutum has been founded as a nucleus for sustainable economic development where resettled people are living together with others that came to establish economic activities that are being incentivized by the Jirau HPP development.</p> <p>In addition, we have to reiterate that all investigations and testimonials demonstrate that the incidents of "criminal arson" were not related to any labor inadequate conditions, but to effectively criminal action by a reduced number of individuals.</p>

Evaluation of the response	<p>The detailed strategy for professional capacity of the local workforce has been confirmed by the validator by assessing the Population Qualification and Opportunity Development Sub-Program, which is part of the Social Compensation Program – Item 27 of the Basic Environmental Project (PBA 27, 2009). The actual progress of the program implementation has been confirmed from the report submitted by the PP to IBAMA, covering the period from June 2009 to February 2012, (ESBR, Final Report IBAMA, 2012), section 4.27 about the Social Compensation Program.</p> <p>The validation team has confirmed, during the visit to the site and to the Nova Mutum Paraná district, the adequate working and living conditions as described by the PP in their response.</p> <p>The arsons' criminal nature has been confirmed to the validation team by the Prosecutor of the Public Ministry of the State of Rondônia, in an interview carried out on 23 May 2012.</p>
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#### 1.4. Contamination by mercury

Comment	<p><u>Philip Fearnside, page 4:</u></p> <p>“Various additional impacts of the dam are unmentioned in the PDD, such as mercury methylation in bays along the river edges (Forsberg &amp; Kemenes, 2006).”</p>
Response submitted by the PP	<p>Mercury exposure due to natural or anthropogenic sources is a general issue in the Amazon region and not an attribute of the Jirau HPP. Thus the question is of the implementation of the project has an impact on this situation and on the exposure of the local population.</p> <p>In this context the Hydro-bio-geochemical Monitoring program has been defined to allow environmental and human bio monitoring in the pre and post impoundment phase. The monitoring program determines concentration of organo-metalics, evaluates the risk of human exposure, as well as potential negative impacts on health of the communities that live along the Madeira river course. The program also includes an information campaign to educate the local population about the general risks and adequate behaviour (ESBR Relatório Final IBAMA, 2012).</p> <p>So far 10 measurement campaigns have been conducted to determine different forms of mercury in soil, water, sediment and biosphere. Results for water are below the reference values for natural sweet water courses defined by Resulution CONAMA no 357/2005, as well as those for drinking water as defined by the Health Ministry (Portaria no 2.914/2011). In addition, levels or organic mercury are below 10% of the total mercury content, which shows that there is no specific concern in the Madeira river course. Likewise, mercury concentrations found in soil are below the precautionary value as defined by Resolution CONAMA nº 420/2009. Likewise the values found in sediment, phytoplankton, invertebrates and fish, as well as the values measured in the local population are fully in line with the normal levels in the Amazon region (Venturo, 2012).</p> <p>In summary the program so far has allowed to establish a sound understanding of the mercury exposure of the region and up to now no specific concerns were identified. In addition, as the Jirau HPP does not materially interfere with the natural behaviour of the watercourse and will only flood areas that are already regularly exposed to natural floods it is not expected that the implementation will change as a consequence of the project and the ongoing studies and water quality and stratification behaviour do not only show that no stratification and anoxic zones exist, but also that their formation after impoundment are not expected due to low depth and high flows (LIFE, 2011). In any case, the</p>

	<p>monitoring program will allow identifying any significant change in relation to the water quality and mercury content when compared to the baseline which is being consolidated on the basis of the ongoing measurements (Venturo, 2012; ESBR Relatório Final IBAMA, 2012; LIFE, 2011)</p>
Evaluation of the response	<p>The validation team has confirmed that:</p> <ul style="list-style-type: none"> <li>- A hydro-bio-geochemical Monitoring program has been defined as being implemented by the PP, which includes the environmental and human bio monitoring in the pre and post impoundment phases, the monitoring of concentration of organo-metalics, the evaluation of the risk of human exposure and of the potential negative impacts on health of the riparian communities. As verified during the site visit, the program also includes an information campaign to educate the local population on the risks related to the exposure to mercury (ESBR, Final Report IBAMA, 2012)</li> <li>- The validation team has confirmed, from the Hydro-Bio-Geochemical Monitoring Program Technical Report, prepared by Venturo (Venturo, 2012), pages 296 and 297, that measurement campaigns have been conducted to determine different forms of mercury in soil, water, sediment and biosphere. According to the study, the results for mercury concentrations in water are below the reference values for natural sweet water courses, as defined by Resultion CONAMA no 357/2005, and the values for drinking water are below the limits defined by the Ordinance number 2.914/2011 of the Ministry of Health.</li> </ul> <p>The validation team has also confirmed that the mercury concentrations found in soil are below the precautionary value defined by Resolution CONAMA nº 420/2009. With respect to the mercury accumulation in the food chain, still according to the study, the values found in sediment, phytoplankton, invertebrates and fish, as well as those measured in the local population, are below the normal levels in the Amazon region.</p> <ul style="list-style-type: none"> <li>- Jirau HPP will only flood areas that are already regularly exposed to natural floods (ANA Resolution 269, 2009 article 5)</li> <li>- Water quality and stratification behavior do not only show that no stratification and anoxic zones exist, but also that their formation after impoundment are not expected due to low depth as referenced by a technical study about water stratification propensity of the Madeira River, page 34 (LIFE, 2011)</li> </ul> <p>The validation team concludes that the issues raised by the comments received have been duly dealt with by the PP as part of the requirements imposed by IBAMA during the process for granting the installation environmental permit. The continuous operation of the Basic Environmental Project, with all its programs, is subject to the control from IBAMA and is a requirement for the maintenance of the operation permit. Furthermore, the project activity will be subject to approval by the Brazilian DNA. The DNA's confirmation of the project's environmental sustainability is a CDM requirement for the project's registration.</p>

#### 1.5. GHG emissions

Comment	<p><u>Philip Fearnside, pages 4 and 5:</u></p> <p>"The PDD classifies the dam as only a "minor emissions source" of methane (p. 13), but makes clear that officially the emissions are zero and that no measurements or monitoring are required (p. 58). No technical studies are cited to substantiate the claim that the dam would only be a "minor" source of</p>
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	<p>methane. The claim rests on the loophole in the CDM's regulations classifying dams by power density, or the ratio of installed capacity to reservoir area. Dams with small reservoirs and large installed capacities are allowed to pretend that they have no emissions. In reality, having a small reservoir reduces, but does not eliminate, emissions from the reservoir surface.</p> <p>The question of whether the water in the reservoir will stratify is important to the potential for emissions. The EIA calculates that the water in the reservoir will not be stratified based on the turnover time and on the Froude density equation that relates stratification to water velocity (FURNAS, CNO &amp; Leme Engenharia, 2005, Tomo B, Vol. VII, p. 3.8). The one-dimensional models used in the EIA have been criticized by Forsberg &amp; Kemenes (2006) as inadequate to model stratification in the irregularly shaped reservoir, and these authors expect stratification along the reservoir's edges.</p> <p>Stratification would occur in the bays and other features where water velocities are much lower than the all-reservoir averages used in the EIA calculations. Stratification with anoxic bottom water has already been found in the flooded mouths of two of the tributaries that enter the new reservoir (B.R. Forsberg, pers. comm., 2012)."</p> <p>"Jirau claims a power density of 18.05W/m<sup>2</sup>, allowing the PDD to conclude that "Therefore, .... project emissions can be neglected" (p. 7). The CDM regulation allows the power density to be calculated not in the normal way as a simple ratio of installed capacity to reservoir area but rather using the "reservoir area increase" as the numerator. This means not counting the natural river bed, which in Amazonian reservoirs is taken to include not only the river channel but also the wide area that is temporarily flooded at the peak of the high-water period. The PDD uses a "reservoir area increase" of 207.74 km<sup>2</sup> (p. 8), rather than the full reservoir area of 361.60 km<sup>2</sup> (p. 9). If the power density were calculated using the full reservoir area and the current configuration of 3750MW the result would be 10.4W/m<sup>2</sup>, or barely above the 10W/m<sup>2</sup> cutoff for making use of the loophole for considering the dam's emissions to be zero."</p>
Response submitted by the PP	<p>A representative literature review for Life Cycle Emissions (LCA - Life Cycle Assessments) of hydro power and other energy sources has been conducted by the IPCC (2011) to assess GHG emissions from reservoir and run-of-river hydro power plants. The study is clear by expressing that "The LCAs evaluated in this assessment only accounted for gross LUC (Land Use Change)-related emissions. Characterizing a reservoir as a net emitter of GHG implies consideration of emissions that would have occurred without the reservoir, which is an area of active research". Now in spite of this limitation, the IPCC has identified hydro power and especially run-of-river plants to have the lowest GHG emissions of all commercially available electricity generation sources, including wind and solar. Graph 9.8 of the publication is replicated below in Figure 1. The comparison is also interesting because it shows the increased advantage of hydro power from the perspective of Life Cycle Assessments where the emission intensities of Gas, Coal and Fuel oil generated electricity are significantly higher than the emission factors which are used to calculate the emission reductions which are calculated and certified on the basis of UNFCCC methodologies. Though this is an obvious fact due to the large direct (coal mine gas, flaring and venting of natural gas and associated gas) and indirect emissions (production, transport, refinery) related to the production of fossil fuels, this issue (and therefore this benefit of renewable energies) gains only reduced attention while the discussions around GHG emissions from hydro power plants is emphasized without taking the recent scientific progress</p>

adequately into account.

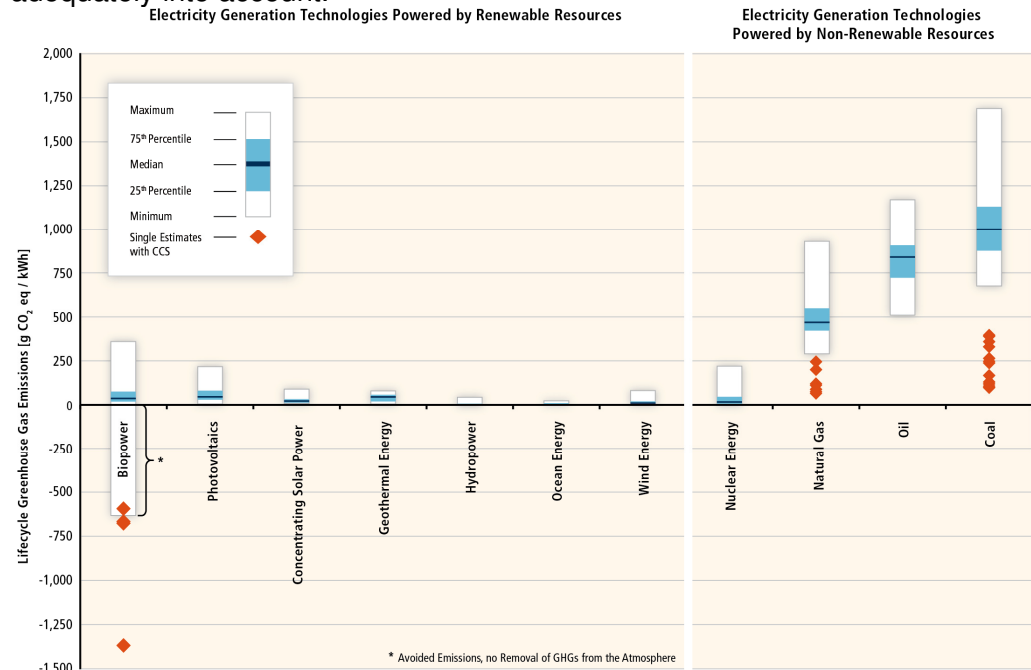


Figure 1: IPCC (2011) comparison of Life Cycle GHG emissions of different energy generation technologies

Recent scientific studies have defined sound rules and principles for the assessment and discussion of GHG emissions from reservoirs and show that a general conclusion that hydro power is a net source of GHG emissions cannot be drawn. To the contrary, a literature review conducted by the IPCC shows that run-of-river hydro power plants such as Jirau offer the lowest Life Cycle Emissions off all commercially available energy technologies.

With regards to Fernside's request that Power Density should be calculated with the full reservoir surface, the PDD has been adjusted accordingly and accurately follows this strict interpretation of the CDM rules. Further discussion of their applicability does not apply in the context of the PDD.

Evaluation of the response

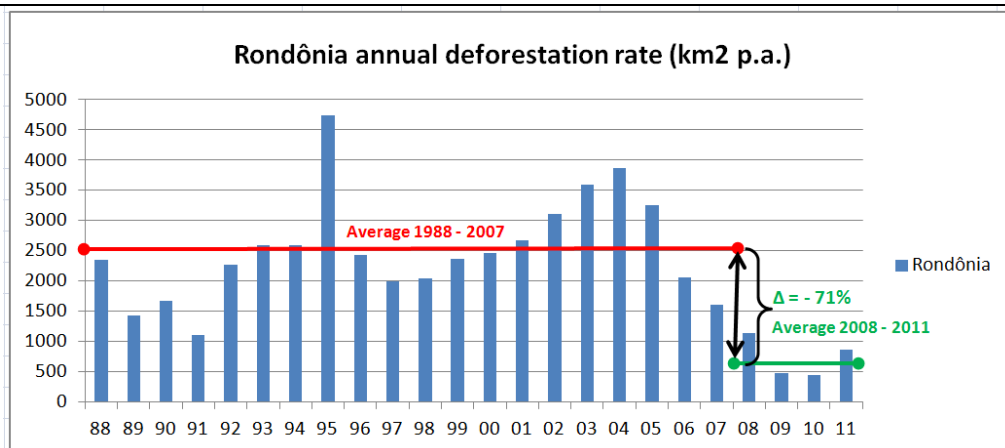
The validation team has confirmed that, according to a literature review conducted by the IPCC (2011), i.e. the *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*, prepared by Working Group III (available at: <http://srren.ipcc-wg3.de/report>), that run-of-river hydro power plants have very low lifecycle land use (chapter 9, page 744) and that hydro power has one of the lowest lifecycle GHG emissions between all the electricity generation technologies powered by renewable resources (chapter 9, figure 9.8, page 732).

The estimation of the project's emission and, consequently, the calculation of the reservoir's power density, have been validated by the DOE based on the current version of the methodology. The PP has corrected, from the CAR03 raised by the validation team, the reservoir's power density considered in the PDD. The PDD version 2 considers the area of the surface of the water before the project activity (ABL) as zero, as required by the applicable methodology ACM0002. The reservoir's power density presented in the PDD version 2 is 10.4 W/m<sup>2</sup>.

Further discussions on the CDM rules for the consideration of project emissions are outside the scope of this validation.

#### 1.6. Deforestation in the project's vicinity

<p>Comment</p>	<p><u>Philip Fearnside, page 4:</u></p> <p>"One unmentioned impact with relevance to greenhouse-gas emissions is the dam's providing a link in a series of planned industrial waterways that would promote the advance of soybeans into rainforest areas in Brazil and especially in Bolivia, thus causing emissions and other impacts from deforestation (Kileen, 2007; Molina Carpio, 2005; Vera-Diaz et al., 2007). In addition to future deforestation expected upstream for soy in areas to be served by the waterways, current deforestation rates have skyrocketed in the immediate vicinity of Jirau and the adjacent Santo Antônio Dam: this area was the number one hotspot of deforestation in Amazonia in December 2010 (Angelo &amp; Magalhães, 2011; Hayashi et al., 2011)."</p> <p><u>Zachary Hurwitz, page 5:</u></p> <p>"Deforestation and reduction of conservation areas. The PDD ignores official data on the increased incidence of deforestation associated with the Jirau HPP. The Brazilian Instituto Nacional de Pesquisa Espacial (INPE) attributed a doubling in the rate of deforestation in the state of Rondônia during 2010-2011 to the construction and implementation of the Jirau HPP and Santo Antônio HPP further downstream. The deforestation is explained both by direct intervention in forested areas by the project proponent as well as by an increase in forest asset extraction as a result of labor market migration induced by the HPP. In addition, in 2009, 140,000 hectares of the "Reserva Estadual do Rio Vermelho" protected area were reduced in order to accommodate the Jirau HPP. To offset the reduction, 140,00 hectares were added to the existing "Reserva Federal do Rio Pardo." Yet only 70,000 hectares of the offset area consisted of forested land, while the remaining 70,000 hectares consisted of land for agricultural production occupied by 5,000 families. The resulting effect was a net loss of 70,000 hectares of forested areas attributable to the Jirau HPP."</p>
<p>Response submitted by the PP</p>	<p>To understand and assess the criticisms raised by Fearnside and IR it is important to consider that the key motors of deforestation in the Amazon region are poverty, lack of employment opportunities and the non-enforcement of environmental laws, all of which lead to illegal logging and deforestation mainly for cattle raising activities. The state of Rondônia has traditionally been a hotspot for these activities and for decades has presented one of the highest deforestation rates in the country. According to the results of the Program of Deforestation Assessment in Brazilian Legal Amazonia of the National Institute of Space Research (INPE) historically monitored data signals that deforestation in Rondônia state was definitely higher between the 1980s and the beginning of 2000. The Figure 2 below shows annual deforestation rates between 1988 and 2011.</p>



**Figure 2: Evolution of deforested area in Rondônia State 1988-2011**

As it can be seen, in 1995 deforestation in Rondônia State achieved its highest and most impressive deforestation point - of approximately 4,700 km<sup>2</sup> – at a time lacking effective governmental monitoring, supervision and control of deforestation and illegal mining and extracting activities. However, deforestation in Rondônia decreased significantly after 2007 and reached an average deforestation rate below 730 km<sup>2</sup> between 2008 and 2011, a reduction of more than 71% compared to the average deforestation rate in the period 1988-2007

Therefore, Jirau HPP is part of a broader context which aims to reduce deforestation and promote clean and sustainable development growth in the country. In fact, it is expected that Jirau HPP CDM project will contribute to the sustainable development in the country as it will replicate what has been observed in other hydro power plants in the country: Human Development Index (HDI) is higher in the surrounding areas of hydro power plants in many regions and environmental protection is more effective, which is confirmed by social-environmental programs and investments promoted by the Brazilian Government.

In relation to the question about direct forest interference it is important to explain that some suppression of vegetation in the area of the future reservoir were defined by the Environmental Impact Assessment and the Basic Environmental Plan to minimize adverse impacts of degrading biomass on the water quality of the reservoir, also to ensure suitability for multiple usage.

The activities are being implemented following the requirements and conditions of the Authorization for Suppression of Vegetation (ASV) nº 447/2010 and nº 530/2011 as issued by IBAMA, following the stages and process defined by the Reservoir vegetation suppression program.

The company Intertechne Consultores S.A. was contacted by ESBR to plan, manage and control these activities to guarantee that they are realized in line with best practices to protect environment, health and safety.

On the allegation that ship gates will impulse soybean agriculture in the region and lead to increased deforestation and they should be considered project leakage, Jirau HPP would like to clarify that in case ship gates are constructed in the future, they would represent a totally new project to be evaluated, approved, licensed and implemented according to regulations of the Transport Ministry and the National Waterway Transportation Agency (ANTAq); Jirau HPP has no influence or responsibility on the hypothetical possibility of ship gates being constructed on the Madeira river; Jirau HPP cannot be held responsible or

	<p>have project leakage attributed to events outside the scope of the project. Therefore, definitely such claim does not apply to Jirau HPP CDM project.</p> <p>Regarding the allegation that Jirau HPP has caused a net loss of 70,000 hectares of forested areas we wish to clarify the situation as it illustrates well how the implementation of the Jirau HPP catalyzes and supports activities for environment protection and improvement of the social circumstances. In fact, the “reduction of the State reserve of Rio Vermelho” is related to the expansion of the Mapinguari National Park, which resulted in gross increase of protected area by 73,927 ha. In addition, the creation of the Environmental Protection Area (APA) of 70,000 ha and the Conservation Unit of 130.000 ha Flona Bom Futuro is not related to any reduction of other protected areas, but represents an improvement of the previous unregulated and unprotected situation. Following some details:</p> <p>The Brazilian Environmental Ministry (MMA), the Institute Chico Mendes for Conservation of Biodiversity and the government of Rondônia devised a way to preserve the National Forest Bom Futuro (Flona). An area of 70,000 hectares (about 25% of Flona) occupied by 5,000 families will be converted into an Environmental Protection Area (APA), with a sustainable management plan and exploration projects (MMA, 2009). This measure legalizes the previously unregulated occupation, which also had led to illegal deforestation, and integrates the now legal inhabitants in sustainable economic and forest protection activities. Another well preserved area of the same size in Flona will be converted in state forest (FES), an official environmental reserve. Other 130,000 hectares of the Flona Bom Futuro will be decreed Conservation Units (UC) with strict preservation measures. In conclusion, this measure improved the social situation of 5,000 previously illegal inhabitants, established a new APP and Conservation Units without any offsetting.</p> <p>Another project covered by the agreement between The Brazilian Environmental Ministry (MMA), the Institute Chico Mendes for Conservation of Biodiversity and the government of Rondônia led to the inclusion of 172,430 hectares to federal Mapinguari National Park. This area is located along the left bank of Madeira River and borders Jirau HPP’s area of influence. 98,503 ha of this increase stem from the conversion of the previously state owned parks Sustainable Forest Rio Madeira A, Rio Vermelho A, Rio Vermelho B and the Ecological Station of Mujica Nava and Serra dos Três Irmãos. In addition to this “conversion” another 73,927 ha of previously unprotected areas were added to the Federal Mapinguari Park. In conclusion on Jirau’s left margin, i) the total protected are increased by 73,927 ha, ii) previously state owned parks were integrated to the federal park and iii) an increased and well protected Mapinguari National Park will spread from the margin of the Jirau HPP reservoir over the border into the state of Amazonia, which represents an improvement in the quality of the protection of the area.</p>
Evaluation of the response	<p>The deforestation data presented by the PP, from the Program of Deforestation Assessment in Brazilian Legal Amazonia of the National Institute of Space Research (INPE), has been confirmed by the validation team from the webpage <a href="http://www.obt.inpe.br/prodes/prodes_1988_2011.htm">http://www.obt.inpe.br/prodes/prodes_1988_2011.htm</a>.</p> <p>Regarding the PP’s statement that “Human Development Index (HDI) is higher in the surrounding areas of hydro power plants in many regions and environmental protection is more effective”, the validation team has confirmed from the review of the official National Energy Plan 2030 page 15 produced by EPE, the national energy research company (available at</p>

[http://www.epe.gov.br/PNE/20080512\\_3.pdf](http://www.epe.gov.br/PNE/20080512_3.pdf)) that, according to this official body, “Many areas in the vicinity of several reservoirs already installed in the country today are, in many cases, among the best preserved, including with respect to biodiversity. Rescue programs of flora and fauna (and also of archaeological sites), developed during the implementation of the dam are, in many cases, ensuring conservation of key elements of the biome reached. In the socio-economic aspect, the effect of recent projects is emblematic, around which the urban centers have human development indices generally higher than those of the region in which they operate”.

The authorisations received by the PP for the suppression of vegetation have been confirmed (please refer to the files ASV 447 and ASV 530 (IBAMA 2010/2011)).

The validation team has confirmed that the Reservoir Vegetation Clearing Program, item 4.14 of the Basic Environmental Project – PBA 14, 2009, is part of the requirements imposed by IBAMA during the process for granting the installation environmental permit and for the maintenance of the environmental operation permit. The PP must semiannually submit to IBAMA a detailed report on the progress of the program. The validation team has reviewed the report produced by the company Intertechne Consultores S.A., covering the activities over the period from June 2009 to February 2012 (ESBR Relatório Final IBAMA, 2012).

Furthermore, the project activity will be subject to approval by the Brazilian DNA. The DNA’s confirmation of the project’s environmental sustainability is a CDM requirement for the project’s registration.

In addition, with regards to the implementation of conservation units, the validation team has not found any evidence that, as stated in the comment received by the PP, “140,000 hectares of the “Reserva Estadual do Rio Vermelho” protected area were reduced in order to accommodate the Jirau HPP”. As stated in the item 4.19.2 of the Basic Environmental Project – (PBA 19, 2009), “The environmental offset is a financial compensation for impacts not mitigable due to the establishment and operation of the project, as identified during the environmental licensing process” and “It is also established that it is up to the licensing authority to define the conservation areas to be benefited, considering the proposals presented in the EIA”.

Therefore, the installation of the environmental conservation unit (UC) has no relation with deforestation due to the project. The project activity was presented by the Minister of Environment as an additional supporting factor for the UC. It has been confirmed, from the official webpage of the Brazilian Ministry of the Environment, <http://www.mma.gov.br/informma/item/5502-acordo-garante-permanencia-definitiva-de-5-mil-familias-em-bom-futuro> , that

- An area of 70,000 hectares, occupied by 5,000 families, will be converted into an Environmental Protection Area (APA), with a sustainable management plan
- Another preserved area within the National Forest (Flona), with 70,000 ha, will become State Forest, serving as legal reserve. The other 130,000 hectares of Bom Futuro unit will be transformed into strictly protected areas. It was also agreed that the state government will donate an area of 180,000 hectares, well preserved, to create a National Park.
- As stated in the webpage, “The area is near the Rio Madeira, where the Jirau hydro power plant will be installed, which should receive the environmental permit this week. For Minc (the Minister of Environment), the

	<p>location is good and will help implement the conservation unit. The conservation unit (CU) will receive cash for environmental compensation, which means the UC will be easier to implement, with the construction of the headquarters, research center, demarcation and regularization, he explained."</p> <p>The donation, by the state government, of an area of 180,000 hectares, as stated in the webpage of the Brazilian Ministry of Environment mentioned above, ended up to be in fact 172,430 ha. The PP's statement regarding the enlargement of 172,430 ha of the Conservation Unit PARNA Mapinguari has been confirmed from the federal law 12678/2012, article 8: "There were redefined the boundaries of the National Park Mapinguari, created by decree on June 5, 2008, currently located in the state of Amazonas, in the municipalities of Canutama and Lábrea, which now includes within its limits the area of about 172,430 ha described in accordance with the arts. 116 and 117, located in the city of Porto Velho, Rondônia State."</p> <p>The validation team agrees that any future industrial waterways mentioned in the comment would be completely new projects and should not be considered as project leakage. The validated project's leakage is zero, following the current approved methodology ACM0002.</p>
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#### 1.7. Technical correctness and integrity of the licensing process

Comment	<p><u>Philip Fearnside, pages 1 and 2:</u></p> <p>"...criticism from civil society of the EPE plans, and of the Madeira River dams in particular, based on their socio-economic and environmental impacts (see for example: Amigos da Terra-Amazônia Brasileira &amp; International Rivers Network, 2006;Monteiro, 2011, 2012; Ortiz et al., 2007; Switkes, 2008) . A 2010 letter to the president of GDF Suez from 16 environmental groups (Amigos da Terra-Amazônia Brasileira et al., 2010) describes multiple deficiencies in dealing with environmental and social impacts at Jirau. These problems led to GDF Suez being elected a 2010 finalist for the "public eye award" that is given annually to the world's most irresponsible company (<a href="http://www.publiceye.ch/en/">http://www.publiceye.ch/en/</a>)."</p> <p>"As the Folha de São Paulo described it, the licensing process was a "collection of errors" (Angelo, 2011). Jirau's environmental impact study (EIA) was done jointly with the neighboring Santo Antônio Dam (FURNAS, CNO &amp; Leme Engenharia, 2005). The preliminary license was only granted after a sudden replacement of the head of the licensing department of the federal environment agency (IBAMA) and later the same person was promoted to head the agency as a whole just before approving the installation license, again overriding the agency's technical staff (see International Rivers, 2012 for names and dates). The demoralization of Brazil's environmental licensing system may prove to be one of the greatest impacts of the Madeira River dams."</p> <p><u>Jorge Molina, page 3:</u></p> <p>"... despite the conclusions and recommendations of the IBAMA technical report No. 014/2007, the preliminary license was issued within a few months. During the process of licensing of Jirau and Santo Antonio projects the head of IBAMA, several technicians and even the Minister of Environment of the Brazil resigned or were removed.</p> <p>In general, the process of approval of the environmental licenses for Jirau showed the political interest by the Brazilian Government to deliberately ignore the transboundary impacts of Jirau and Santo Antonio, and to take advantage of</p>
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obvious asymmetries between Brazil, Bolivia and Peru to handle the licensing process.

Zachary Hurwitz, page 6:

“As demonstrated by numerous lawsuits filed by the Federal Public Prosecutor’s office and reports published by civil society organizations, the planning, licensing and construction of the Jirau project have been marred by repeated violations of Brazilian legislation and international agreements.

Mandatory analysis and dialogue with neighboring countries regarding transboundary impacts on Bolivia and Peru have been systematically denied by the Brazilian government. In Brazil, a host of lawsuits have been filed on this general issue and specific violations of legislation regarding impacts on migratory fish and implications for the livelihoods of local populations, reservoir sedimentation and flooding in Bolivia. Lawsuits have also been filed regarding isolated indigenous peoples and violations of workers’ rights.

The Brazilian DHESC filed a report detailing violations of human rights protected by national and international law during the planning and implementation of the Jirau HPP, including the following violations:

- Exclusion of transboundary impacts in the upstream Madeira basin from the EIA;
- Violation of the principle of self-determination of populations in neighboring countries, which caused a diplomatic row between the governments of Brazil and Bolivia, leading the government of Bolivia to reject the Jirau HPP in 2007 based on the risk of transboundary impacts;
- Unsatisfactory evidence of undertaking needs and options assessments;
- Violation of democratic principles including the right to information and participation;
- Violation of indigenous peoples’ rights, the right to a healthy environment, and the commitment to biodiversity protection;
- Violation of the right to access to water and sanitation, including increased malaria risk and lack of water quality studies;
- Violation of the right to safe working conditions, access to property, and adequate housing; and
- Violation of the right to cultural property, especially historical architectural patrimony.”

The report’s allegations have been substantiated by a number of lawsuits awaiting trial in Brazilian courts. A 2008 lawsuit filed by Amigos da Terra Amazônia-Brasileira and Kanindé argued that the Jirau HPP would cause impacts on indigenous peoples in voluntary isolation found northwest of the projected reservoir, in Amazonas state. Subsequent lawsuits were filed in 2009 by the same plaintiffs against ANEEL, IBAMA, and the federal government alleging the illegality of the project licenses of the Jirau HPP due to severe errors and gaps in the project EIA. Further, a lawsuit has been filed by the Public Prosecutor of the state of Rondônia over the federal government’s violation of CONAMA resolution 01/76, which mandates the inclusion of transboundary basin-level impacts in project EIAs.”

Observation from the validation team: the comment from Hurwitz cites, in the footnote 12, a report prepared by DHESCA, ““Violações de direitos humanos ambientais no complexo madeira, ([http://www.dhescbrasil.org.br/attachments/449\\_2011\\_madeira\\_%20missao%20seguimento\\_revisao3.pdf](http://www.dhescbrasil.org.br/attachments/449_2011_madeira_%20missao%20seguimento_revisao3.pdf)). The validation team was not able to open the weblink in the footnote 11, under the name “Rondônia Vivo”.

Response submitted by the PP	<p>Before entering into a detailed response to the issues raised, it is important to reiterate that Brazil is a pluralistic society with division of powers and judicial independence and where free expression of opinion is a fundamental right.</p> <p>The regulatory bodies that are responsible for the regulation of the energy sector (ANEEL), of water use rights (ANA), environmental licensing (IBAMA), as well as the agency that represents the interests of the indigenous peoples (FUNAI) are independent governmental institutions that operate according to their missions and the country's legislation. Furthermore any citizen is free to be a plaintiff before an independent judiciary, as stated in the Brazilian Constitution<sup>1</sup>. Such a process is positive and healthy in maintaining the checks and balances and a certain understanding of the Brazilian regulation is required to derive a reasonable judgment of these processes. Furthermore, as in any jurisdiction based on the rule of law, only definitive judgments and rulings can be taken as solid evidence or reference for misconduct or regulatory failures.</p> <p>The licensing process of the Jirau hydro power plant was and is in full compliance with the Brazilian legislation and all conditions and requirements have and are being fulfilled to full satisfaction of the authorities. Any infliction or not observation of the legal requirements would lead to sanctions by the regulator and up to date all requirements have been met. No preliminary or final verdict exists which could indicate that ESBR has at any stage inflicted the Brazilian legislation. In addition to that, the Jirau HPP CDM project will be presented to the Brazilian Designated Authority, and demonstration of "compliance of the project activity with the environmental and labor legislation in effect", (MCT, Resolution N°1, 2003) and demonstration of the project activity's contribution to sustainable development according to the priorities set forth by Resolution N° 7, and as described for local publics stakeholder consultation (ESBR, Annex III, 2012) which was conducted according to the rules of the DNA (MCT, Resolution N° 7, 2008) in the period from 28 March 2012 to 12 April 2012 is a precondition for host country approval.</p>
Evaluation of the response	<p>The validation team has confirmed (please refer to Appendix F section 10 of this report) that the legal environmental licensing requirements have been followed. The team also considers that the lawsuits awaiting trial cannot constitute evidence of culpability until the cases have been tried in final. Some comments received raise suspicions about the integrity of the process, but present no objective evidence to support the charges. The Prosecutor of the Public Ministry of the State of Rondônia has been interviewed by the validation team, and no reference to the violation of any CONAMA's resolution or other environmental requirement has been made.</p> <p>The issues raised in the report prepared by DHESCA have been reviewed by the validation team:</p> <ol style="list-style-type: none"> <li><u>Exclusion of transboundary impacts in the upstream Madeira basin from the EIA: this issue has been addressed in the response to comment 1.1.1 above.</u></li> <li><u>Violation of the principle of self-determination of populations in neighboring countries, which caused a diplomatic row between the governments of Brazil</u></li> </ol>

<sup>1</sup> Chapter 1, article 5, LXXIII - any citizen is a legitimate party to file a people's legal action with a view to nullifying an act injurious to the public property or to the property of an entity in which the State participates, to the administrative morality, to the environment and to the historic and cultural heritage, and the author shall, save in the case of proven bad faith, be exempt from judicial costs and from the burden of defeat.

	<p><u>and Bolivia</u>: this issue has been addressed in the response to comment 1.1.1 above.</p> <p>c. <u>Unsatisfactory evidence of undertaking assessments of the needs and options of the vulnerable social groups</u>: the validation team has confirmed that a comprehensive and thorough assessment, consultation and mitigation process was and has been conducted by the PP, as required by IBAMA for the issuance and maintenance of the environmental licenses.</p> <p>d. <u>Violation of democratic principles including the right to information and participation</u>: The validation team has confirmed, through the desk review and the site visit, that a comprehensive information and consultation process has been carried out as required by IBAMA during the environmental licensing process.</p> <p>e. <u>Violation of indigenous peoples' rights, the right to a healthy environment, and the commitment to biodiversity protection</u>: this issue has been addressed in the response to comment 1.2 above.</p> <p>f. <u>Violation of the right to access to water and sanitation, including increased malaria risk and lack of water quality studies</u>: this issue has been addressed in the response to comment 1.1.3 above</p> <p>g. <u>Violation of the right to safe working conditions, access to property, and adequate housing</u>: this issue has been addressed in the response to comment 1.3 above</p> <p>h. <u>Violation of the right to cultural property, especially historical architectural patrimony</u>: the report refers to a public civil action which was opened in order to defend the Railroad Madeira-Mamore, protected by the Institute of National Historical and Artistic Heritage, in the face of the prospecting works in Santo Antônio and Jirau. The lawsuit is in progress. The first judicial decision was for the dismissal of the case.</p>
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## 2. ADDITIONALITY

### 2.1. CDM additionality rules

Comment	<p><u>Philip Fearnside, pages 5 and 8</u>:</p> <p>" Establishing additionality requires a hypothetical baseline scenario representing what would have happened without the mitigation project, and demonstrating that the project (in this case construction of the dam) would not have taken place without CDM funding. The simple fact that the Jirau dam is already under construction is solid evidence that it is not additional. However, CDM regulations allow projects to calculate an internal rate of return (IRR) and compare it to a "benchmark" IRR value in order to establish that CDM funds are needed to make the dam profitable."</p> <p>"I repeat: the dam is under construction. This is the physical manifestation of the basic fact that the dam would be built anyway and is not "additional". The arguments over IRRs to justify the opposite conclusion are a mere smokescreen, whether or not these arguments are judged to conform to CDM rules. The CDM rules themselves are in urgent need of reform."</p>
Response submitted by the PP	<p>Fearnside's argument that the project implementation would not stop if no CERs would be awarded is a major concern as it illustrates one of the key risks that hamper hydro power plant developments: Once the large implementation costs have been disbursed hydro power plants offer their benefits such as electricity and emission reductions for a relatively low operational cost, but if this is taken as an argument not to remunerate the investment made this would be a very negative signal for future hydro</p>

	power developments. In the case of the Jirau HPP the situation is even more critical as part of the loan financing is related to CER income and thus part of the project financing would be in jeopardy. Consideration of CDM revenues in all stages of project development and financing and financial additionality has been demonstrated in the PDD.
Evaluation of the response	The validation of the project's additionality has been fully carried out in accordance with the CDM's current approved tool for the demonstration and assessment of additionality.

## 2.2. Public funding

Comment	Philip Fearnside, page 6: " One of the questions to be answered by the PDD concerns public funding, which would reduce the cost and investor risk in the project. Under the item "Public funding of project activity" the PDD says simply "There is no public funding from Annex I parties available for the project". However, the question this answers is not restricted to Annex I parties (countries with emissions caps under the Kyoto Protocol). The question regarding public funding is asked because the CDM "additionality tool" requires reporting as revenue "subsidies/fiscal incentives, ODA [overseas development assistance], etc., when applicable" (p. 36). The response in the PDD fails to mention the massive subsidy in public funding that Jirau receives from a non-Annex I party, namely Brazil. Counting these subsidies as revenue would be likely to make the project fall into the "financially attractive" category, making it ineligible for CDM funding."
Response submitted by the PP	In relation to Fearnside accusation that the "The PDD fails to mention the massive subsidy in public funding that Jirau receives from a non- Annex I party, namely Brazil" we believe that there is a misinterpretation of the CDM rules. In fact Fearnside correctly identified the investment incentives offered by the BNDES on the basis of the PDD that was presented for GSC, but he seems to understand that it would be necessary to include this in section A.5. and Appendix 2 of the PDD. Now according to Annex 8, EB 66 (2012), the requirement is to "Indicate whether the project activity receives public funding from Parties included in Annex I". As Brazil is not an Annex I party the PPs understand that it would be wrong to make reference to the fact that Brazil is financing the project activity. In any case this fact has been adequately highlighted in other sections of the PDD.
Evaluation of the response	All subsidies received by the project have been disclosed by the PP and considered by the validation team in this report, the section 7.c "Investment analysis". All these subsidies have their origin in Brazil and, as such, are not public funding from any Annex I party.

## 2.3. Benchmark

Comment	<u>Philip Fearnside, page 6</u> " The Jirau CDM project uses a benchmark IRR of 15.67% (p. 35), while the CDM projects for the Teles Pires and Santo Antônio Dams, which were prepared by a different consulting firm, used 10.35% as the benchmark, this being calculated by applying the Weighted Average Cost of Capital (WACC) for the power generation sector in Brazil in 2007 (Ecopart, 2011; Santo Antônio Energia S.A., 2012). The 15.67% benchmark for Jirau is calculated in the PDD based on various correction factors (p. 35). The principal justification given for this benchmark is not the rationale behind the long list
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	<p>of corrections applied but rather citation of confirmation from an almost identical value in a report by the World Bank (2008) that refers to Brazil's National Agency for Electrical Energy (ANEEL) as having said [without referencing any document] that "investors are prepared to invest in electricity generation only when rates of return are approximately 15%" (p. 34). This figure is repeatedly referred to as a World Bank estimate, and the "prestige and experience" of the Bank are extolled to bolster its credibility (p. 34). Nevertheless, the origin of the number is an unreferenced statement by someone from ANEEL.</p> <p>While an IRR of 9.7%/year was calculated for the case without CDMcredit, the case with credit would raise the return to 16.7%/year (p. 53). The difference would represent a huge windfall profit for GDF Suez and could hardly be considered a wise use of mitigation funds."</p> <p><u>Zachary Hurwitz, page 3</u></p> <p>"The PP's use of a CAPM model for calculating the project's equity IRR is obscure. In general, the CAPM model does not accurately represent the actual hurdle rate of investors. The dates and indexes used to calculate risk premium and the parameters used to calculate the beta can substantially alter the outcome of the model and are an arbitrary choice. The CAPM model's result of 15.7% does not represent a benchmark derived from any analysis of equity IRR for the hydropower sector in general in Brazil. Indeed, both the Santo Antônio and Teles Pires dams, two projects similar to the Jirau HPP that have recently submitted PDDs to the CDM, use a benchmark equity IRR of 10.35%, lower than the cited 15.67%.</p> <p>In fact, construction of the Jirau HPP began in 2009 based on an equity IRR estimate of 12%, promoted to Enersus shareholders in 2008, <a href="http://insurancenewsnet.com/article.aspx?id=113474#.UC2Hxt1IQlo">http://insurancenewsnet.com/article.aspx?id=113474#.UC2Hxt1IQlo</a> and <a href="http://www.pfie.com/americas-brazil-%C3%B1-jirau-consortium-sees-12-return/404391.article">http://www.pfie.com/americas-brazil-%C3%B1-jirau-consortium-sees-12-return/404391.article</a>. This differs substantially from the Project Proponent's assertion that the original IRR was 6.8%, and subsequently 7.5% for the optimized project. Indeed, Enersus decided to optimize the project design after the IRR of 12% had already been promoted publicly. One would assume that the decision to optimize the project was based on an expectation that the Jirau HPP's equity IRR could be even higher. In hindsight, the publicized 12% IRR is closer to the Project Proponent's calculation of IRR with E-policy and BNDES support at 9.7% in the PDD. Clearly, the Project Proponent's decision to utilize a 15.7% benchmark has no clear present in comparison with the earlier estimate of 12% that actually served as the basis for construction. We would prefer that the financial benchmark that has been used by BNDES to assess the investment be made publicly available."</p>
Response submitted by the PP	<p>First we would wish to clarify that the benchmark used in the Jirau HPP PDD as calculated with the Capital Asset Pricing Model (CAPM) represents the cost of equity (Ke) in real terms as calculated for the project starting date. Investment Analysis and benchmark have been defined in line with the "Tool for the demonstration and assessment of additionality", here referred to as the Additionality Tool (Annex 21, EB65, 2011) and the "Guidelines on the assessment of investment analysis" here referred to as the IA Guidelines (Annex 5, EB62, 2011).</p> <p>Therefore the benchmark calculated for the Jirau HPP is not comparable with the Weighted Average Cost of Capital (WACC) used by the Teles Pires Hydro power Plant Project Activity or the Santo Antonio Hydro power Project. The WACC used in the PDDs of the cited projects is an adequate</p>

benchmark to judge the return from the perspective of a project as a whole, while the Cost of Equity (Ke) is adequate to judge the return as calculated for the shareholder capital, i.e. the return on the share of project financed by equity and after full consideration of the debt financing, amortisation and interest payments. According to Guidance 12 of the IA Guidelines, both strategies are accepted, but it is important to compare like for like to avoid wrong conclusions.

Now as the WACC is calculated on the basis of the Cost of Equity (Ke) and the Cost of Debt, it is possible to compare the Ke value calculated for the Jirau HPP with that used by the other project activities. As referenced by page 14 of the PDD for Santo Antonio, a Ke of 17.31% in real terms has been calculated. As the project starting date of the Santo Antonio project activity is about a year before the Jirau project activity, values are not directly comparable, but the benchmark was calculated to be in the same range.

Now in the case of the Teles Pires project activity, page 15 of the PDD indicates that the cost of equity was calculated to be 12.46% in real terms. Again this is not directly comparable as the project starting date of the Teles Pires project is in August 2011, more than three years after the project starting date of the Jirau CDM project activity.

The calculation of the benchmark is based on parameters that are standard in the market and does not consider subjective profit expectations of any particular investor, as required by Guidance 13. This is further regulated by Guidance 15, which allows defining the cost of equity on the basis of simple default values offered by the IA Guidelines (and which will be discussed below), "or by calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors". This option was chosen by the PP and after due validation by the DOE a Standard Benchmark for Baseline Conditions of 12.46% has been determined as applicable additionality criteria for judging the Project's additionality in a scenario without the incentives such as increased leverage offered by the BNDES. In addition to that the Project Specific Benchmark, which considers the increased leverage of 70% offered by the BNDES was corrected to be 16,05%, but this benchmark is not used as additionality criteria under the baseline conditions, but just to demonstrate the importance of the CDM revenues to meet the project specific cost of equity under the promotional conditions offered by the Brazilian development Bank. after corrections required by the DOE were implemented.

Now when it comes to the question in relation to the investor pronouncement of GDFSUEZ on 30 May 2008, where a 12% return was cited as projected return from the investment, depending on the final Capex estimate, anticipation of the construction timeline and other variables. To understand this figure it is important to consider that this is not an investment benchmark, but the probable outcome as calculated on the basis of scenario analysis, which represents a more advanced technique of investment analysis where values and assumptions are varied around certain estimates. Given the uncertainty of many of the variables that define the Base Case as defined in the project PDD, especially considering that they were estimated according to their most ambitious value (maximum revenues and minimum

	<p>cost estimates), which is conservative in terms of the CDM, the results obtained by this benchmark analysis represent the most positive outcome if all assumptions are fulfilled.</p> <p>On the other hand, the 12% figure mentioned should hold if, for example, plant commissioning is delayed, Capex is increased or CER prices are lower than estimated. <u>Such a scenario analysis is not foreseen under the CDM rules, which require that investment analysis shall be developed on the basis of assumptions which are conservative in the terms of the CDM, i.e. maximize the investment return.</u> Furthermore, the Additionality Tool explicitly requires that <i>“the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer.”</i></p> <p>We have clarified that this is not a benchmark for investment decision, but the result of a scenario projection where different assumptions in relation to anticipation, lower CER prices and higher investment costs are taken into account. Such a scenario analysis is not foreseen and allowed under the CDM, but it is a PP internal measure to project the expected outcome of an investment in more conservative scenarios which are adequate to communicate to investors.</p> <p>In spite of these considerations which show that the approach taken in the Jirau HPP PDD as published for GSC, apart from some corrections that were necessary on the basis of the DOEs findings, were correct according to the rules of the CDM we would like to demonstrate that, even if considering the default benchmark as defined by the IA Guidelines, the project requires CDM revenues to be financially feasible. The respective amendments have been made in the PDD and clearly show that, without CERs, neither the Standard Benchmark of 12,46%, nor the default benchmark of 11.75% is reached. This is not only true for the Base Case and the Optimized Project under baseline conditions, but also if the full investment incentive is considered for both perspectives. In fact even if the Optimized Project is evaluated on the basis of full consideration of all investment incentives offered by the Brazilian Development Bank, without CERs the equity IRR reaches only 10.9% and therefore does neither meet the Standard, nor the Default benchmark and much less the Project Specific Benchmark as applicable for the project specific financing conditions with a 70% financial leverage..</p>
Evaluation of the response	<p>The validator confirms that the following statements in the PP’s response are sound:</p> <ul style="list-style-type: none"> <li>- The project’s Investment Analysis and benchmark are in accordance with the “Tool for the demonstration and assessment of additionality”, (Annex 21, EB65, 2011) and the “Guidelines on the assessment of investment analysis” (Annex 5, EB62).</li> <li>- The Weighted Average Cost of Capital (WACC) was adopted by the Teles Pires Hydro power Plant Project Activity (<a href="http://cdm.unfccc.int/Projects/Validation/DB/0LAWB1YZURTG26K2GL72WDDP2VOALS/view.html">http://cdm.unfccc.int/Projects/Validation/DB/0LAWB1YZURTG26K2GL72WDDP2VOALS/view.html</a>) and the Santo Antonio Hydro power Project (<a href="http://cdm.unfccc.int/Projects/Validation/DB/S253ZCTBJU9LJ3VF72CS1J8SHY02PP/view.html">http://cdm.unfccc.int/Projects/Validation/DB/S253ZCTBJU9LJ3VF72CS1J8SHY02PP/view.html</a>).</li> <li>- Both WACC and CAPM are acceptable according to the Guidelines on the Assessment of Investment Analysis, guidance 12: “In cases where a</li> </ul>

	<p>benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a <u>project IRR</u>. Required/expected returns on equity are appropriate benchmarks for equity IRR.”</p> <ul style="list-style-type: none"> <li>- PP was requested to adjust the benchmark for additionality discussion to reflect a default financing structure of 50% debt and 50% equity as applicable under baseline conditions as referenced by CAR 08. After the PP conducted the applicable corrections, a benchmark of 12.46% was obtained to reflect the cost of equity under baseline conditions with a default financing structure as offered by the BNDES to GHG intensive generation assets.</li> <li>- The calculation of equity IRR through the CAPM is in accordance with the guideline, guidance 15: “If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors“. The PP adopted the option (b) in the PDD version 1. All data sources have been validated in this report, section 7c “Investment Analysis”. In response to the comments received, the PP decided to incorporate both approaches, (a) and (b), to the PDD version 2, in order to bring additional robustness to the investment analysis. The sensitivity analysis has been amended, to consider both benchmark values, 12.46% and 11.75%.</li> <li>- The cost of equity (Ke) in the PDD of Santo Antonio is 17.31%, and therefore is Comparable with the project specific cost of equity estimated for this project activity (16,05%). Nevertheless, the starting date of the Santo Antonio project activity (13 June 2008) is about a year before the Jirau project activity</li> <li>- The cost of equity (Ke) in the PDD of Teles Pires is 12.46%. Nevertheless, the starting date of the Teles Pires project activity (19 August 2011) is more than three years after the project starting date of the Jirau CDM project activity. Also, the rate was calculated with a 50% default leverage, which explains that it is identical to the Standard Benchmark as calculated by the PP.</li> <li>- With respect to the comment on the pronouncement of GDFSUEZ on 30 May 2008, the validation team has verified that the actual equity IRR calculated by the PP in the investment analysis model for the Base Case is 16.64% (Jirau HPP Investment Analysis, 2012) in the cell E148, select “P4”, in the cell E149 select “S0”. See the IRR on cell C113 or refer to cell C188 in the Results and Sensitivity Table). This value considers the benefits of the incentives received from BNDES and the expected revenues from the sales of the CERs. Considering that the investment analysis model has been based on the most optimistic assumptions (i.e., conservative from the CDM additionality standpoint), it is reasonable to assume that the PP has decided to disclose to investors a lower IRR value, considering all the uncertainties involved in implementing the project.</li> </ul>
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#### 2.4. IRR calculation

Comment	<p><u>Zachary Hurwitz, pages 2 and 3:</u></p> <p>”The Project Proponents provides an equity IRR calculation for the Base Case considering E-policies plus the inclusion of CERs (see PDD at page</p>
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	<p>53). However, such comparison is not made for the Optimized Case, which will be the ultimate project design and should be the reference. The DOE is asked to review the actual financing model agreed between the Project Proponents and BNDES and make publicly available the equity IRR worked out (with and without CERs). Page 53 says that “If all benefits of the E-regulation are taken into account, the Equity IRR for the base case reaches 9.7%.</p> <p>Without access to a detailed IRR calculation sheet the public cannot assess the validity of the 9.7% figure (e.g. expected CER value not available). Comparable equity IRRs should also be provided for the Optimized Case in the PDD.”</p> <p><u>Philip Fearnside, page 3:</u></p> <p>” The water management plan presented in the PDD to avoid flooding in Bolivia (p. 9) has lower water levels in 6 months of the year as compared to the 2005 EIA (FURNAS, CNO &amp; Leme Engenharia, 2005, Tomo A, p. VII-13), and there are no months in which the PDD plan calls for higher levels (Table 1). Aside from indicating the inaccuracy of the 2005 claim in the EIA that the plan presented there would cause no flooding in Bolivia (FURNAS, CNO &amp; Leme Engenharia, 2005, Tomo A, p. VII-16), the lower levels imply less power generation and an increase in the “additionality” of the carbon claims. More importantly, either one of the operation plans makes clear the very substantial impact on Jirau’s operation from the existence of the international border with Bolivia at the upper end of the reservoir. Operating the reservoir for much of the year at a water level below the “maximum normal” elevation of 90 m implies a substantially lower electricity generation due to the lower head at the dam. This raises the possibility that the company may be expecting that, at some future date, Brazil could reach an agreement with Bolivia to allow the water level to be raised to 90 m (or perhaps even higher) throughout the year. Brazil enjoys considerable leverage in its negotiations with Bolivia over dams, including the terms to be agreed for the planned binational Guajará-Mirim Dam upstream of Jirau (ARCADIS Tetraplan et al., 2005; FURNAS &amp; CNO, 2003). In addition to adding to flooding by the Jirau reservoir, raising the water level beyond that specified in the PDD could make the dam’s carbon credit claims considerably less “additional” than the calculations presented to the CDM imply.”</p>
Response submitted by the PP	<p>To address the suggestion of International Rivers to disclose the rate of return for the “Optimized Project” in order to allow a comparison with the benchmark and for the sake of transparency we have included this value in the PDD. Nevertheless we wish to remind that this is not a requirement of the CDM as the PP is only required to discuss the additionality of the project activity without the CDM and without the comparative advantage created by E- regulation. In addition, investment analysis shall be conducted from the perspective of the project starting date and should not take into account any later changes in project design or costs. Now to fully understand the results it is important to remind that the decision to implement the Optimized Project was taken in August 2011, under full consideration of CDM revenues. Nevertheless, for the purpose of transparency the PDD presents the hypothetical scenario that this optimisation and therefore positive evolution would have been known at the project starting date. In addition, the Optimized Project considers the highest technically possible load factor, even if not recognized by the regulator. On the other hand, negative evolutions, like cost overruns not</p>

	<p>related to the incremental installed capacity, the delays in the construction process are being ignored to address any request of conservativeness. If, as requested by IR, the project would be evaluated under the current and effective situation it would show more additional than at the project starting date.</p> <p>In relation to the request to compare the equity IRR as calculated for the project activity with a benchmark defined by the Brazilian Development Bank, we regret to inform that such a rate does not exist. The BNDES, as third party financier, considers the Debt Service Coverage ratio to be the relevant criteria to define and quantify the degree of financing. This DSCR has been duly taken into account to elaborate the investment analysis;</p> <p>With regards to the question about the fact that the guidance to operate the Jirau HPP implies a reduced energy generation capacity we can confirm that the operation at a constant quota of 90 meters would allow generating higher volumes of energy, but, as defined by the EIA, this would imply that the water levels on the Bolivian side of Abunã would be elevated in the dry period and thus the project would not be contained to the national territory as defined by the original hydro power inventory as approved in the year 2002. Furthermore, such a measure would only be possible on the basis of a governmental arrangement between the federal governments of Brazil and Bolivia, as well as the subsequent environmental licensing on the Bolivian side, an issue which is beyond the scope of a the Jirau HPP concession which is clearly defined by the operational rule as issued by ANA.</p>
Evaluation of the response	<p>The validation team has confirmed the following statements in the PP's response:</p> <ul style="list-style-type: none"> <li>- Although this is not a requirement under the CDM, the PP has included in the investment analysis model and in the PDD the calculation of equity IRR for the Optimized Project, considering the expected revenues from the CERs, as well as the benefits received from the E-policies.</li> <li>- There is no benchmark and equity IRR value considered by the BNDES. The bank considers as relevant criteria for the financial approval the project's capacity to pay the debt, i.e., the DSCR.</li> <li>- The PP has clarified that the constant operation at the maximum quota (90 metres) is not a reasonable scenario from the investors' standpoint, once it goes against the operational rules as determined by ANA. The validation team has confirmed from the ANA Resolution 269, 2009 article 5 that "the normal water level of the reservoir shall vary following the natural conditions of the Madeira river, and that the operator shall effectively monitor the quota in Abunã and adjust the operation accordingly". Besides, ANEEL, in response to applicable requests for clarifications, made clear that the firm energy of the Jirau HPP is only defined by the operational rule established by ANA (ANEEL, 2008).</li> </ul>

## 2.5. Source of the energy displaced by the project

Comment	<p>Philip Fearnside, page 7:</p> <p>"The PDD states that "the electricity displacement will occur at the system's margin, i.e., mainly fossil fuelled thermal plant generation will be substituted" (p. 15). What, one might ask, is the place of the dozens of other dams that Brazil plans to build over the next decade? The "margin" appears to have shifted to hydro, so that one dam is really displacing</p>
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	another rather than “primarily” fossil fuel. Of course Brazil’s future priorities regarding its energy matrix could be different than they are today: this dam could just as well be displacing a future energy-efficiency program or a wind, solar or tidal energy source instead, in which case the justification for claiming carbon credit for Jirau would evaporate even if the dam really were additional.”
Response submitted by the PP	Fearnside is concerned that large sum of money would be spend on non-material emission reductions generated by the Jirau hydro power plant and at the same time he is concerned that the energy generated by Jirau would substitute other hydro power and renewable energy, as being promoted by the Brazilian Government. In fact here he recognizes the effectiveness of the Brazilian policy and, on the other hand, flags a risk for the CER revenues of the Jirau HPP. As the operational margin is calculated ex post, Jirau will generate less and less emission reductions and carbon related revenues as the Brazilian policy for a clean energy expansion advances. This shows how the CDM is effectively contributing for the transformation of en energy sector and that the resulting emission reductions are related to structural change. Such investment, from a global perspective is to be preferred than the expenditures to achieve emission reductions from fuel switching in mature markets. Even when carbon revenues reduce or go to zero after the full crediting period, Jirau HPP CDM project will continue to effectively generate clean energy and global GHG reduction without being remunerated for it
Evaluation of the response	The emissions reduction from the displacement of non-renewable energy sources is continuously accounted for in the calculation of the grid’s emission factor, which is included in the project’s monitoring plan. The validation team considers that the comment has been satisfactorily answered by the PP.

## 2.6. E- Policies

Comment	<p><u>Philip Fearnside, page 7:</u></p> <p>“CDM regulations permit using an IRR benchmark calculated from a scenario without government subsidies or other favorable regulations that are designed to reduce emissions. The question of whether the subsidies the dam receives are motivated by climate concerns is therefore critical. Hydro receives favorable financing terms from BNDES, including both lower interest rates (partly from a 2007 change in BNDES policy to offer large hydro projects rates calculated from a “basic spread” of only 0.5%, versus 1.8% for fossil fuels: p. 47) and a provision in effect since 2006 for a 20-year amortization period, as compared to 14 years for gas-fired power plants (p. 48). It is ironic that the 0.5% “basic spread” value charged to large hydro is much lower than the 0.9% charged to wind power (p. 47), raising doubt as to whether the generous concession to hydro is really motivated by climate-mitigation concerns.</p> <p>“The Bolivian crisis motivated Brazil to institute a strong program to promote domestic energy production through hydro development for a reason that is independent of any alleged benefit of hydropower for climate change. Of course additional factors could also be favoring dam projects since the construction industry represents one of the largest sources of contributions to political campaigns (Scofield Jr., 2011). Brazil is currently engaged in a massive effort to build dams, with an average of one large dam to be completed in the country’s Legal Amazon region every four months for the</p>
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	<p>next decade (Brazil,MME, 2011, p. 285). The portrayal of the government's subsidy for this as a selfless contribution to global efforts to combat climate change stretches the limits of credibility.”</p> <p><u>Zachary Hurwitz, pages 2 and 3:</u></p> <p>”As described in the PDD, the Brazilian National Development Bank (BNDES) is the financing facility, and provided preferential credit lines for this proposed CDM project activity (see PDD at e.g. page 18, 46 following). BNDES operates as a national bank, not private, and offers preferential credit lines for renewable energy projects, which should be considered as governmental subsidies when compared with lending for conventional energy projects. BNDES has to date disbursed a total of 10 billion BRL to Enersus for the Jirau HPP. BNDES' initial line of credit was 7.2 billion BRL in 2009.<sup>2</sup> The Project Proponent then requested an additional 2.2 billion BRL of credit from BNDES in February 2012.<sup>3</sup> GDF-Suez now currently seeks an additional 1 billion BRL of credit from the BNDES to pay for project expansion, including the addition of six turbines, as of April 2012</p> <p>Despite the Project Proponents' comments on the treatment of E- policies based on EB 22 meeting, we believe that it is wrong to conduct an equity IRR analysis excluding this record of fiscal benefits. In addition, EB 53, Annex 32 provides an 'Information note on the implementation of E+/E- in the context of projects on the agenda of the fifty-third meeting of the CDM Executive Board'. As per §3 of the document the “... DOE should assess whether the tariff has been affected by any national and/or sectoral policy and if so whether this policy/policies are E+ policies or E-policies.” Such detailed analysis is expected to be provided in the Validation Report.”</p> <p>“By invoking the E+/E- rule from EB 22 to justify not including these preferential lines of credit in the investment analysis the project proponent is going against CDM convention. In July 2010 the EB “agreed not to continue the consideration of the treatment of national and sectoral policies in the demonstration and assessment of additionality.” The Board also agreed that “the possible impact of national and sectoral policies in the demonstration and assessment of additionality shall be assessed on a case by case basis.” (EB 55, paragraph 27). Convention has been that the investment analyses should use subsidies, tax benefits and preferential tariffs at the time of the development and investment decision.</p> <p>The treatment of E-policy as defined per EB22 contradicts with § 6 of the “Guidelines on the assessment of investment analysis,” which says that “Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant”. Investment decision (in the PDD referred to as project start date) was 22/07/2008. At that time BNDES already had announced the indicative financing conditions to support the implementation of the Jirau HPP (11/02/2008); see also PDD at page 33. By considering the E-policy rule, the equity IRR calculation was prepared with input values that were not valid at the time of investment decision.”</p>
Response submitted by the PP	<p>Both Fearnside and IR agree that the financial incentives provided by the BNDES are fundamental for the project's financial viability and they recognize that the Brazilian Government has a policy to promote hydro power and other renewable energies for the expansion of the Brazilian energy supply.</p> <p>In contrast to Fearnside, IR acknowledges that “BNDES operates as a</p>

national bank, not private, and offers preferential credit lines for renewable energy projects, which should be considered as governmental subsidies when compared with lending for conventional energy projects.” Now in spite of this recognition IR also states: “we believe that it is wrong to conduct an equity IRR analysis excluding this record of fiscal benefits.” In fact IR seems to be of the opinion that the provisions of Annex 3, EB 22 have been eliminated by decisions taken at EB 55, where the EB “agreed not to continue the consideration of the treatment of national and sectoral policies in the demonstration and assessment of additionality” and that “the possible impact of national and sectoral policies in the demonstration and assessment of additionality shall be assessed on a case by case basis.” (EB 55, paragraph 27). In addition, IR requests, in reference to Annex 32, EB 53, that the DOE should assess whether the tariff has been affected by any national and/or sectoral policy”.

In fact the discussion about the adequate treatment of national policies that promote renewable energies and emission reduction technologies started at CMP1 in Marrakech. Now with the evolution of NAMAs, national support policies for renewable energies are gaining a vital role for the effectiveness of the CDM to support non Annex I countries in their ambition to pursue the objectives of the UNFCCC. In this context, the concept of E- Policies<sup>2</sup> as defined by Annex 3 of CDM Executive Board Report 22 (Annex 3, EB 22) is key to adequately treat national mitigation policies under the CDM, to promote such policies. Since many national policies also include financial incentives, their adequate treatment under the investment analysis paramount. To achieve this, the Additionality Tool<sup>3</sup> and the Combined Tool<sup>4</sup> make clear reference to the E- decisions (CDM EB 22). They allow the project developer to exclude specific subsidies and incentives from the investment analysis.

In addition, with regards to E- policies, the VVS defined that: ***“National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programmes), otherwise known as policies that decrease GHG emissions, are called type E-. For this type of national and/or sectoral policies or regulations, those that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) need not be taken into account in identifying a baseline scenario (i.e. the baseline scenario could refer to a hypothetical situation without the national***

<sup>2</sup> The regulation also identifies E+ policies as those that provide a comparative advantage to GHG emission intensive technologies, such as fossil fuel subsidies. These need to be ignored if established after 1997, but no such policy has been identified in Brazil.

<sup>3</sup> The “Tool for the demonstration and assessment of additionality (Version 06.0.0)” defines that for investment analysis “all relevant costs and revenues (excluding CER revenues, but possibly including inter alia subsidies/fiscal incentives) shall be taken into account” and Footnote 11 clarifies that the “EB guidance on the consideration of national/local/sectoral policies and measures for the baseline setting” shall be taken into account.

<sup>4</sup> Footnote 11 of the “Combined tool to identify the baseline scenario and demonstrate additionality” (Version 04.0.0)” defines that “Note that according to guidance by the EB (EB 22, Annex 3), subsidies and incentives may be excluded from consideration in certain cases. Available from: <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-01-v6.0.0.pdf>.

***and/or sectoral policies or regulations being in place)”.***

Based on this provision, the Jirau PDD and its additionality section has been developed in the most transparent way possible in order to clarify and quantify all support policies granted to the project activity. As a result, two kind of support policies have been identified:

0. Generic support policies that do not provide any comparative advantage when compared to GHG intensive technologies and thus do not classify as E- policies. These policies imply a reduced payment of income tax and have been fully and transparently described in the PDD and taken into account for the investment analysis;
1. Support policies which provide a comparative advantage to the implementation of the project activity when compared to more GHG intensive alternatives and which have been implemented after 11 November 2001 and therefore classify as E- policies. For their treatment and in line with paragraph 93 of the VVS a hypothetical situation without the comparative advantage created by the national or sectoral policies has been taken into account to evaluate the project activity under the baseline scenario.

In relation to IR request, in reference to Annex 32, EB 53, that the DOE should assess whether the tariff has been affected by any national and/or sectoral policy”, it is important to understand that Brazil does not regulate tariffs, but offers energy sales contracts under competitive purchase tenders. In the case of the Jirau HPP, 70% of the energy has been sold under such a tender and the project has been awarded with a 30 year long energy sales contract, which was an important measure to make the project bankable and therefore viable. Another 30% of the energy is being sold on the free market, where also no government interference on prices exists. Therefore, as Brazil’s policy focuses on reduction of the financing cost of renewable in comparison to GHG intensive fossil fuelled thermal power generation assets, there is a clear comparative advantage for investments in such renewable energy projects, while tariffs are a result of free competition.

In relation to the question why the spread for hydro power is lower than for other renewable energies, the response is related to the fact that hydro power plants are more sensitive to interest rates due to their long construction time. While wind projects can be operational in 18 months, large hydro power plants take up to 5 years or more to be completed. This leads to high cost for interests during construction, which is one of the main barriers for hydro power developments as cited before.

*“On the basis of a differentiation in basic spread, the extension of the financing duration, next to the increased participation in financing, it was possible to reduce the financial cost of hydro power investments to a level which granted them with competitiveness in relation to the financial cost of coal and fuel oil based generation plants”(BNDES, 2012, translation ours).*

#### Conclusion:

In fact Annex 3, EB 22 defines an E- policy only on the basis of the fact that a comparative advantage has been identified to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public

	<p>subsidies to promote the diffusion of renewable energy) and therefore it is not of relevance if the policy was established with the explicitly objective to mitigate GHG emissions. In any case, it has been shown on the basis of numerous governmental documents and references that the implementation of the Jirau HPP and other renewable energies investments since 2008 are effectively related to Brazil's National Climate Change Mitigation Policy. Further it was shown that the support policies defined by the government were important for the project's licensing and financial viability and that that CDM revenues have been consistently considered not only by the investor, but also by the government when planning, licensing and financing the project activity;</p> <p>The PDD was developed on the basis of EB 22 Annex 3 and contains a detailed analysis of all "relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector" has been offered. Incentives which represent a comparative advantage to the implementation of the Project Activity have been identified and a hypothetical baseline without these policies has been established. Other incentives, which do not represent a comparative advantage when compared to GHG intensive technologies, have been fully considered in the baseline and investment analysis.</p>
Evaluation of the response	<p>The validation team notes that the E- policies as defined by EB22 Annex 3 are not those designed to reduce emissions, but those which give comparative advantages to less GHG intensive technologies over more GHG intensive ones. The E- policy concept is, then, based on the policy's actual effect, not on its motivation.</p> <p>The validation team considers that the implementation of the Jirau HPP and other renewable energy investments since 2008 are credibly related to the Brazilian National Climate Change Mitigation Policy. Please refer to the law project establishing the National Policy on Climate Change, of 04 June 2008 (<a href="http://www.camara.gov.br/sileg/integras/574554.pdf">http://www.camara.gov.br/sileg/integras/574554.pdf</a>) and the National Plan on Climate Change of September 2008, version for public consultation (<a href="http://www.mma.gov.br/estruturas/169/arquivos/169_29092008073244.pdf">http://www.mma.gov.br/estruturas/169/arquivos/169_29092008073244.pdf</a>).</p> <p>The validation team considers that the PP has adequately explained, with numerous references to currently valid CDM documents, the application of the E- policies concept to the project activity. Support policies which do not provide a comparative advantage to less GHG intensive technologies when compared to more GHG intensive technologies have not been considered in the PDD as E- policies.</p> <p>The validation team confirms that the electric energy tariff in Brazil is not regulated. The electricity price is determined by the free market, as has been validated in detail in this report, section 7.c, Investment Analysis.</p> <p>The validation team has confirmed the explanation given by the PP for the financial spread for hydro power, which is lower than for other renewable energies. As explained in the letter sent by BNDES to the Energia Sustentável do Brasil S.A. (BNDES, 2012), page 1, "On the basis of a differentiation in basic spread, the extension of the financing duration, and the increased participation in financing, it was possible to reduce the financial cost of hydro power investments to a level which granted them with</p>

	competitiveness in relation to the financial cost of coal and fuel oil based generation plants”.
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## 2.7. Common practice

Comment	<u>Zachary Hurwitz, page 4:</u> ”Brazil is clearly one of the world’s leading dam–building nations and is already highly dependent on hydropower for its electricity, with about 80% of its electrical energy coming from hydroelectric dams. It has at least 63 dams either under construction or planned, and the government regularly sets both credit and electricity prices. This means that hydropower cannot be considered an uncommon technology in the country. In general, the common practice analysis should be strengthened because the ability to argue that a project is “essentially distinct” from other similar projects can easily be abused. Projects under construction and in the CDM pipeline should be included in the common practice assessment.”
Response submitted by the PP	The Jirau HPP cannot be seen as common practice because a comparable project has never been developed by the private sector in Brazil. In addition, the project is also different from any plant build by the Brazilian state in the 70’s and 80’s as it was designed to have minimal environmental impacts on the basis of a pure run-of-river concept with reduced reservoir and no alteration of the river’s natural flow.
Evaluation of the response	The project is not common practice. All projects with comparable scale had their investment decisions carried out under a completely different investment climate, where the electricity generation, transmission and distribution were state owned. Please refer to section 7.e, “Common Practice Analysis”, in this report.

## 3. STAKEHOLDER CONSULTATION PROCESS

Comment	<u>Zachary Hurwitz, page 5:</u> ”Chapter E.2. Summary of comments received states that “No comments have been received during the local stakeholder consultation process, as implemented according to the requirements of the Brazilian DNA.” However, chapter E.1 describes additional public consultations that were held during the process of obtaining the various licenses (Preliminary License, Installation License). For completeness and transparency reasons, the public comments made during these consultations should be made publicly available in the PDD. It is difficult to believe that no public comments or objections were made for a project of this size, where enormous environmental and social impacts can be expected. The PP should prepare a detailed summary of statements made during the pre CDM public hearings under E.2. in the PDD.”
Response submitted by the PP	As a matter of fact the PPs understand that the Brazilian DNA and the CDM only require to explicitly treat the local stakeholder comments that have been obtained as part of the CDM related local stakeholder consultation. Now as a matter of fact, the Jirau HPP did not receive any comments during this process, even though the issue was presented to and discussed with the Sustainability Committee, an action which was conducted in complement to the official requirements of the Brazilian DNA. Nevertheless, ESBR is happy to provide a summary of the different levels and procedures for stakeholder consultation which were implemented in preparation and during the development of the EIA. In fact, besides the official stakeholder consultation process undertaken in the context of the EIA/RIMA, as a legal

	<p>requirement for the issuance of the Preliminary License, the consortium (Furnas – Odebrecht) responsible for the development of the EIA/RIMA has voluntarily organized a preparatory consultation process which involved 32 communities identified in the influence area of the Madeira Hydro power Complex (including Jirau HPP and Santo Antonio HPP).</p> <p>The methodology applied in this pre-licensing consultation made use of social survey developed in the context of the EIA/RIMA for the identification of the following stakeholders:</p> <ul style="list-style-type: none"> <li>A. Riparian population located in the Madeira Hydro power Complex area and downstream and upstream populations</li> <li>B. Indigenous peoples</li> <li>C. Urban population of Porto Velho           <ul style="list-style-type: none"> <li>• Academic community, students</li> <li>• Industry and commerce entrepreneurs</li> <li>• Representatives of workers' agencies</li> </ul> </li> <li>D. Public Authorities</li> <li>E. Media</li> </ul> <p>After this preparatory phase, in compliance with regulations and within the licensing scope of the Madeira River Hydroelectric Power Plants – Santo Antônio and Jirau, several official hearings and public meetings were called and presided by IBAMA. More than 3,000 people attended these calls:</p> <p>5.14.2004 – Official public meeting in Porto Velho: debate on the draft Reference Term, 95 attendees.</p> <p>11.10.2006 – Official public hearing in the Jaci-Paraná district attended by almost 800 citizens.</p> <p>11.11.2006 – Official public hearing in Porto Velho with the presence of about 1,100 citizens.</p> <p>11.27.2006 – Official public hearing held by the State of Rondônia Public Prosecution Service: presentation of the “Contents Analysis Report of Environmental Impact Studies (EIA) and Environmental Impact Report (RIMA) of Santo Antônio and Jirau Hydroelectric Developments on the Madeira River” with IBAMA representatives.</p> <p>11.29.2006 – Official public hearing in the Abunã District with the presence of 404 citizens.</p> <p>11.30.2006 – Official public hearing in the Mutum Paraná District attended by 669 citizens.</p> <p>01.25.2007 – Official public hearing at the Calama community, located downstream the area proposed for the damming of Santo Antônio Hydroelectric Development.</p> <p>Clear and straightforward discussions with local civil society and public authorities resulted in mutual trust and tacit agreements so that all could benefit from the implementation of the Madeira River Power Complex.</p>
Evaluation of the response	<p>In response to the CL 14 raised by the validation team, the PP has sent to the validation team a summary of the consultation process under the IBAMA licensing process. A summary of the comments received has been included in the PDD. The validation team confirms that the summary as</p>

	provided in the PDD is complete and comprehends the comments received from the fulfilment of the environmental licensing process. The validation of the stakeholder consultation process is detailed in the section 9 of this report.
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#### 4. OTHER CONCERNS

##### 4.1. Compliance with EU regulations

Comment	<p><u>Zachary Hurwitz, pages 1 and 2:</u></p> <p>"Non-compliance with European Regulations: The project does not comply with the EU-ETS and EC regulation on the 3rd trading phase. GDF-Suez is a 50.1% holder of the Enersus project consortium, and therefore the Project Proponents must provide evidence of compliance with the policies of the EU Emissions Trading System, which requires large hydropower projects above 20MW to comply with the recommendations of the World Commission on Dams (WCD). The Project Proponents should add a chapter in the PDD on how they have respected the relevant international criteria and guidelines including those contained in the World Commission on Dams – A New Framework for Decision-Making (2000) during the development of the project activity. This is important as the buyer of the CERs will be GDF Suez, a French company included in the Emissions Trading System with a compliance gap (see footnote 69 at page 21 of the PDD). It is illustrative of the inviability of this PDD that GDF Suez proposes to purchase CERs from its own investments while simultaneously omitting this information from section A.4 on page 12."</p> <p>"If it is the intention by GDF Suez to generate CERs through its own project developments, the DOE should first request the approval letter of an Annex 1 country before finalizing the Validation. As there had been no international agreement at the end of 2010, nor had there been any EU agreements with third countries, article 11a(4-5) (Directive 2009/29/EC ) provides a default situation of prohibition on using new-project CERs unless they are from LDCs registered after 2012. Taking this into consideration the PP is asked to justify their expectation that they will indeed receive registration this year, and to explain the likelihood of CERs really materializing for this project and serving as an income stream to project financing."</p>
Response submitted by the PP	IR is concerned that the Jirau CERs would not be eligible as offsets in Europe in case the project is not awarded with an LoA from any European member state. Though this is not related to the CDM, the PPs are aware of the situation and will take all necessary action.
Evaluation of the response	This comment is outside the scope of the validation.

##### 4.2. Alternatives to the project activity

Comment	<p><u>Zachary Hurwitz, page 4:</u></p> <p>"A recent study by Greenpeace on alternative energy scenarios in Brazil concluded that: (1) energy losses in the country's transmission system are an estimated 20%, a phenomenon largely related to a heavy dependence on extremely long-distance transmission lines, such as those planned for the Santo Antônio and Jirau dams; (2) Brazil's potential for wind power generation is at least 143,000 MW and may easily surpass 300,000 MW;</p>
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	and (3) considering an average annual level of solar radiation of 1.742 - 2.300 KWh/m2, tapping only 5% of the Brazil's solar potential would produce of the equivalent of the energy demands of the entire country. Considering the increasing economic attractiveness of investments in energy efficiency and alternative renewables such as wind power (with much lower social and environmental footprints, including GHG emissions), the CDM should require evidence of a serious assessment of investment options."
Response submitted by the PP	To accuse the Jirau HPP of being non sustainable implies that a combination of thermal energies with non-conventional energies is seen as a more sustainable option and it ignores the important benefits that the project has for the environmental protection and the development of a sustainable economy in its surroundings. In any case, the decision about promoting the implementation of the Jirau HPP was taken by the Brazilian government and the environmental licensing is a responsibility of its regulatory bodies. Likewise, the decision if it contributes to sustainable development will be a sovereign right of the Brazilian DNA when deciding about the issuance of the Host country letter of approval. Nevertheless, we would like to highlight that hydro power is fundamental to assure that a portfolio of renewable energies can provide clean expansion and energy security at moderate cost which supports Brazil's sustainable economic development.
Evaluation of the response	The comment concerns to the discussion of alternative energy generation scenarios from the national strategic standpoint, and is therefore outside the scope of the project activity validation.

##### 5. Excerpts not included in the comments above

Comment	<p><u>Philip Fearnside:</u>  <u>Page 1:</u>  <b>THE JIRAU DAM</b>  Two dams, Santo Antônio and Jirau, are nearing completion on theMadeira River, a major Amazon tributary that drains parts of Brazil, Bolivia and Peru. Both dams have applications pending for carbon credit under the Kyoto Protocol's Clean Development Mechanism (CDM). The Jirau Dam, located in Brazil's state of Rondônia near the border with Bolivia, is being built by the French multinational GDF Suez together with Energia Sustentável do Brasil S.A (a consortium with the Suez group made up of Eletrosul, Chesf and Camargo Correa). Commercial energy production is expected to begin in by the end of 2012, with the full 3750 MW of installed capacity coming on line by 2014. The Project Design Document (PDD) for the carbon credit proposal (Energia Sustentável do Brasil S.A. &amp; GDF Suez Energy Latin America Participações Ltda., 2012) is similar to other CDM proposals for dams and serves as a warning both of the defects of this project and of the inadvisability of carbon credit for hydroelectric dams in general.</p> <p><b>ENVIRONMENTAL AND SOCIAL IMPACTS</b>  The PDD states that "The Brazilian Energy Research Company (EPE), part of the Ministry of Mines and Energy (MME),.... Considers economic and social as well as environmental aspects.... In this context, EPE also considers Brazil's insertion in international agreements.... This view implies that all external costs and benefits are adequately assessed to identify most beneficial projects and to maximize their socioeconomic benefits and minimize their impacts" (p. 5). The irony of this portrayal would be hard to</p>
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	<p>exaggerate, given the enormous accumulation of ...”</p> <p>“The PDD asserts that “...the Jirau HPP [hydropower plant project] is being developed according to the best technical and environmental practices and standards” (p. 5). The local people and the civil society groups mentioned above would contest this claim.”</p> <p><u>Page 2:</u></p> <p>“All CDM projects must contribute to “sustainable development” (Kyoto Protocol, Article 12, Paragraph 2). Sustainable development is generally considered to have three pillars: social, environmental and economic. The PDD stresses the social benefits of jobs provided by the construction project, pointing out that “more than 70% of workers are hired locally” (p. 6). However, this apparently must mean that ...”</p> <p>“An indication that conditions at the construction site are less than ideal is given by persistent labor unrest at Jirau, including two major incidents of criminal arson (e.g., Romero, 2012).”</p> <p><u>Page 4:</u></p> <p>“... and various social biodiversity impacts. One unmentioned impact with relevance to greenhouse-gas emissions is the dam’s providing a link in a series of planned industrial waterways that would promote the advance of soybeans into rainforest areas in Brazil and especially in Bolivia, thus causing emissions and other impacts from deforestation (Kileen, 2007; Molina Carpio, 2005; Vera-Diaz <i>et al.</i>, 2007).”</p> <p>“Ironically, the PDD takes pains to claim that the dam will have no “leakage” causing emissions outside of the project area (p. 59).”</p> <p>“The PDD repeatedly cites official documents (e.g., pp. 18-19) referring to hydro as “clean” or as a “non-emitting source” (e.g., Brazil, CIMC, 2008; Brazil, MME, 2011). It should be noted that these documents have been roundly criticized for the assumption that hydroelectricity is clean energy (e.g., Fearnside, 2012a). Although the claim that hydro is clean has been repeated so many times that most people are surprised to learn otherwise, such claims have been scientifically untenable for some decades (see Fearnside, 2011). Multiple studies indicate large emissions in tropical dams (e.g., Abril <i>et al.</i>, 2005; Fearnside, 2002, 2005a,b; Kemenes <i>et al.</i>, 2007, 2011). The high water flow rate through the reservoir at Jirau will result in lower emissions than at other Amazonian dams, but emissions will not be zero.”</p> <p><u>Page 5:</u></p> <p>“These areas can be expected to emit methane through the surface, but, unlike reservoirs with more widespread stratification, most of the portion of the dissolved methane that these edge areas produce in their anoxic sediments that does not reach the surface as bubbles will be prevented from reaching the turbines due to the presence of oxygenated water in the main channel where the water is moving faster. The loophole in the CDM regulations that allows dams with high power densities to claim zero emissions specifies 10W/m<sup>2</sup> as the limit for this complete exemption (see Fearnside, 2012a)”</p> <p>“If the 3300 MW installed capacity originally planned were used, the power density would have been 9.1W/m<sup>2</sup>, making the project ineligible for claiming zero emissions from the dam. Adding the six extra turbines after the dam location was changed in 2009 gives a double assurance of being able to cash in on the loophole. The CDM regulation’s not counting the full reservoir area is apparently based on the mistaken assumption that the water over the natural river bed does not emit methane (see Fearnside,</p>
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2012a).

#### ADDITIONALITY AND CARBON CREDIT

The Kyoto Protocol (Article 12, Paragraph 5) requires that any emissions reductions claimed for CDM credit must be “additional to any that would occur in the absence of the certified project activity”, giving rise to the term “additionality” in the jargon for discussing this topic.

#### Page 6:

“Project proponents are free to search the literature for an IRR value to use as a “benchmark”. Obviously, there is an inherent interest in picking a high value so that the dam project will be classified as unprofitable when compared to the benchmark, thus making it “additional” and eligible for CDM credit. The values appear to be essentially picked out of a hat.”

“The basic fact remains that the dam is under construction. The firms would not abandon the project in the absence of CDM funds. Even straining to make the dam look unprofitable, the PDD calculates an IRR of 9.7%/year after taxes and in real terms (i.e., after discounting inflation) under the project’s actual loan terms from BNDES (i.e., not under a hypothetical scenario), and without CDM credit (p. 53). This is not a bad deal as compared to most investments and is almost as high as the 10.35% IRR benchmark that was used for the neighboring Santo Antônio Dam’s CDM proposal (Santo Antônio Energia S.A., 2012), despite all of the ways that this benchmark was inflated (see International Rivers, 2012; Fearnside, 2012b).”

#### Page 7:

“Brazil’s offering of more favorable loan terms from BNDES to hydro as opposed to gas-fueled power plants (pp. 45-47) is not motivated by concern for global warming alone. In 2006 the EvoMorales government took over Petrobrás facilities in Bolivia and sent shock waves through the Brazilian government (*Folha de São Paulo*, 2006). Brazil imported 50% of its gas from Bolivia in 2006, a percentage the country has now managed to reduce to 36% (Ordoñez, 2012).”

“In other words, the applicability of the CDM regulation allowing a benchmark IRR value to be used based on a hypothetical scenario without the subsidies from “E-policies” is open to question. After the various adjustments to represent the hypothetical scenario without government “E-policy” subsidies, the PDD arrived at an equity internal rate of return of 6.8%/year for the project in the “base case”[i.e., in the configuration announced at the time of the bidding] and 7.5%/year in the “optimized” configuration [i.e., with more turbines value of the 15.7%/year IRR benchmark in real terms, post-tax (p. 35), which is inflated by various correction factors to compensate for alleged risks (p. 35).”

#### Page 8:

#### “HOT AIR AND CLIMATE CHANGE

The amount of “hot air” (carbon credit granted without a real climate benefit) to be generated by the project is staggering. As an annual average, emissions reductions claimed are 6,180,620 t CO<sub>2</sub>e/year, equivalent to 1.69 million t C/year. Over the seven-year project they will total 11.8 million tons of carbon, or approximately the annual emission of the city of São Paulo. This amount of carbon will be emitted somewhere else in the world in the countries that purchase the certified emissions reductions (CERs). Since the dam would have been built anyway, no real mitigation takes place to offset the emissions authorized by the credits. CER revenues are expected to average R\$250 million per year (at the exchange rate on the project start date: 22 July 2008), or US\$158 million per year (p. 52). Over 7

years US\$ 1.11 billion will be siphoned off from real mitigation. When the world becomes serious about containing global warming the measures needed will be very expensive, and we cannot afford to waste money intended for this purpose. The initial paragraphs of the PDD describe GDF Suez as dedicated to “responsible growth” and “respecting the environment” (p. 3). Unfortunately, in addition to the many other impacts of the dam, the Jirau CDM project would represent a blow to global efforts to contain climate change. The contrast between these impacts and the platitudinous “greenwashing” of company statements dramatizes the need for basic reorientation, not only of the companies but also of the Brazilian designated national authority (DNA) for the Clean Development Mechanism, the CDM executive board, and the United Nations Framework Convention on Climate Change as a whole. Unfortunately, the problems of the Jirau CDM proposal are, in essence, common to vast numbers of other carbon proposals for dams. The take-home lesson is that funds for mitigating global warming should be used for other types of projects – not dams.”

Zachary Hurwitz:

Page 1:

“We are writing to express our concerns over the application for validation of the Jirau Hydropower Project in Brazil. The Project Design Document (PDD) for this project is flawed and inaccurate. In addition, CDM validation of this project would reward not only a clearly non-additional project, but also one of the most socially and environmentally destructive dams in the Amazon Basin.

Summary of Key Concerns

- *The project does not comply with the EU-ETS and EC regulation on the 3rd trading phase.* GDF-Suez is a 50.1% holder of the Enersus project consortium, and therefore the Project Proponents must provide evidence of compliance with the policies of the EU Emissions Trading System, which requires large hydropower projects above 20MW to comply with the recommendations of the World Commission on Dams (WCD). In addition, an approval letter from an Annex 1 country is necessary for GDF-Suez to generate CERs using its own project development, as there is currently a default prohibition on using new-project CERs beyond 2013 unless they are generated by least-developed countries (LDCs).
- *The project clearly does not meet criteria for additionality.* The Brazilian National Development Bank (BNDES), acting as the financing facility for this proposed CDM project activity, provided preferential credit lines for the proposed project activity (see PDD at e.g. page 18, 46 following). Despite the Project Proponents' comments on the treatment of E- policies based on the EB 22 meeting, we believe that it is wrong to conduct an equity IRR analysis excluding BNDES' fiscal benefits. CDM revenues are clearly not additional due to both current and future public finance committed to the project. In addition, the PDD's IRR calculation methods and benchmark are obscure.
- *The project has devastating and irreversible environmental and social impacts.* Technical studies conclude that the Jirau hydropower project will cause transboundary impacts in Bolivia and Peru. The project EIA avoided an analysis of transboundary impacts and creation of relevant mitigation plan. By only referring to the EIA, the PDD violates Decision 4/CMP.1, which foresees the inclusion of transboundary issues in its discussion of

	<p>environmental and social impacts.</p> <ul style="list-style-type: none"> <li>• <i>There are serious examples of inconsistencies with applicable laws.</i> The planning, licensing and construction of the Jirau HPP has been marred by repeated violations of Brazilian legislation and international agreements regarding human rights and environmental protection.”</li> </ul> <p><u>Page 4:</u>        “Taking into account the real input values of the credit line provided by BNDES, the equity IRR without the CERs is much higher, and can be expected to be even higher for the Optimized Case. The validator should be aware that the E-policy treatment in this case can lead to unrealistic and financial parameters. Allowing a treatment of E-policies as presented in this project would set a precedent that supports large infrastructure projects that are already promoted by the national government, and for which it is doubtful that the government will drop just because it may not obtain CERs. We believe that the credit line as offered by BNDES to the project with all its input values contained therein give a more realistic insight into the equity IRR and the additionality assessment.”</p> <p><u>Page 6:</u>        “Conclusion: In conclusion, the PDD for the Jirau HPP is clearly flawed, violates existing regulations and national legislation, and manipulates the CDM rules in an attempt to obtain CERs. The project is non-additional, has provoked high social and environmental impacts, and would continue to be built anyway regardless of approval of CERs. We request that validation for this project be rejected. The approval of this project would set an extremely dangerous precedent for the CDM as it prepares to enter the third trading period.”</p> <p><u>Jorge Molina:</u>  <u>Page 1:</u>        “I am writing to express my concerns over the application for validation of the Jirau Hydropower Project in Brazil. The Project Design Document (PDD) for this project is deeply flawed and inaccurate. This is particularly true in relation with transboundary environmental impacts, as is described below. Summary of Key Concerns</p> <p>a) <i>The project will have serious transboundary environmental and social impacts in Bolivia and Peru.</i> Both independent technical studies<sup>1</sup> and IBAMA (Instituto Brasileiro do Meio Ambiente) concluded that the Jirau hydropower project will cause transboundary impacts in Bolivia and Peru. By only referring to the EIA, the PDD violates Decision 4/CMP.1, which foresees the inclusion of transboundary issues in its discussion of environmental and social impacts.</p> <p>b) <i>Transboundary impacts were deliberately ignored in the EIA and the licensing process show inconsistencies with Brazilian and international laws.</i> The project EIA avoided an analysis of transboundary impacts and therefore, the possibility of mitigating or compensating project impacts outside Brazil. Project licenses were given in spite of serious observations of the Brazilian body in charge of licensing (IBAMA).”</p> <p><u>Page 2:</u>        “The western shore to the front is Bolivian.”        “ANEEL and the authors of the EIA subsequently denied their own results, relying on simple “views” (i.e. opinions and not studies) of supposed experts.”</p>
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	<p>“Even for the modest increase in water levels estimated in the feasibility study and the cost of energy to which was awarded , the value of the energy lost in the binational stretch would be 70 million dollars per year, and over 100 million dollars per year according to independent studies (Molina et al, 2008).”</p> <p>“Potential transboundary impacts of the Jirau project are not limited to the main river course. Several of the socio-environmental impacts identified in the EIA (as listed in section D.2 of the PDD) would affect much of the Madera River basin, located mostly in Bolivia.”</p> <p>Page 3;</p> <p>“Another example is the system of fish passage (STP) and the statement on the PDD that eggs and larvae would pass through the turbines without suffering damage.’</p> <p>“This demonstrates that the "technical and political reasons" were primarily political. Thus, ...”</p>
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With respect to the Brazilian DNA requirements, as determined by the DNA's (CIMGC) (MCT, Resolution N° 7, 2008), article 3, project proponents must send to CIMGC the invitations for comments. No comment was received from this process.

The local stakeholder consultation process and the environmental issue are intertwined in the Brazilian environmental licensing process. Four public hearings were promoted by IBAMA for the presentation and discussion of EIA's results. The validation team confirms that the summary of the comments received as provided in the PDD is complete and comprehends the comments received from the fulfilment of the environmental licensing process.

## 6.6 Appendix E: Certificate of Appointment

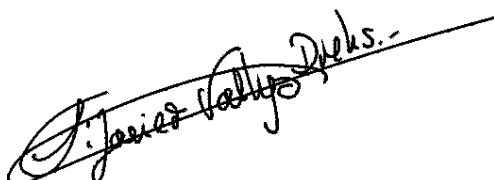
### Validation of Jirau Hydro Power Plant

We hereby certify that the following personnel have engaged in the validation process that has fully satisfied the competence requirements of the validation of the CDM project activity.

Name of Person	Assigned Roles
<b>Iuri de A. Barroso</b>	Team Leader
<b>Hilton Carvalho</b>	Sector expert
<b>Talita Beck</b>	Technical Reviewer
<b>Javier Vallejo Drehs</b>	Technical Reviewer / Decision Maker after LoA issuance
<b>Steve Ross</b>	Technical review sector expert
<b>Andrew Ritchie</b>	Decision Maker

Signed by  
Decision Maker

**Decision Maker**



Andrew Ritchie  
CDM Quality Manager  
24/12/2012

## 6.6 Appendix F: Validation Protocol and findings log

This document has been produced by the LRQA Validation Team after the completion of the desk review and the site visit. It outlines the validated situation in relation to a number of criteria, including those defined in the Validation and Verification Standard (VVS) produced by the CDM Executive Board.

	Validated situation	Conclusion
<b>SECTION 1. Approval and contribution to sustainable development</b>		
<b>Host Country Approval</b>		
1. Has the Host country DNA provided a written approval?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/> <sup>5</sup> According to the Brazilian DNA's rules, the issuance of the Letter of Approval is conditional on the presentation of the DOE's validation report by PP to the DNA (Resolution No. 1 of September 11, 2003).  The Host country DNA provided a written approval. The LoA, dated 20 December 2012, has been issued by the Brazilian DNA.	OK
2. Confirm that the letter has been issued by the Party's DNA and is valid for the proposed CDM project activity under validation	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>  The LoA, dated dated 20 December 2012, has been issued by the Brazilian DNA.	OK
3. Mention the means of validation employed to assess the authenticity of the Letter of Approval. Indicate the source of the LoA (for example, PP or directly from the DNA)	The project approval by the DNA has been confirmed through the email sent by the DNA to the PP, with the LoA attached (see Appendix B, "LoA_email").	OK

<sup>5</sup>For each section and question where a YES/NO/NA answer is required, explain your choice.

	Validated situation	Conclusion
4. Does the written Letter of Approval confirm the following: (a) The Party is a Party to the Kyoto Protocol (including ratification)? (b) Participation is voluntary? (c) The proposed CDM project activity contributes to the sustainable development of the country? (d) It refers to the precise proposed CDM project activity title in the PDD being submitted for registration?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>  The Letter of Approval confirms that: (a) The Party is a Party to the Kyoto Protocol (including ratification); (b) Participation is voluntary; (c) The proposed CDM project activity contributes to the sustainable development of the country;  The letter refers to the precise proposed CDM project activity title in the PDD being submitted for registration.	OK
5. Is the letter of approval unconditional with respect of (a) to (d) above?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>  The LoA is unconditional with respect of (a) to (d) above	OK
6. Does the LoA from the host party acknowledge the bundle activity (if applicable)?	Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input checked="" type="checkbox"/>	OK
<b>Annex I Party Approval</b>		
7. Has the Annex I country DNA provided a written approval?	Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input checked="" type="checkbox"/>  There is no Annex 1 Party involved	NA
8. Confirm that the letter has been issued by the Party's DNA and is valid for the proposed CDM project activity under validation (CDM VVS, version 02.0, paragraphs 4).	Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input checked="" type="checkbox"/>	NA
9. Mention the means of validation employed to assess the authenticity of the Letter of Approval.  Indicate the source of the LoA (for example, PP or directly from the DNA) (CDM VVS, version 02.0, paragraphs 42, 43 (a) and (b)).	Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input checked="" type="checkbox"/>	NA

	Validated situation	Conclusion
<p>10. Does the written Letter of Approval confirm the following (CDM VVS, version 02.0, paragraphs 39 (a) (b) (c), 40 and 43 (d)):</p> <p>(a) The Party is a Party to the Kyoto Protocol (including ratification)?</p> <p>(b) Participation is voluntary?</p> <p>(c) It refers to the precise proposed CDM project activity title in the PDD being submitted for registration?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input checked="" type="checkbox"/></p>	NA
<p>11. Is the letter of approval unconditional with respect of (a) to (c) above?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input checked="" type="checkbox"/></p>	NA
<b>Host Country and Annex I Party Approval</b>		
<p>12. Do any of the Letters of Approval contain additional specification of the project activity? Like:</p> <ul style="list-style-type: none"> <li>- PDD Version number?</li> <li>- Validation report version number?</li> </ul> <p>Make sure that the request for registration is made on the basis of the documents specified in any of the letters.</p>	<p>Yes the LoA mentions the PDD version 03 and the Validation Report version 03. The Validation Report was updated to reflect the receipt of the letter of approval from the Brazilian DNA. The LoA acknowledgement and some few typo corrections are the only changes that were made to the version 03 of the Validation Report referred to in the letter of approval. The version 03.1 is being submitted for the request for registration.</p>	OK

		Validated situation		Conclusion
SECTION 2. Authorisation				
1	Confirm that the PPs are listed in a tabular form in section A.4 of PDD and that this information is consistent with the contact details provided in Annex 1 of the PDD and with the contact details in the MoC.	Host Party PP name in PDD/ A.4	<ul style="list-style-type: none"><li>Private entity: Energia Sustentável do Brasil S.A.</li><li>Private entity: GDF SUEZ Energy Latin America Participações Ltda.</li></ul>	OK
		Host Party PP name in PDD/ Annex 1	<ul style="list-style-type: none"><li>Private entity: Energia Sustentável do Brasil S.A.</li><li>Private entity: GDF SUEZ Energy Latin America Participações Ltda.</li></ul>	
		Host Party PP name in MoC	<ul style="list-style-type: none"><li>Private entity: Energia Sustentável do Brasil S.A.</li><li>Private entity: GDF SUEZ Energy Latin America Participações Ltda.</li></ul>	
		Annex 1 Party PP name in PDD/ A.4	The project has currently been proposed as a unilateral CDM project and the Annex I Party has not yet been identified. In line with the provision of paragraph 57 of the 18 <sup>th</sup> meeting of the CDM-EB, registration of a project activity can take place without an Annex I party being involved at the stage of registration.	
		Annex 1 Party PP name in PDD/ Annex 1		
		Annex 1 Party PP name in MoC		
2	Confirm that each of the PPs has been approved by at least one Party involved.	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>  The Host Country DNA has approved the project’s PPs, Energia Sustentável do Brasil S.A. and GDF SUEZ Energy Latin America Participações Ltda. , which are the only project participants.		OK

		Validated situation	Conclusion
3	Confirm that no entities other than those approved as PPs are included in section A.4 of PDD.	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/> No entities other than those approved as PPs are included in section A.4 of PDD	OK
4	Ensure that the approval of participation has been issued from the relevant DNA. If in doubt verify this with the corresponding DNA.	The approval has been issued by the host party DNA (Brazil), which is the relevant DNA for the Project Activity.	OK

Validated situation					Conclusion
<b>SECTION 3. Modalities of communication</b>					
<p>1 Validate the corporate identity of all the PPs and the focal point included in the MoC letter:</p> <ul style="list-style-type: none"> <li>- Validate the signatures</li> <li>- Validate the employment status.</li> </ul> <p>To validate this use any of the following options:</p> <ol style="list-style-type: none"> <li>1. Directly checking with evidence from PPs and the corresponding companies, for example, contracts, personal identity card or passport, HR records.</li> <li>2. Notarised documentation, e.g. power of attorney for signing on behalf of the company and the other PPs.</li> <li>3. Written confirmation from the PP that all the personal details are valid and accurate.</li> </ol>	PPs	Focal points (Joint authority)	Primary authorised signatory	Alternative authorised signatory	OK
	Energia Sustentável do Brasil S.A.	Energia Sustentável do Brasil S.A.	Antônio Jorge Representing the PP and focal point Energia Sustentável do Brasil S.A. Refer to (1) below.	None	
	and  GDF SUEZ Energy Latin America Participações Ltda.	GDF SUEZ Energy Latin America Participações Ltda.	Philipp Hauser Representing the PP and focal point GDF SUEZ Energy Latin America Participações Ltda. Refer to (2) below.	None	

1.(continuation)	<p>1): Mr. Antônio Jorge was duly appointed as Environmental Director for the PP Energia Sustentável do Brasil S.A. by the company's Supervisory Board on 12 April 2011 (ESBR Board, 2011). Furthermore he has signed the contract with LRQA (ESBR LRQA, 2012)".</p> <p>(2): A notarised power of attorney granted by the PP GDF SUEZ Energy Latin America Participações Ltda. confers to Mr. Philipp Hauser the power to, alone, represent the PP before the DNA of Brazil, for the purpose of obtaining the letter of approval (LoA) and as a PP and focal point representative before the UNFCCC Secretariat and the CDM Executive Board, for communication purposes related to requests for allocation of certified emission reductions, applications for voluntary inclusion or withdrawal of project participants and for communication purposes in relation to any other matters related to registration and issuance (GSELA, 2012).</p>	OK
<p>2 If a written confirmation (option c) is chosen from the options above, the following issues shall be validated:</p> <ul style="list-style-type: none"> <li>- The PP sending the written confirmation and signing it shall be the one signing the contract with LRQA.</li> <li>- The person signing the written confirmation and the person signing the MoC (if they are different persons) are duly authorised to do so on behalf of all the PPs, that is, they have a signed authorisation from the other PPs and the identity and role of the person who has signed this authorisation has been checked.</li> </ul>	N.A.	N.A.
<p>3 Has the MoC been completed as per the latest "Procedures for MoC between the project participants and the Executive Board"?</p> <ul style="list-style-type: none"> <li>- No modifications to the template / form should be made and each document should be clearly dated</li> <li>- Title of the project and names of project participants and focal points should be fully consistent with those indicated in all other project documentation</li> <li>- Focal point scopes should be clearly and correctly indicated</li> <li>- Contact details and specimen signatures of focal point entities including those of project participants in</li> </ul>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/></p> <p>The PPs have adopted the version 02.1 of the F-CDM-MOC form (according to the new VVS track). No modifications to the template were identified.</p> <p>All signatures from the PP and the focal points signatories were clearly dated.</p> <p>The project's title and the names of project participants and focal points are fully consistent with those indicated in all the project documentation (e.g. the PDD and the power of attorney documents).</p> <p>The focal point scopes are clearly and correctly indicated (joint between the two</p>	OK

<p>Annex 1 should be correctly entered. Only one telephone, fax, email contact should be entered per authorised signatory. In cases where additional contact details are included, only the first indicated information will be taken into account and only the official business address of the proposed entity should be provided on the F-CDM-MOC form.</p> <p>- The Statement of Agreement in Section 3 should be signed by one authorised signatory for each project participant; signatures made available in Section 3 should correspond to those indicated in the related Annex 1 document; focal point entities who are not designated as project participants should not sign Section 3.</p>	<p>focal points).</p> <p>The Statement of Agreement in Section 3 was signed by one authorised signatory for each project participant, and only by the PPs. The signatures made available in Section 3 correspond to those indicated in the related Annex 1 document.</p>	
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	Validated Situation	Conclusion
<b>SECTION 4. Project design document</b>		
1. Is the project activity Small Scale or Normal Scale?	Normal Scale <input checked="" type="checkbox"/> Small Scale <input type="checkbox"/> Bundled Small Scale <input type="checkbox"/>  Nominal power > 15 MW (decision 17 CP.7).	OK
2. Has the PDD used the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM Website?  Check outputs from the completeness check.	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> The PP has used the template F-CDM-PDD - Project Design Document Form version 04.1 and the "Guidelines for completing the project design document form (CDM-PDD) version 01.0 (CDM PDD Guidelines v01, 2012), The PDD was completed correctly using the latest PDD template and guideline (CDM VVS v02, 2012, paragraphs 62 and 63).	OK

	Validated situation	Conclusion
<b>SECTION 5. Description of project activity</b>		
1. Describe the process undertaken to validate that the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate, and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity.	<p>The project boundaries, the argument regarding the contribution to sustainable development and the technical description of the project activity were assessed against the approved methodology (ACM0002).</p> <p>It has been confirmed, from the map shown in section III-5 of the Environmental Impact Assessment (EIA, 2005; TOMO A -1, III-5), that the Direct Impact Area of the Jirau HPP is within the limits of the Municipality of Porto Velho. This is also in line with the definitions of the Installation License from 3 June 2009 (IBAMA, 2009_06_03).</p> <p>Abunã, Nova Mutum Paraná and Jaci Paraná are districts of the municipality of Porto Velho, as has also been confirmed during the site visit from the interview with the representative of the City Hall of Porto Velho.</p> <p>The PDD's project description as well as accuracy and completeness of relevant elements, such as: number of turbines and installed capacity; dimensions of dam and transmission line, implementation timeline; investor identity and ownership; reservoir surface and Power Density were validated against:</p> <ul style="list-style-type: none"> <li>i) applicable engineering studies (Basic Design Study 2010_08_31) and topographical surveys (Topocart, 2012_07_03)</li> <li>ii) official documents, studies and licenses of the Ministry for Mines and Energy (EPE, 2011_11_07; MME Portaria 26, 2011_08_01),</li> <li>iii) regulatory documents issued by the electric energy regulatory agency ANEEL (ANEEL Auction Notice, 2008; ANEEL Homologation, 2008_07_22);</li> <li>iv) environmental licenses issued by IBAMA (IBAMA, 2009_06_03);</li> <li>v) regulatory documents issued by ANA (ANA, Resolução 269, 2009)</li> </ul> <p>In addition, the PDD and its Annexes are in line with the Feasibility Study Report (FSR, 2008) which was submitted to the Brazilian Development Bank to request the project's financing. Where differences had been identified they were questioned in requests for clarification or corrective action requests.</p>	OK

	Validated situation	Conclusion
	<p>Details about the validation of all relevant parameters can be found in other sections of the Validation Protocol, especially Section 7c. Investment analysis, and the sector expert confirmed that all the presented information and the project description in the PDD is consistent and credible.</p> <p>A thorough inspection of the construction site was carried out during the site visit, with the participation of a sector expert, qualified according to the DOE's internal procedures. The works were in an advanced stage of construction of the dam and the beginning of installation of the first machines. The validation team confirms that the description of the proposed CDM project activity as contained in the PDD accurately reflects the observations made during the site visit. The project's description as presented in the PDD provides the reader with a clear understanding of the nature of the proposed CDM project activity, its boundaries and how it is going to contribute with the reduction of GHG emissions.</p> <p>The content and veracity of the project's contribution to local sustainable development was verified against the references provided in the PDD and cross-checked with the content and conclusions of interviews and research of secondary sources, specifically:</p> <p><b>Technological innovation to reduce environmental impact:</b> Tests with bulb turbines carried out by Pavlov et al., 2002 and Godinho &amp; Boyd, 2009, found them to be the least harmful turbines.</p> <p>The Ichthyofauna Conservation Program (PBA 4.17, Programa de Conservação da Ictiofauna) presented by the PP to IBAMA in order to obtain IL states that several studies on pressure variation, blades, friction etc, which affect eggs and larvae, suggest that mortality associated with the passage through turbines can be relatively low in low head plants with Kaplan or Bulb turbines.</p> <p><b>Connection of isolated system and diversification of energy matrix:</b> These benefits are referenced by the Brazilian Ministry for Mines and Energy: National Energy Plan 2030 (MME PNE 2030, 2007 p 81; 88).</p>	

	Validated situation		Conclusion
	<b>Promotion of regional development:</b> The payment of Royalties and Taxes was validated in Section 7c. Investment analysis, the training efforts and results were validated on the basis of Camargo Corrêa (Camargo Corrêa, 2012), page 29 and the information about Mutum Paraná was validated against the Final Report submitted to IBAMA (ESBR, Final Report IBAMA, 2012), Annex 4.14, Report of the Relocation Program for the Affected Population, pages 40-42		
2. Confirm that the exact project location is provided in the PDD with Geographical coordinates, check the accuracy of them and the format of the notation (Grades, minutes, seconds or decimal indicating latitude N or S and Longitude E or W) Please include here the Geographical coordinates:	The project's coordinates presented in the PDD (9° 15' 17.96" S; 64° 38' 40.13" W) are in accordance with those mentioned on page 1 of the Environmental installation permit issued on 03 June 2009 (IBAMA, 2009_06_03)  These coordinates were also confirmed by the validation team during the site visit with the aid of a GPS device.		OK
3. Confirm that the physical site inspection reflects the description in the PDD of the proposed CDM project activity.  Describe briefly the physical site inspection: Travel details and installations, facilities and buildings visited.	A 6-day site visit was carried out in May and June 2012 (1.5 day of travel time). Three days were spent in the PP's head office (21 and 22 May and 04 June 2012), where the project's conceptual issues were discussed. The project activity's site was visited on 23 and 24 May 2012, when the construction works were observed and the PP's personnel, as well as representatives of the stakeholders, were interviewed. The detailed site visit plan is shown in the item 3.2 of this report.		OK
4. If the team did not undertake a physical site inspection, describe the justification as approved by the CDM Quality Manager. (VVS 02.0: 65-67)	N.A.		N.A.
5. If the proposed CDM project activity involves the alteration of an existing installation or process, ensure that the project description clearly states the differences resulting from the project activity compared to the pre-project situation.	Pre-project	Project activity	N.A.
	NA. As confirmed during the site visit, the project activity does not involve the alteration of an existing installation or process (CDM VVS v02, 2012, paragraph 68).		
6. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance (ODA).	As discussed during the visit to the PP's head office and as stated in the PDD appendix 2, there will be no public funding from Annex I parties or from ODA. The validation team confirms, from its host country expertise, that the BNDES is the predominant financing source for all capital intensive investments in the energy sector in Brazil. This is also referenced by Sousa & Ottaviano (Sousa &		OK

	Validated situation	Conclusion
	<p>Ottaviano, 2009). Commercial banks only act as intermediaries for 50% of the total loan. Therefore all third party financing is being provided by the Brazilian Development Bank as part of its policy to promote hydro power and renewable energy projects.</p> <p>This is referenced by the FSR (FSR, 2008) and by BNDES' public press announcements about the loan approval (BNDES, 2009).</p>	
<p>7. If the project activity is a small scale one, confirm that it is not a debundled component of a large scale project, in line with the Guidelines for assessment of de-bundling for SSC project activities.</p> <p>Check if there is another registered small scale project activity or an application to register one.</p> <p>Take into account specific debundling requirements for Type I project activities.</p> <p>Describe how this has been validated.</p>	<p>The project is not small scale. The output capacity (total nominal capacity: 3,750 MW, according to PDD section A) is greater than 15 MW (decision 17 CP.7).</p>	OK

	Validated situation	Conclusion
<b>SECTION 6. Application of the selected baseline and monitoring methodology applicability</b>		
1. Have the baseline and monitoring methodologies selected by the project participants been previously approved by the CDM Executive Board, that is, does it appear on the methodologies page of the UNFCCC website?	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/></p> <p>The project activity applies the ACM0002 Version 13.0.0 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002 v13, 2012)</p> <p>The methodology refers to the following tools:</p> <ul style="list-style-type: none"> <li>• Tool to calculate the emission factor for an electricity system;</li> <li>• Tool for the demonstration and assessment of additionality;</li> <li>• Combined tool to identify the baseline scenario and demonstrate additionality;</li> <li>• Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion.</li> </ul> <p>The project activity follows the</p> <ul style="list-style-type: none"> <li>• “Tool for the demonstration and assessment of additionality” version 6.0.0 (CDM EB 65 Annex 21 2011) and the</li> <li>• “Tool to calculate the emission factor for an electricity system” version 02.2.1 (CDM EB 63 Annex 19, 2011)</li> </ul> <p>The Combined tool to identify the baseline scenario and demonstrate additionality is not applicable, the project being a Greenfield project activity. The Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion is not applied as the project activity does not involve fossil fuel combustion.</p>	OK
2. If the project activity is a Small Scale one; does it qualify within the threshold of the three possible types of small scale projects? Confirm information provided in the PDD.	The project is large scale.	N.A.
3. If the project activity is a Small Scale one; which approved small scale methodology does the project apply? Confirm that the SSC methodology is applied with the general guidelines to SSC CDM methodologies.	The project is large scale.	N.A.

	Validated situation	Conclusion																
<p>4. Determine whether the methodology selected is applicable to the project activity including that the used version is valid.</p> <p>Describe steps taken to assess the relevant information contained in the PDD in the table below.</p>	<p><b>CL 15:</b> the PP was asked with respect to his intention to adopt the recently issued version of the methodology ACM0002, version 13.0.0 (CDM EB 67, 2012). The PDD was amended to conform to the methodology’s new version.</p> <p>The proposed project activity was confirmed to meet the applicability conditions of the selected methodology and methodological tools as below.</p> <p>Out of the tools referenced in the applied methodology, the Combined tool to identify the baseline scenario and demonstrate additionality and the Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion are not used in the project.</p>	<p>OK</p> <p>CL 15, closed</p>																
	<table><tr><th>Methodology/Tool</th><th>Version of AM/ AT mentioned in the PDD version 2</th><th>Number / date of latest version</th><th>Validation of the version adopted in the PDD</th></tr><tr><td>ACM0002</td><td>13.0.0</td><td>13.0.0, 11 March 2012</td><td>OK, the latest version is being used</td></tr><tr><td>Tool for the demonstration and assessment of additionality</td><td>6.0.0</td><td>06.0.0, 25 Nov 11</td><td>OK, the latest version is being used</td></tr><tr><td>Tool to calculate the emission factor for an electricity system</td><td>2.2.1</td><td>2.2.1, 29 Sep 11</td><td>OK, the latest version is being used</td></tr></table>	Methodology/Tool	Version of AM/ AT mentioned in the PDD version 2	Number / date of latest version	Validation of the version adopted in the PDD	ACM0002	13.0.0	13.0.0, 11 March 2012	OK, the latest version is being used	Tool for the demonstration and assessment of additionality	6.0.0	06.0.0, 25 Nov 11	OK, the latest version is being used	Tool to calculate the emission factor for an electricity system	2.2.1	2.2.1, 29 Sep 11	OK, the latest version is being used	
	Methodology/Tool	Version of AM/ AT mentioned in the PDD version 2	Number / date of latest version	Validation of the version adopted in the PDD														
	ACM0002	13.0.0	13.0.0, 11 March 2012	OK, the latest version is being used														
	Tool for the demonstration and assessment of additionality	6.0.0	06.0.0, 25 Nov 11	OK, the latest version is being used														
Tool to calculate the emission factor for an electricity system	2.2.1	2.2.1, 29 Sep 11	OK, the latest version is being used															

No.	Applicability and inapplicability conditions in the ACM0002 Version 13.0.0 (CDM VVS, v022012, paragraph 76-77)	Information in the PDD	Steps taken to assess PDD information	Conclusion
<b>Applicability conditions of ACM0002</b>				
1	<i>The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro</i>	<i>PDD B.2: "The project activity is a grid-connected renewable power generation project activity that installs a new power plant</i>	It was confirmed during the site visit that the project activity is the installation of a new hydro power plant.	OK

	power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant);		
2	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter EGPJ,y): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	PDD B.2: "The project activity does not involve a capacity addition, a retrofit of (an) existing plant(s) or a replacement of (an) existing plant(s);"	As confirmed during the site visit, the project activity is a Greenfield project and it does not involve a capacity addition, a retrofit or a replacement of an existing plant.	OK
3	In case of hydro power plants, one of the following conditions must apply: <ul style="list-style-type: none"> <li>The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or</li> <li>The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m<sup>2</sup>; or</li> <li>The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per</li> </ul>	PDD B.2: "The project activity results in a new single reservoir and the power density of the power plant is greater than 4 W/m <sup>2</sup> after the implementation of the project activity"	The fulfilment of the condition was demonstrated during the site visit and desk review. The power density is 10.4 W/m <sup>2</sup> (please refer to the validation of this parameter in the section 6.c.1 of this protocol).	OK

	<i>the definitions given in the project emissions section, is greater than 4 W/m<sup>2</sup>.</i>			
4	<p><i>In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m<sup>2</sup> all the following conditions must apply:</i></p> <ul style="list-style-type: none"> <li><i>The power density calculated for the entire project activity using equation 5 is greater than 4 W/m<sup>2</sup>;</i></li> <li><i>Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant;</i></li> <li><i>Water flow between multiple reservoirs is not used by any other hydro power unit which is not a part of the project activity;</i></li> <li><i>Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m<sup>2</sup>, is lower than 15 MW;</i></li> </ul> <p><i>Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m<sup>2</sup>, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.</i></p>	Not applicable.	Not applicable, as the hydro power plant will implement and use one single reservoir where the power density of the reservoir is higher than 10 W/m <sup>2</sup> .	OK
<b><i>Inapplicability condition of ACM0002 (CDM VVS, v02, 2012, paragraphs 76-77)</i></b>				
5	<i>Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil</i>	<i>PDD B.2: "The project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity"</i>	As demonstrated during the site visit and desk review, the project activity does not involve switching from fossil fuels to renewable energy sources.	OK

	<i>fuels at the site;</i>			
6	<i>Biomass fired power plants;</i>	<i>PDD B.2: "The project activity is not a biomass fired plant"</i>	As demonstrated during the site visit and desk review, the project activity is not a biomass fired power plant.	OK
7	<i>A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m<sup>2</sup>.</i>	<i>PDD B.2: "The project activity results in a new single reservoir and the power density of the power plant is greater than 4 W/m<sup>2</sup> after the implementation of the project activity"</i>	The fulfilment of the condition was demonstrated during the site visit and desk review. The power density is 10.4 W/m <sup>2</sup> (please refer to the validation of this parameter in the section 6.c.1 of this protocol).	OK
<b>Applicability condition of "Tool to calculate the emission factor for an electricity system"</b>				
8	<i>This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).</i>	<i>PDD B.2: "The project activity meets the applicability conditions of the "Tool to calculate the emission factor for an electricity system", and the "Tool for the demonstration and assessment of additionality"</i>  <i>and</i> <i>PDD A.1: "electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources."</i>	The fulfilment of the condition was demonstrated during the site visit and desk review.	OK
<b>In applicability condition of the "Tool to calculate the emission factor for an electricity system"</b>				
9	<i>In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.</i>	<i>PDD B.2: "The project activity meets the applicability conditions of the "Tool to calculate the emission factor for an electricity system", and the "Tool for the demonstration and assessment of additionality"</i>  <i>and</i> <i>PDD A.1: the project "consists of the installation of a new grid-connected renewable run-of-river hydro power plant,</i>	As demonstrated during the site visit, the project activity is totally located in Brazil, which is not an Annex I country.	OK

		<i>situated in Rondônia State, in the North Region of Brazil (hereafter referred to as the "Host Country")."</i>	
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	Validated situation	Conclusion
5. Confirm that any specific guidance provided by the CDM Executive Board in respect to an approved methodology has been correctly applied.	The methodology sets the clear criteria to check the applicability conditions and each condition is checked as detailed above.	OK
6. If a determination regarding the applicability of the selected methodology to the proposed CDM project activity cannot be made, request clarification of the methodology in line with the guidance provided by the CDM Executive Board.  Describe the clarification request and response.	N.A.	N.A.
7. If the Validation Team determines that the proposed CDM project activity does not comply with the applicability conditions of the methodology, the Team may proceed by means of requesting revision to or deviation from the methodology in line with the guidance provided by the CDM Executive Board.  Describe the request for revision or deviation and approval by the CDM Executive Board. (CDM VVS, version 02.0, paragraph 78-81)	N.A.	N.A.

	Validated situation	Conclusion
<b>SECTION 6a. Project boundary</b>		
1. Does the project boundary include physical, geographical site of the industrial facility, processes, or equipment that are affected by the project activity? (CDM VVS, version 02.0, paragraph 86)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/> The project boundary was described in the PDD, section B.3, figure 5, as the hydro power plant facility and the entire National Interconnected System. This is in accordance with the adopted methodology ACM0002, which states that “the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.”	OK
2. If the proposed project activity has both Afforestation/Reforestation (A/R) and non-A/R components, to avoid double counting of emission sources, LRQA shall confirm that the emissions associated with the A/R activity will be accounted for and documented by the A/R project activity.	N.A.	N.A.
3. If there are any GHG emissions occurring within the proposed CDM project activity boundary, which are not addressed by the applied methodology and which are expected to contribute more than 1% of the overall expected average annual emissions reductions as a result of the implementation of the project, LRQA shall request clarification of, revision to, or deviation from the methodology as appropriate (CDM VVS, version 02.0, paragraph 87).	During the documental review or the site visit, no GHG emissions occurring within the proposed CDM project activity boundary were identified, besides those addressed by the applied methodology, which are expected to contribute more than 1% of the overall expected average annual emissions reductions.	OK

	Validated situation	Conclusion
<p>4. Confirm that all sources and GHGs required by the methodology have been included within the project boundary.</p> <p>Describe here if any emission source that will be affected by the project activity and is not addressed by the approved methodology, has been identified. In such case request clarification of, revision to or deviation from the methodology in accordance with EB guidance.</p> <p>Use the table below for this purpose:</p>	<p>All sources and GHGs required by the methodology have been included within the project boundary. (CO<sub>2</sub> from the grid for the baseline; CH<sub>4</sub> emissions from the reservoir for the project activity).</p> <p>No additional emission source, besides those addressed by the applied methodology, was identified during the desk review or the site visit.</p>	OK

Gases And Sources Included In The Project Boundary						
	Source	Gas	Inc./Exc. PDD	Justification PDD	Steps Taken To Assess PDD Justification	Conclusion
BASELINE	Power plants supplying energy to SIN	CO <sub>2</sub>	Yes	Main emission source	The selected baseline is justified, since the project was confirmed through the desk review and the site visit as a greenfield plant and the installation of a new grid-connected renewable power plant/unit. The declared baseline sources are in accordance with the baseline scenario determined by the adopted methodology ACM0002 and the Tool to calculate the emission factor for an electricity system.	OK
		CH <sub>4</sub>	No	Minor emission source		OK
		N <sub>2</sub> O	No	Minor emission source		OK
PROJECT	For geothermal power plants, fugitive emissions of CH <sub>4</sub> and CO <sub>2</sub> from non-condensable gases contained in geothermal steam.	CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	No	Not applicable	The project is a new hydro power plant.	OK

	CO <sub>2</sub> emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants.	CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	No	Not applicable		OK
	For hydro power plants, emissions of CH <sub>4</sub> from the reservoir.	CO <sub>2</sub>	No	Not applicable	The project's reservoir power density (10.4 W/m <sup>2</sup> ) is slightly higher than the threshold of 10 W/m <sup>2</sup> above which, according to the methodology ACM0002, the methane emissions from the project activity's reservoir must not be accounted for emissions calculation purposes (for the validation of the project's power density, refer to the item 6.c.1 of this protocol). For this reason the ex-ante calculation of emission reductions did not take into consideration any emissions from the reservoir. Nevertheless, as explained in the PDD section B.6, parameter A <sub>PJ</sub> , the area of the reservoir in the surface of the water, will be continuously measured and the methane emissions will be accounted for if the power density falls below the minimum level of 10 W/m <sup>2</sup> during any specific period.	OK
		CH <sub>4</sub>	Yes	Main emission source		
		N <sub>2</sub> O	No	Not applicable		

	Validated situation	Conclusion
<b>SECTION 6b. Baseline scenario identification and description.</b>		
1. Determine whether the PDD provides a verifiable description of the identified baseline scenario, including a description of the technology that would be employed and/or the activities that would take place in the absence of the proposed CDM project activity.	The identified baseline scenario (Electricity provided to the grid by more-GHG-intensive technologies) and the description of the technology to be employed are clearly described in the PDD item B.3 figures 4 and 5 and are in accordance with ACM 0002 version 13.0.0.	OK
2. Confirm that any procedure contained in the methodology to identify the most reasonable baseline scenario, has been correctly applied.	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/></p> <p>According to the Tool for the demonstration and assessment of additionality (CDM EB 65 Annex 21 2011), project activities that apply the Tool in the context of the approved consolidated methodology ACM0002 only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity. Among other alternative scenarios, provision of equivalent amount of electricity by the grid system is considered as a credible and feasible alternative that satisfies the requirement of the methodology/tool.</p> <p>According to the ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:  <i>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, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".</i></p>	OK
3. Check each step in the procedure described in the PDD to identify the baseline scenario against the requirements of the methodology. (Note that if the methodology requires use of tools, that is, such as the tool for the demonstration and assessment of additionality and the combined tool to identify the baseline scenario and demonstrate additionality, the guidance in the methodology shall supersede it in the tool.)	As stated in the PDD in item B.4, the project activity is the installation of a new grid-connected renewable power plant. In this situation, the baseline scenario is determined by the methodology ACM0002, as mentioned above.	OK

	Validated situation	Conclusion
4. Based on financial expertise and local and sectoral knowledge, determine whether all scenarios that are considered by the project participants and are supplementary to those required by the methodology, are reasonable in the context of the proposed CDM project activity and that no reasonable alternative scenario has been excluded. Use the table below for this purpose:	As confirmed above, provision of equivalent amount of electricity by the grid system is considered as a credible and feasible alternative that satisfies the requirement of the methodology/tool. The PP does not consider any scenario supplementary to those required in the methodology. No reasonable alternative scenario was excluded.	OK

Alternative Scenario Ref.	Description in the PDD	Cross-checked with	Validation Opinion
The baseline scenario is determined by the applied methodology and no further analysis is necessary as per VVS paragraph 115.			

5. Determine whether the baseline scenario identified is reasonable by validating the assumptions, calculations and rationales used, as described in the PDD. It shall be ensured that documents and sources referred to in the PDD are correctly quoted and interpreted. Cross check the information provided in the PDD with other verifiable and credible sources, such as local expert opinion. The table above may be used for this purpose.	<p>The baseline scenario identified in PDD, i.e., the operation of grid-connected power plants and the addition of new generation sources, is the current practice and conforms to the methodology applied (ACM002 version 13.0.0)</p> <p>No other plausible and credible alternatives to the project activity were identified, which are economically attractive and technically feasible.</p> <p>The provision of equivalent amount of electricity by the grid system is a credible and feasible alternative and satisfies the requirement of the methodology/tool.</p>	OK
6. Is the identified baseline scenario in line with regulatory or legal requirements and does it take into account relevant national and/or sectoral policies?	<p>Yes. The energy generation, transmission and distribution is done by the ONS in the context of the SIN (Integrated National System), which is regulated in the host country by a governmental body (ANEEL). The electricity delivered to the grid by the project would necessarily, in the baseline scenario, be produced by the operation of grid-connected power plants in the SIN.</p> <p>The scenario is legally compliant and is current practice.</p>	OK
7. If applicable, identify the type of national and/or sectoral policies: <ul style="list-style-type: none"> <li>- E+: Those adopted after the adoption of the Kyoto Protocol (11 December 1997) shall not be taken into account in identifying the baseline scenario.</li> </ul>	CL 17: The PP was asked to provide and has provided clarification on the difference between loan conditions offered to Wind and Hydro power projects in terms of Basic Spread and Loan Payback period and on the references that demonstrate that the support conditions for hydro power have been established with the objective to reduce GHG emission reductions and not for other reasons.	OK CL 17, closed

<p>Please describe how the baseline scenario refers to the hypothetical situation without these national and or sectoral policies.</p> <ul style="list-style-type: none"> <li>- E-: Those adopted after the adoption of the M&amp;P for a CDM (11 November 2001) shall not be taken into account in identifying the baseline scenario. Please describe the hypothetical situation without these national and/or sectoral regulations being taken into account for the baseline identification.</li> </ul>	<p>This CL has been closed out. For details, please refer to the section Findings, at the end of this report.</p> <p>No E+ policies have been identified related to the baseline scenario.</p> <p>Different E- policies that provide comparative advantages to the implementation of the project activity when compared to GHG intensive technologies were identified. These policies were established to promote the Jirau Hydro Power Plant implementation and other renewable energies and have accurately been described in the PDD and taken into account for identification of the baseline scenario. The policies generate a comparative advantage for the project activity and renewable energy in general as they offer preferential financing conditions when compared to more GHG intensive technologies and therefore they promote the financial viability of the project activity and improve its competitiveness in relation to GHG intensive fossil fuelled thermal power plants. The policies have been implemented by the Brazilian Development Bank BNDES, which is one of the Brazilian Government's key economic policy instruments (Sousa &amp; Ottaviano, 2009). To promote the implementation of the Jirau HPP, it has established special support conditions which were announced by the Bank on 28 April 2008 (BNDES, 2008). These preferential conditions are part of a broader policy to promote hydro power and other renewable energies, as referenced by the Bank's website (BNDES FINEM, 2012) and by a specific statement which was issued by the Bank to clarify that favourable financing conditions for renewable energies, when compared to GHG intensive generation technologies based on fuel oil and coal, are part of its policy to promote a clean expansion of the Brazilian energy matrix, (BNDES, 2012). According to the letter, in line with the Bank's website, the promotional policy is based on:</p> <ul style="list-style-type: none"> <li>a) a reduction in the Financial Cost</li> <li>b) a reduction in the Basic Spread</li> <li>c) a higher loan amortization period and</li> <li>d) an increased participation of the Bank in the total investment.</li> </ul> <p>A summary regarding the actions taken to validate each parameter is as follows:</p> <p><b>a) Reduction in Financial Cost:</b></p> <p>The TJLP is the interest rate which the BNDES pays to capture the major part of its funds and thus is included in the cost of the loans given to any project. This minimum financing cost applies for renewable energies, while GHG intensive generation plants based on coal and oil pay a higher financial cost. While the financial cost for renewable energies is 100% defined by the TJLP, the financial costs for thermal generation from coal or oil is defined by</p>	
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	<p>50% of TJLP plus 50% of the TJ-462. Once the TJ-462 is the TJLP plus 1 percentage point (BNDES Loan Composition, 2012), this benefit means a difference of half a percentage point in the cost of debt, and thus a comparative advantage, for renewable energies. This benefit has been established after 11 November 2001, as explained below.</p> <p><b>b) Reduction in Basic Spread:</b> A reduced Basic Spread of 0.5% instead of 1.8% as applicable for coal and fuel oil fired generation assets reduces the cost of debt by an additional 1.4 percentage points when compared to GHG intensive technologies and therefore provides an additional comparative advantage (BNDES, 2008). This benefit has been established after 11 November 2001, as explained below.</p> <p><b>c) Higher loan amortization period:</b> BNDES provides an extension in the loan amortization period from 14 years (for thermal generation from coal or oil) to 20 years for the Jirau HPP and other hydro power projects with an installed capacity of 1,000 MW or higher (BNDES FINEM, 2012, BNDES, 2008). Again this provides a comparative advantage to the implementation of the project activity. This benefit has been established after 11 November 2001, as explained below.</p> <p><b>d) Increased participation of the Bank in the total investment:</b> A financing participation cap of 50% is imposed by the BNDES for GHG intensive generation activities, while the participation in the financing for renewable and hydro power is up to 70%. (BNDES FINEM, 2012; BNDES, 2012). This benefit has been established after 11 November 2001, as explained below.</p> <p>This policy to promote renewable energies with a reduction in interest rates and improved financing conditions is an instrument used by BNDES since 2008 to promote the expansion of clean energy generation in the country, as confirmed by the Brazilian Research Company (EPE) in the technical note “Abatement of GHG emissions due to the production and use of energy in Brazil up to 2020” (EPE, 2010), page 16, footnote 12. Furthermore this was confirmed on the basis of the Brazilian Development Bank’s statement (BNDES, 2012), which clarifies that the differentiation in the basic spread, the participation and the extended loan payback periods were capable of reducing the financial cost of the Jirau</p>	
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	<p>HPP and hydro power projects in general to guarantee their competitiveness with coal and fuel oil based generation alternatives (please refer to appendix B for references).</p> <p>The BNDES (BNDES, 2012) letter also clarifies that this policy development started only in 2007 and that prior to the year 2006 no differentiation or preference for any generation source applied. This is also confirmed by a BNDES press release of 26 September 2006, (BNDES, 2006), which shows that, on that date, it was not giving any advantage to less GHG intensive projects over the more intensive ones, regarding the BNDES remuneration, the financing costs, the debt amortization period or the financing participation cap. The validation team confirms that no evidence was found that such benefits were being given before 2006 and much less before 11 November 2001.</p> <p>Another independent reference about the establishment of support policies for hydro power and other renewable is a press release from the Brazilian Association for Mineral Coal which makes explicit reference to the support policies for renewable energies which have been established in 2008 (ABCM, 2010).</p> <p><u>Validation of the abovementioned benefits as per CDM EB22 Annex3 and CDM VVS, v02, 2012:</u></p> <p>The validation team concluded that the policies mentioned were enacted post 11 November 2001 and give comparative advantages to less emissions-intensive over more emissions-intensive technologies and, according to the guidance of CDM EB22 Annex 3 as well as the CDM VVS v02, paragraph 93, need not to be taken into account in developing a baseline scenario. Accordingly the comparative advantages which are generated by reduced interest rates, extended loan payback periods and higher share of financing when compared to GHG intensive technologies were not considered by the PP in the project's financial analysis. This approach is deemed correct to eliminate the comparative advantage offered by the BNDES to the Jirau HPP from the financial analysis and thus to conduct the additionality analysis under baseline conditions, i.e. in a hypothetical situation without the national/and/or sectoral E- policy for differentiation of financing cost in place.</p> <p>Though this does not seem relevant for the identification of an E- policy, there are multiple consistent and supplementary references from different governmental and non governmental entities which reference that the policy has the objective to contribute to GHG mitigation. Key references are cited above and supplementary references are provided below.</p>	
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	On the basis of the responses that the PP provided to <b>CL 17</b> , the validation team agrees that the difference in interest rates and amortisation period between wind and hydro power is explained by the fact that hydro power needs stronger support and extended payback periods to be competitive. This has been referenced by the BNDES clarification letter (BNDES, 2012) and is in line with the conclusion of the World Bank (World Bank, 2000).	
8. Is this identification supported by official and/or verifiable documents (for example, studies, web pages, certificates, etc)?	<p>The importance of hydro power in general and specifically the Jirau HPP for a clean expansion of the Brazilian energy matrix and the policies established to promote their implementation are referenced by official documents, as shown below:</p> <ul style="list-style-type: none"> <li>a) The Governmental Energy Research Company (EPE), which is responsible for the planning of the Brazilian Energy Policy in 2007 published the National Energy Plan 2030 which identifies hydroelectricity as the preferred alternative to thermal generation sources and to achieve GHG emission reductions. The CDM is mentioned as relevant financing mechanism (EPE, 2007b).</li> <li>b) In the 10-year expansion plan published by EPE on December 2007, Jirau is defined to be a plant of highest priority which receives special attention by the regulator to promote its implementation (Table 19, page 420) and the clean expansion and GHG reduction is cited as one of the key objectives for this policy (page 55) (EPE, 2007a).</li> <li>c) As per Resolution N°1, of 11 February 2008 by the Brazilian National Council for Energy Policy (CNPE, 2008), the Jirau HPP plant was declared project of public interest with priority for energy contracting and implementation, which converts the priority defined for the Jirau HPP in the 10-year expansion plan as cited above into a regulatory act.</li> <li>d) The National Plan for Climate Change (Plano Nacional sobre Mudanças do Clima) which was developed during the year 2008, also makes clear reference to hydro power and other renewable energies as fundamental for GHG reduction on the basis of a clean expansion of the energy matrix. The project makes clear reference to the emission reductions related to the Jirau and other hydro power projects and also refers to the BNDES financing conditions as being a key policy to promote GHG mitigation activities (CIM, 2008).</li> <li>e) The Law N° 12.187/09, which defined the Brazilian Law for Climate Change</li> </ul>	OK

	<p>and was enacted in December 2009, defines that the existing and future mechanisms such as i) Preferential licensing and contracting, ii) private public partnerships; iii) preferential financing conditions by private and public Banks, as well as iv) the CDM are among the applicable policy tools to promote GHG mitigation (Law 12187, 2009).</p> <p>Other promotional policies and investment subsidies have been identified, such as a reduction of 75% in income tax for investments in the Amazon region as well as the possibility for accelerated depreciation (both incentives were defined by Federal Law 11.196, Article 32, from 21 November 2005 (Law 11196, 2005)). Now as these incentives are not specific to any technology they do not provide a comparative advantage to the project activity and therefore do not classify as an E- regulation. These policies have been correctly taken into account by investment analysis as developed by the project developer. These policies and their effects have been specifically addressed by CAR 02 and CL 03.</p> <p>In summary, the promotion of the Jirau HPP as clean and renewable energy and thus GHG mitigation project by the regulator and the BNDES is coherent with the general policy context and applicable references. Furthermore the project has been developed in, and is compliant with, the general regulatory context of the host country and all applicable incentive policies have been adequately taken into account. More information about Brazil's general energy sector regulation can be found in the ANEEL web page, <a href="http://www.aneel.gov.br/">http://www.aneel.gov.br/</a>.</p>	
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	Validated situation	Conclusion
<b>SECTION 6c. Algorithms and/or formulae used to determine emission reductions</b>		
<p>1. Compare the equations and parameters in the PDD to those in the selected approved methodology and determine if they have been correctly applied to calculate project emissions, baseline emissions, leakage, and emission reductions.</p> <p>Confirm that adequate justification has been provided for selection between different options.</p>	<p><b>CL 11:</b> The PP was asked to provide and has provided the emission calculations worksheet.</p> <p><b>CAR 03:</b> The PP was asked with respect to the determination of the area of the reservoir's water surface before the project activity (<math>A_{BL}</math>) which, from the validation team standpoint, was not according to the methodology. In response, the PP has changed the adopted valued for <math>A_{BL}</math>, which is now zero. The PDD sections B.6 (Emission reductions) and B.7 (Monitoring plan) have been changed accordingly.</p>	<p>OK</p> <p>CL 11, closed CAR 03, closed</p>

	Validated situation	Conclusion
	<p>The equations and parameters in the PDD were compared to those in the methodology ACM0002 and the Tool to calculate the emission factor for an electricity system and were found to have been correctly applied.</p> <p><b>Project emissions:</b> According to ACM0002 the project emissions are zero (<math>PE_{HP,y} = 0</math>) if the power density of the project is greater than <math>10 \text{ W/m}^2</math>. Once the project is a new hydro run-of-river power plant, the power density (PD) is the ratio between the project's installed capacity (<math>Cap_{PJ}</math>) and the area of the reservoir measured on the surface of the water, after the implementation of the project activity, when the reservoir is full (<math>A_{PJ}</math>). According to the methodology, for new reservoirs, the area of the reservoir measured on the surface of the water before the implementation of the project (<math>A_{BL}</math>) is zero.</p> <p>The level of the full reservoir is 90 metres, the "maximum operational water level upstream" as confirmed from the ANA Resolution 269 of 27 April 2009 (ANA Resolution 269, 2009).</p> <p>The value of <math>A_{PJ}</math> at 90m (maximum operational water level) adopted by the PP was validated from a topographical map produced by the subcontracted consulting company Topocart (2012_07_03), which specialises in topographic studies (<a href="http://www.topocart.com.br">http://www.topocart.com.br</a>). The PP provided an E-mail archive which demonstrates that the topographical survey was produced by Topocart (Email Topocart). The study is signed by the responsible engineer. The topographical survey is signed by the technical person responsible, Givanildo José Silva (CREA_DF: 11522/D). Mr. Givanildo J. da Silva is director of cartography at Topocart, as can be confirmed on the webpages <a href="http://www.topocart.com.br/topo/noticia/46/topocart-executa-levantamento-aerofotogrametrico-e-laser-da-uhe-jirau">http://www.topocart.com.br/topo/noticia/46/topocart-executa-levantamento-aerofotogrametrico-e-laser-da-uhe-jirau</a> and <a href="http://www.topocart.com.br/topo/noticia/41/topocart-participa-do-projeto-da-uhe-belo-monte">http://www.topocart.com.br/topo/noticia/41/topocart-participa-do-projeto-da-uhe-belo-monte</a>.</p> <p>The topographical survey was last submitted to the PP on 22 August 2008 and determines the total surface area (including the original river surface) at different operational levels (82.5; 85 and 90 m). At the quota of 90 m, as defined as the maximum operational level, the total water surface is <math>361.60 \text{ Km}^2</math>. Therefore the nature and quality of the reference complies with the requirements of ACM0002.</p> <p>The total installed capacity (<math>Cap_{PJ}</math>) has been validated on the basis of the site visit, the Basic Design Study (2010) and by official approval from the Brazilian Ministry</p>	

	Validated situation	Conclusion
	<p>for Mines and Energy (MME, Portaria 26, 2011_08_01). The value is also corroborated by other documents (CDM Notification 2011_08_17), which is the 3<sup>rd</sup> notification on CDM consideration of Jirau HPP with 50 turbines (3.750 MW) sent to the UNFCCC on 17 August 2011). Furthermore, the Sector Expert confirmed its accuracy on the basis of the site visit and its sector expertise.</p> <p>Based on <math>A_{PJ}</math> and <math>Cap_{PJ}</math>, the power density is then <math>3,750 \text{ MW}/361.60 \text{ Km}^2 = 10.4 \text{ W/m}^2</math>. Hence, as per ACM0002, the project emissions can be regarded as zero (<math>PE_{HP,y} = 0</math>).</p> <p><b>Baseline emissions:</b> Still according to ACM0002 the baseline emissions are</p> $BE_y = EG_{PJ,y} \cdot EF_{grid, CM,y}$ <p>where <math>EF_{grid, CM,y}</math> is estimated using the latest data calculated and published by the Brazilian DNA according to the latest version of the “Tool to calculate the emission factor for an electricity system”.</p> <p>The PP chose to use the values of <math>EF_{grid, CM,y}</math> supplied by the Brazilian Designed National Authority (DNA), which calculates the emission factors of the SIN according to the tool and makes them available to the public. The PP applied the latest values of <math>EF_{grid, BM,y}</math> and <math>EF_{grid, OM,y}</math> (year of 2010) as available on the 24 April 2012, which is the day the PDD was published for global stakeholder consultation. The fact that the Build Margin for 2011 was not yet available on that day was validated on the basis of a print screen of the DNA’s respective website (Brazil DNA, GEF 2011, 2012_04_24). Another print screen (Brazil DNA, GEF 2010, 2012_04_24) for the website for the values of the year 2010 was used to validate the latest available value for the Build margin as used in the PDD. This value was cross-checked with the DNA’s website: <a href="http://www.mct.gov.br/index.php/content/view/72764.html">http://www.mct.gov.br/index.php/content/view/72764.html</a></p> <p><b>Leakage:</b> Still according to ACM0002, no leakage emissions apply and therefore were left out of account.</p>	

	Validated situation		Conclusion																					
<div>2. Verify the justification given in the PDD for the choice of data and parameters used in the equations to determine estimated emission reductions.</div> <div>If data and parameters will not be monitored throughout the crediting period and will remain fixed, assess that all data sources and assumptions are appropriate and calculations are correct, applicable to the proposed CDM project activity and will result in a conservative estimate of the emission reductions.</div> <div>If data and parameters will be monitored on implementation and hence become available only after validation of the project activity, confirm that the estimates provided in the PDD for these data and parameters are reasonable.</div> <div>List all data and parameters provided in the PDD in the tables in next column.</div>	<table><tr><th>Data/Parameter title: EF<sub>grid,BM,2010</sub></th><th>Comments</th></tr><tr><td>Value</td><td>0.1404 tCO<sub>2</sub>/MWh</td></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Fixed throughout the crediting period?</td><td>Yes (ex-ante)</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>yes (DNA's webpage)</td></tr><tr><td>Value provided is considered reasonable?</td><td>yes</td></tr><tr><td>Has this value been verified?</td><td>yes (Brazil DNA, GEF 2010)</td></tr><tr><td>Choice of data correctly justified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>value fixed (ex-ante)</td></tr></table>	Data/Parameter title: EF <sub>grid,BM,2010</sub>	Comments	Value	0.1404 tCO <sub>2</sub> /MWh	Title in line with methodology?	Yes	Fixed throughout the crediting period?	Yes (ex-ante)	Data unit correctly expressed?	Yes	Appropriate description of parameter?	Yes	Source clearly referenced?	yes (DNA's webpage)	Value provided is considered reasonable?	yes	Has this value been verified?	yes (Brazil DNA, GEF 2010)	Choice of data correctly justified?	Yes	Measurement method correctly described?	value fixed (ex-ante)	OK
	Data/Parameter title: EF <sub>grid,BM,2010</sub>	Comments																						
	Value	0.1404 tCO <sub>2</sub> /MWh																						
	Title in line with methodology?	Yes																						
	Fixed throughout the crediting period?	Yes (ex-ante)																						
	Data unit correctly expressed?	Yes																						
	Appropriate description of parameter?	Yes																						
	Source clearly referenced?	yes (DNA's webpage)																						
	Value provided is considered reasonable?	yes																						
	Has this value been verified?	yes (Brazil DNA, GEF 2010)																						
	Choice of data correctly justified?	Yes																						
	Measurement method correctly described?	value fixed (ex-ante)																						
	<table><tr><th>Data/Parameter title: EF<sub>Res</sub></th><th>Comments</th></tr><tr><td>Value</td><td>90 KgCO<sub>2</sub>/MWh</td></tr><tr><td>Title in line with methodology?</td><td>yes</td></tr><tr><td>Fixed throughout the crediting period?</td><td>yes</td></tr><tr><td>Data unit correctly expressed?</td><td>yes</td></tr><tr><td>Appropriate description of parameter?</td><td>yes</td></tr><tr><td>Source clearly referenced?</td><td>yes (EB23 annex 5, item ii)</td></tr><tr><td>Value provided is considered reasonable?</td><td>yes</td></tr><tr><td>Has this value been verified?</td><td>yes (EB23 annex 5, item ii)</td></tr><tr><td>Choice of data correctly justified?</td><td>yes</td></tr><tr><td>Measurement method correctly described?</td><td>the value is fixed</td></tr></table>	Data/Parameter title: EF <sub>Res</sub>	Comments	Value	90 KgCO <sub>2</sub> /MWh	Title in line with methodology?	yes	Fixed throughout the crediting period?	yes	Data unit correctly expressed?	yes	Appropriate description of parameter?	yes	Source clearly referenced?	yes (EB23 annex 5, item ii)	Value provided is considered reasonable?	yes	Has this value been verified?	yes (EB23 annex 5, item ii)	Choice of data correctly justified?	yes	Measurement method correctly described?	the value is fixed	
	Data/Parameter title: EF <sub>Res</sub>	Comments																						
	Value	90 KgCO <sub>2</sub> /MWh																						
	Title in line with methodology?	yes																						
	Fixed throughout the crediting period?	yes																						
	Data unit correctly expressed?	yes																						
	Appropriate description of parameter?	yes																						
	Source clearly referenced?	yes (EB23 annex 5, item ii)																						
	Value provided is considered reasonable?	yes																						
	Has this value been verified?	yes (EB23 annex 5, item ii)																						
	Choice of data correctly justified?	yes																						
	Measurement method correctly described?	the value is fixed																						
	<table><tr><th>Data/Parameter title: Cap<sub>BL</sub></th><th>Comments</th></tr><tr><td>Value</td><td>Zero (MW)</td></tr><tr><td>Title in line with methodology?</td><td>yes</td></tr><tr><td>Fixed throughout the crediting period?</td><td>yes</td></tr><tr><td>Data unit correctly expressed?</td><td>yes</td></tr><tr><td>Appropriate description of parameter?</td><td>yes</td></tr><tr><td>Source clearly referenced?</td><td>yes</td></tr><tr><td>Value provided is considered reasonable?</td><td>yes (new greenfield HPP)</td></tr><tr><td>Has this value been verified?</td><td>yes (site visit)</td></tr><tr><td>Choice of data correctly justified?</td><td>yes</td></tr><tr><td>Measurement method correctly described?</td><td>the value is fixed (zero)</td></tr></table>	Data/Parameter title: Cap <sub>BL</sub>	Comments	Value	Zero (MW)	Title in line with methodology?	yes	Fixed throughout the crediting period?	yes	Data unit correctly expressed?	yes	Appropriate description of parameter?	yes	Source clearly referenced?	yes	Value provided is considered reasonable?	yes (new greenfield HPP)	Has this value been verified?	yes (site visit)	Choice of data correctly justified?	yes	Measurement method correctly described?	the value is fixed (zero)	
	Data/Parameter title: Cap <sub>BL</sub>	Comments																						
	Value	Zero (MW)																						
	Title in line with methodology?	yes																						
	Fixed throughout the crediting period?	yes																						
	Data unit correctly expressed?	yes																						
	Appropriate description of parameter?	yes																						
	Source clearly referenced?	yes																						
	Value provided is considered reasonable?	yes (new greenfield HPP)																						
Has this value been verified?	yes (site visit)																							
Choice of data correctly justified?	yes																							
Measurement method correctly described?	the value is fixed (zero)																							

	Validated situation		Conclusion
2.(continuation)	Data/Parameter title: A <sub>BL</sub>		OK
	Value	Zero	
	Title in line with methodology?	yes	
	Fixed throughout the crediting period?	yes	
	Data unit correctly expressed?	yes	
	Appropriate description of parameter?	yes	
	Source clearly referenced?	yes	
	Value provided is considered reasonable?	yes(new greenfield HPP)	
	Has this value been verified?	yes	
	Choice of data correctly justified?	yes (as per ACM0002)	
	Measurement method correctly described?	the value is fixed (zero)	
	Data/Parameter title: EG <sub>facility,y</sub>		
	Value	19,967,544 MWh/yr	
	Title in line with methodology?	yes	
	Fixed throughout the crediting period?	no	
	Data unit correctly expressed?	yes	
	Appropriate description of parameter?	yes	
	Source clearly referenced?	yes (EPE, 2011_11_07)	
	Value provided is considered reasonable?	Yes	
	Has this value been verified?	Yes (EPE, 2011_11_07)	
	Choice of data correctly justified?	yes	
	Measurement method correctly described?	yes	
	Data/Parameter title: Cap <sub>PJ</sub>		
	Value	3,750,000,000 W	
	Title in line with methodology?	yes	
	Fixed throughout the crediting period?	no	
	Data unit correctly expressed?	yes	
	Appropriate description of parameter?	yes	
	Source clearly referenced?	Yes (MME Portaria 26, 2011)	
	Value provided is considered reasonable?	Yes	
	Has this value been verified?	Yes (MME Portaria 26, 2011)	
	Choice of data correctly justified?	yes	
	Measurement method correctly described?	yes	

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2.(continuation)	Validated situation		Conclusion
	Data/Parameter title: $A_{PJ}$	Comments	
	Value	361,600,000 m <sup>2</sup>	OK
	Title in line with methodology?	yes	
	Fixed throughout the crediting period?	no	
	Data unit correctly expressed?	yes	
	Appropriate description of parameter?	yes	
	Source clearly referenced?	yes	
	Value provided is considered reasonable?	yes	
	Has this value been verified?	Yes (Topocart, 2012_07_03)	
	Choice of data correctly justified?	yes	
	Measurement method correctly described?	yes	
	Data/Parameter title: $EF_{grid,OM-DD}$	Comments	
	Value	0.4787 tCO <sub>2</sub> /MWh	
	Title in line with methodology?	yes	
	Fixed throughout the crediting period?	no	
	Data unit correctly expressed?	yes	
	Appropriate description of parameter?	yes	
	Source clearly referenced?	yes (DNA's webpage)	
	Value provided is considered reasonable?	yes	
	Has this value been verified?	yes (Brazil DNA, GEF 2010, 2012_04_24)	
	Choice of data correctly justified?	yes	
	Measurement method correctly described?	yes	
	Data/Parameter title: $EF_{grid,CM,y}$	Comments	
	Value	0.3095 tCO <sub>2</sub> /MWh	
	Title in line with methodology?	yes	
	Fixed throughout the crediting period?	no	
	Data unit correctly expressed?	yes	
	Appropriate description of parameter?	yes	
	Source clearly referenced?	yes (0,5 x ( $EF_{grid,BM} + EF_{grid,OM}$ ))	
	Value provided is considered reasonable?	yes	
	Has this value been verified?	yes (see $EF_{grid,BM} + EF_{grid,OM}$ )	
	Choice of data correctly justified?	yes	
	Measurement method correctly described?	yes	

	Validated situation		Conclusion
	Data/Parameter title: TEG <sub>y</sub>	Comments	
2.(continuation)	Value	No value was needed for the emissions estimation, once the project's power density is above 10 W/m <sup>2</sup>	OK
	Title in line with methodology?	yes	
	Fixed throughout the crediting period?	no	
	Data unit correctly expressed?	yes	
	Appropriate description of parameter?	yes	
	Source clearly referenced?	yes	
	Value provided is considered reasonable?	yes	
	Has this value been verified?	yes	
	Choice of data correctly justified?	Yes	
	Measurement method correctly described?	yes	
3. Confirm that all assumptions and data used by PPs are listed in the PDD including their references and sources, and that the documentation used as the basis for these assumptions and source of data is correctly quoted and interpreted in the PDD. If the project activity has both A/R and non A/R components, ensure that no emissions associated with the A/R activity are accounted for.	All assumptions and data used by the PPs are mentioned in the PDD section B.6., including their references and sources, and are in accordance with ACM0002. According to ACM0002, the leakage emissions were left out of account.		OK
4. Confirm that all estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.	The calculation of estimates of the baseline emissions were cross-checked with the data sources mentioned in the PDD section B.6.3 (Jirau HPP ER calculation, 2012).		OK
5. If any of the parameters used to calculate ERs have been obtained using sampling methods, please use the "Standard for sampling and surveys for CDM project activities and PoA" paragraphs 20 to 26 to determine whether the sampling plan proposed by the PPs will provide parameter value estimates in an unbiased and reliable manner. Provide the following data for each parameter in	N.A.		N.A.

	Validated situation	Conclusion
the sampling plan: <ul style="list-style-type: none"><li>- The size of the sample: n</li><li>- The acceptance number: c</li></ul>		

	Validated situation	Conclusion
SECTION 7. Additionality of a project activity		
1. Does the PDD clearly describe how the proposed CDM project activity is additional?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> The validation team confirms that the PDD clearly describes how the proposed CDM project activity is additional. The identification of alternative scenarios, prior consideration, investment analysis and discussion of common practice were assessed during the desk review and the site visit. For details, please refer to the items 7.a to 7.e below in this protocol.	OK
2. List the documents and tools provided by the CDM Executive Board used to demonstrate the additionality	1. Tool for the demonstration and assessment of additionality version 06.0.0 (CDM EB 65 Annex 21 2011) 2. Guidance on the demonstration and assessment of prior consideration of the CDM version 04 (CDM EB 62 Annex 13, 2011) 3. Guidelines on the assessment of investment analysis version 05 (CDM EB 62 Annex 5, 2011) 4. “Guidelines on Common Practice” version 01.0 (CDM EB 63 Annex 12, 2011) 5. “Guidelines for the Reporting and Validation of Plant Load Factors”, version 01.0 (CDM EB 48 Annex 11, 2009)	OK
<b><u>Additionality for small-scale project activities</u></b> Determine whether the proposed project activity is additional in accordance with CDM requirements applicable for small-scale project activities: Attachment A to Appendix B of 4/CMP 1 annex II and “non binding best practice examples to demonstrate additionality for SSC project activities”		

	Validated situation	Conclusion
6. Describe and assess the relevant criteria for the automatic additionality of the following cases: <ol style="list-style-type: none"> <li>Type I project activities up to 5 MW that employ renewable energy as their primary technology,</li> <li>Type II energy efficiency project activities that aim to achieve energy savings at a scale of no more than 20 GWh per year,</li> <li>Type III project activities that aim to achieve emissions reductions at a scale of no more than 20 ktCO<sub>2</sub>e per year.</li> </ol>	N.A.	N.A.

	Validated situation	Conclusion
<b>SECTION 7a. Prior consideration of the clean development mechanism</b>		
1. Does the PDD clearly indicate the start date of the project activity in format: dd/mm/yyyy, and is it in line with the Glossary of CDM Terms?	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p><b>CL 19:</b> The PP considers the homologation of the rights to concession as the “real action” of the project activity. The TL asked the PP to explain why an earlier date, such as the auction, or a later date, such as the effective entering into force of the EPC construction contract would not represent “real action” and therefore adequate project starting dates. The PP provided the clarifications.</p> <p>The PDD clearly indicates, in the timeline of table 6 and in the section C, the starting date of the project activity, as 22 July 2008, which is the date of the homologation of the previous auction from 19 May 2008. The homologation officially declared ESBP as due winner of the auction and formally granted the PP with the rights to the concession and with the authority and obligation to pursue the project development. This was as verified on the basis of the regulatory decisions available on ANEEL’s official webpage (ANEEL Homologation, 2008_07_22).</p> <p>To validate the applicability and accuracy of this date according to the Glossary of CDM terms, the DOE analysed if this date is the <u>earliest</u> date at which either the <u>implementation</u> or <u>construction</u> or <u>real action</u> of a CDM project activity begins. For adequate validation, different options and dates and the complete</p>	CL 19, closed OK

	Validated situation	Conclusion
	<p>development history have been analysed as follows:</p> <p>The validator, based on the Preliminary Installation Licence for the jobsite as granted by IBAMA on 14 November 2008 (IBAMA Installation License 563, 2008_11_14) and as verified from interviews during the site visit, confirmed that no implementation or construction activities occurred before 22 July 2008.</p> <p>With respect to real action, although the Engineering, Procurement and Construction (EPC) contract for civil construction was signed on 8 May 2008, it only came into force on 14 November 2008, the day the project obtained the Preliminary Installation License mentioned above. The contract explicitly defines that it does not imply any costs or obligations for its parties before the installation license is obtained, or in case it is not obtained at all. This was confirmed by the validation team on the basis of clause 29.1 page 182 (EPC contract, 2008).</p> <p>Therefore the date of issuance of the Preliminary Installation License, i.e. 14 November 2008, is the date when the PP has effectively committed to expenditures related to the implementation or construction of the project activity and would classify as the latest, but not necessarily as the earliest possible date.</p> <p>In fact, the project starting date as defined in the PDD (22 July 2008) is earlier and therefore before the date when the PP has effectively committed to expenditures related to the implementation or construction of the project activity, but 1) it represents the date the PP has taken the effective investment decision to implement the project activity 2) it is the earliest date the PP could possibly take real action and 3) it is the date the PP effectively undertook real action to obtain the installation license which was necessary to start construction. These three aspects were cross-checked against public available sources and validated as follows:</p> <ol style="list-style-type: none"> <li>1) On 22 July 2008, after homologation was awarded, ESBR's president gave an interview stating that the PP was only awaiting the homologation to present its new project proposal for approval by the regulators to swiftly obtain installation license (Globo, 2008_07_22). On the same day the PP announced that the total investment will be 9 billion BRL and that the Brazilian Development Bank is requested to finance 70% of the total (Estadão, 2008_07_22). The importance of the homologation for the investment decision was also clarified in the</li> </ol>	

	Validated situation	Conclusion
	<p>interviews where the PP explained that the homologation granted them with the necessary legal right to the concession as necessary to take effective action to implement its project proposal which was different from the one originally foreseen by the regulator.</p> <p>2) The argument that homologation was a necessary condition to pursue real actions for project implementation is justified by the fact that homologation represents official recognition of the validity and conformity of the PP's bid and the recognition that all subsequently required habilitation documents as required from the PPs were delivered and accepted to be valid. This implies that the PP was declared the effective winner of the auction and thus granted with the rights and obligations related to the concession. It also implies that third parties could no longer question or challenge the results of the auction as referenced by ANEEL's statement and that the PP could promote the approval of its alternative project design (CANAL ENERGIA, 2008_07_22).</p> <p>3) The homologation, as granted by ANEEL on 22 July 2008, was published in the Federal Official Gazette of Brazil on 23 July 2008, which is necessary to make it legally valid on a federal level. On the same date, and thus as early as they could legally do so, the PP submitted the Basic Environmental Project to require the installation license for the project activity's construction site at the new proposed location at Ilha do Padre (ESBR License Request, 2008_07_23). This request is the first official document and action referring to the project activity and describes its location and characteristics as a basis for obtaining the effective installation license for the construction site, which was granted on 14 November 2008 (IBAMA TO 63, 2008_11_14).</p> <p>In conclusion, the homologation represents the date as well as necessary and sufficient condition for the PP to take real actions towards the project implementation which resulted in the installation license and construction start of 14 November 2008.</p> <p>To further analyse if the homologation was the earliest possible project starting date, the validation team further analysed the following aspects:</p>	

	Validated situation	Conclusion
	<p>Prior to the date of homologation was the auction of 19 May 2008 where ESBR had submitted the most competitive bid, but only immediately after the auction ESBR informed about its proposal to build the project activity in a revised configuration at the Ilha do Padre, which represents a project configuration that is different from the governmental indications as was accurately described in the PDD. As cross-checked with a publication of the Electricity Sector Study Group of the University of Rio de Janeiro (Castro and Brandão, 2008) the proposed location at the Ilha do Padre reduced difficulty, time, impact and cost for construction and therefore was fundamental for ESBRs investment proposition. Further, it was validated from Annex 8.3 that the EPC contract (2008), that it was specific for the project site at Ilha do Padre and therefore that the PP was focused on the development of this more cost efficient configuration.</p> <p>In sequence of the auction, this proposition was questioned by the competing consortium and the dispute led to a situation where three different options were evaluated by the government: i) confirmation of ESBR as the winner of the auction, ii) declassification of ESBR and thus convocation of the second bidder or iii) declaring the auction void to repeat the tender (Folha, 2008_06_19). In addition to this discussion where ESBR defended the validity of its proposal, the PP had to pursue formal habilitation to demonstrate its eligibility and capability for project implementation, which was concluded on 20 June 2008 (ANEEL, 2008_06_20). Based on this preliminary step, the homologation on 22 July 2008 finally awarded ESBR with the rights and legal grounds to pursue the implementation of the project activity. (ANEEL Homologation, 2008_07_22).</p> <p>As referenced by (CANAL ENERGIA, 2008_07_22; Folha, 2008_07_22a) homologation was important to give ESBR the legal grounds and security to pursue the project implementation, as ANEEL's decision is final and cannot be questioned by third parties. In addition ANEEL's president stated, after the announcement of the homologation of the rights to the concession, that the changes in the project location and design and location in principle are compatible with the regulatory rules and that otherwise ANEEL would not have progressed with the process (Folha, 2008_07_22b).</p> <p>After analysing these circumstances the validation team concluded that the auction of 19 May 2008 and the habilitation of 20 July 2008 do not represent the project starting date as they implied too much uncertainty for real action to be taken.</p>	

	Validated situation	Conclusion
	<p>Based on the listed references and arguments, as well as on the basis of sector experience and the interviews held for cross-checking, the validation team agrees that the homologation of the auction, which took place on 22 July 2008 and which granted the PP with the effective rights and obligations related to the concession and which was the basis for the immediate request of the installation license, is reasonably the earliest date where real action towards implementation of the project activity could start and effectively have started. Therefore the date conforms to the definition of Start Date given in the Glossary of CDM terms and represents the PPs effective real action. This is corroborated on the basis of the fact that the PP immediately took all steps necessary to successfully initiate project construction as observed in 14 November 2008.</p> <p>The “Granting with the rights to the concession” date fulfills the definition of the Glossary of CDM Terms: “<i>the starting date of a CDM project activity is the <u>earliest date at which either the implementation or construction or real action of a project activity begins</u></i>”. This is understood by the fact that it was the result of the investor’s active promotion and defense of its proposal to develop the Jirau HPP project activity located at the Ilha do Padre and the necessary precondition and mark for effective activities related to its implementation which concluded with the effective preliminary installation license as obtained on 14 November 2008. A later possible date would be the issuance of the installation license, which is the date where effective construction starts, but given the requirement that the Project Starting Date shall be “<i>the <u>earliest date</u> ...</i>”, as well as the effort made by the PP to present its response and arguments to demonstrate that its proposal and all documents were in line with the legal requirements and to offer any additional information possibly requested by the regulator (“<i>real action</i>”), the validation team finds it reasonable and conservative to choose the homologation date as the earliest date at which the CDM project activity began.</p> <p>The homologation of the rights to concession also implies real and material obligations for the winner, as described in the clauses of Article 4.2.11 of the Auction Notice (ANEEL, 2008):</p> <ul style="list-style-type: none"> <li>• According to clause 4.2.11.1: The regulator’s (ANEEL and CCEE) expenses with the auction process need to be refunded within 5 days after the adjudication.</li> <li>• According to clause 12.3, after 30 days following Homologation and Adjudication, the winner needs to deliver a set of documents defined by the</li> </ul>	

	Validated situation	Conclusion
	<p>clause.</p> <ul style="list-style-type: none"> <li>According to clause 4.2.15.2: The winner needs to deposit the performance guarantee of a total of 650 MBRL (six hundred and fifty million BRL) within 15 days after the delivery of the documents requested by clause 12.3 above. The performance guarantee is only fully released after the plant is operational.</li> <li>According to clause 12.7.2: The official granting of the concession by presidential decree implies the unconditional obligation by the winner to sign the Concession Contract.</li> <li>According to clause 13.2, the winner is obliged to sign the PPAs at the price defined in the homologation.</li> </ul> <p>The project starting date was validated to be the earliest date on which real action of the CDM project activity started and therefore it is in line with the latest CDM Glossary of Terms (CDM VVS, version 02.0, paragraphs 106 (b) and 112 (a)).</p> <p>Furthermore, the DOE validates the 22 July 2008 as date of investment decision as necessary in response to Guidance 6 of the Guidelines on the assessment of Investment Analysis.</p>	
If the PDD was published for Global Stakeholder Consultation process after the start date, check that the CDM benefits were considered necessary in the decision to undertake the project activity as a CDM project, following the below queries.		
<p>2. For a project activity with a start date on or after the 02 August 2008, confirm that the PPs have informed the host party DNA and the UNFCCC secretariat in writing of their intention to seek CDM Status.</p> <p>If such a notification has not been provided by the PPs within 180 days of the project activity start date, determine that the CDM was not seriously considered in the decision to implement the project activity.</p>	N.A. The project's starting date is prior to 02 August 2008.	N.A.
For a project activity with a start date before 02 August 2008		

	Validated situation	Conclusion
<p>3. Check the following requirements through document reviews to assess the PPs prior consideration of the CDM:</p> <p>(a) Evidence that must indicate that awareness of the CDM before the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project.</p> <p>(b) Reliable evidence from project participants that must indicate that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation.</p>	<p><u>According to the Guidelines on the demonstration and assessment of prior consideration of the CDM, EB62 annex 13:</u></p> <p>The project's starting date is prior to 2 August 2008, so the guideline's item III applies. The elements (a) and (b) below must be satisfied:</p> <p>(a) "The PP must indicate awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project"</p> <p><u>(a).1: awareness of the CDM:</u> Both Suez and GDF were early movers in the CDM, are founding members of the Prototype Carbon Fund and had developed several CDM projects before they merged into GDF SUEZ, which occurred in parallel to the project starting date. The engagement and strategic focus on the CDM is referenced by the Suez Reference Document (Suez Reference Document, 2007), a public document. The document mentions on page 22 under the title "Risks Related to Climate Change", that the group is broadly engaged to manage risks and opportunities related to climate change and especially within the framework of the EU ETS and the Kyoto protocol. Furthermore the document comments on page 82 that the use of Project Mechanisms such as CDM represent a major opportunity and that it already has significant expertise in the field. On page 86 a specific section on Project Mechanisms documents that i) the company is "alert to opportunities which may arise in the context of CDM [...] when the anticipated revenues cover the additional costs of GHG reduction", ii) that knowledge of flexible mechanisms allows the company to design and integrate projects in the CDM iii) that several CDM projects are under construction and operation and that new CDM investment projects are under development in Latin America and Asia.</p> <p>As the document describes the prior experience and a clear strategy to further use of the CDM, the validation team finds it credible that the group has given much importance to the internal generation of carbon credits as an alternative to the purchase of allowances and as a strategy for hedging against possible variations in the prices of carbon offsets in the EU ETS.</p> <p>The origin of the reference document, available in French, has also been confirmed from the official AMF's webpage <a href="http://www.amf-">http://www.amf-</a></p>	OK

	Validated situation	Conclusion
	<p><a href="http://france.org/DocDoif/txtint/RAPOSTPdf/2008/2008-012200.pdf">france.org/DocDoif/txtint/RAPOSTPdf/2008/2008-012200.pdf</a> .</p> <p><u>(a).2: awareness of the CDM and consideration of its benefits as a decisive factor:</u> The fact that the CDM is clearly mentioned in the Environmental Impact Assessment for the Madeira hydro power plants Santo Antonio and Jirau demonstrates that the mechanisms had been considered as a value driver for the project activity. In fact the document had been developed by Leme Engineering, which is a subsidiary of the GDFSUEZ group, and it clearly mentions that “In any case Certified Emission Reductions generated by the Projects, according to the rules of the Clean Development Mechanism as defined by the Kyoto Protocol and the Marrakesh Accords, shall help to make the projects viable” (EIA, 2005).</p> <p><u>(a).3: awareness of the CDM and consideration of its benefits as a decisive factor:</u> To obtain references for the CDM applicability of the Madeira Hydro power plants Santo Antonio and Jirau, the PPs had commissioned two studies to define the eligibility of such plants under the CDM:</p> <p>1: On 30 November 2007, Pricewaterhouse Coopers Ltda. delivered a study on the eligibility of the Santo Antônio Hydro Power Project to the CDM (PWC, 2007_11_30). The study’s conclusion, as verified by LRQA on page 4, was favourable to the project’s application to CDM according to the methodology ACM0002. Although the study refers specifically to the Santo Antônio Hydro Power Project and not the Jirau Hydro Power Plant Project itself, the validation team finds it reasonable that the investors had the same intentions regarding both projects, which are part of the same Environmental Impact Assessment and very similar and near to each other in space (they are both located on the same river and very close to each other), configuration and time (the auction of Santo Antônio occurred on December 2007, only five months before the auction for Jirau) and therefore the realisation of the same study on Jirau Hydro Power Plant Project would be considered redundant from an investor perspective.</p> <p>2: On 6 November 2007, Tractebel Engineering, a company of the Suez</p>	

	Validated situation	Conclusion
	<p>group with specific CDM competence, delivered a study on the CDM eligibility of the Hydro Project Madeira River – Santo Antônio Dam, which also makes reference to the Jirau HPP. Content, identity and date of the study was validated on the basis of E-mail exchanges between different company employees (Tractebel Memo, 2007_11_06; E-mail Tractebel, 2007_11_06). The study also confirms the eligibility of the Madeira HPPs under the CDM and calculates the grid emission factor as a basis for projection of CER revenues.</p> <p><u>(a).4: awareness of the CDM and consideration of its benefits as a decisive factor:</u> The PP has demonstrated that, as of 14 February 2008, wide and regularly updated CER price projections were being carried out at company level as a basis for project assessments and that it was assumed that CER prices would follow the United States price. It was also verified through these projections that the GDF SUEZ Group expected a shortfall of CERs in the market, the reason why the price of 16 € was projected at the project starting date. The last update before the project starting date is from 02 May 2008. (E-mail Suez, 2008_02_14; E-mail Suez, 2008_02_14; "E-mail Suez, 2008_05_02). All communications have been presented as original mail files, which allow validating the date and the identity of the files that were circulated.</p> <p><u>(a).5: CDM benefits as a decisive, purposeful factor in the decision to proceed with the project:</u> The PP presented the project to the BNDES in a meeting carried out on 30 May 2008 and to other potential intermediating Banks on 28 May 2012. The slide 18 of this presentation shows that the revenues from the sales of the project's carbon offsets were actually considered during the investment decision. The presentation (Suez Presentation, 2008_05_28) is also embedded in the correspondence exchanged between the PP and the banks, which is valid evidence of the presentation's content and of the participation of the banks in these meetings. The correspondence assessed by the validator are from the BNDES (E-mail BNDES, 2008_05_30), from the Caixa Econômica Federal (Federal Savings Bank) (E-mail Caixa, 2008_05_28) and from the Bank of Brazil (E-mail BdB, 2008_05_28).</p>	

	Validated situation	Conclusion
3.(continuation)	<p><u>(a).6: CDM benefits as a decisive, purposeful factor in the decision to proceed with the project:</u></p> <p>The Feasibility Study Report submitted to BNDES (FSR, 2008), table of page 47 "Venda de Créditos de Carbono" (sales of carbon credits), defines under the Section: Other Revenues:</p> <p><i>"The Sales of Certified Emission Reductions: The Jirau project meets all the criteria of Clean Development Mechanism as defined under the Kyoto Protocol and the methodology ACM0002. The reduced flooded area in relation to the generating capacity and the low environmental impact of the venture are important features for project eligibility".</i></p> <p>In summary, the PPs have demonstrated that the CDM and the resulting revenues from the sale of CERs had been considered already in the preliminary environmental licensing phase of the project and that a clear strategy for the assessment and evaluation of CDM feasibility and revenue streams took place alongside the project implementation process. Furthermore, CER revenues were clearly referenced in early presentations to the banks and considered as fundamental revenues in the FSR and thus for the calculation of the project's financial return and leverage. The fact that this revenue was a decisive value driver is also illustrated by the results of the financial analysis.</p>	OK
3.(continuation)	<p>(b) "The project participant must indicate, by means of reliable evidence, that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation"</p> <p>The evidence below was verified by the validation team and was considered as sufficient evidence that continuing and real actions were taken to secure CDM status for the project.</p> <ul style="list-style-type: none"> <li>• <u>23 September 2008</u>: request for CDM consultancy proposal with respect to the project registration, verified through the email exchanged on this date (E-mail SUEZ, 2008_09_23).</li> <li>• <u>10 October 2008</u>: ESBR board approves the terms of the CDM consultancy proposal and management as well as preferential rights for the purchase of the CERs by ESBR's shareholders. The board meeting report is signed and stamped by the Rio de Janeiro State Secretary for Economic Development (ESBR Board, 2008_10_24).</li> <li>• <u>13 February 2009</u>: first notification to document the CDM consideration to</li> </ul>	OK

	Validated situation	Conclusion
	<p>the Brazilian DNA, considering the capacity initially foreseen in the official governmental documentation, 3,300 MW (44 turbines) (CDM Notification 2009_02_13).</p> <ul style="list-style-type: none"> <li>• <u>2 March 2009</u>, contract signed with Econergy for PDD development services (Econergy, 2009).</li> <li>• <u>July and August 2009</u>, several validation proposals were received, among them one of LRQA (2009).</li> <li>• <u>24 August 2009</u>, second and revised Prior CDM Notification sent to the UNFCCC and the Brazilian DNA, considering the revised installed capacity of 3,450 MW (46 turbines), verified on the UNFCCC webpage <a href="http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html">http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html</a></li> <li>• <u>7 January 2010</u>: Presentation of the CDM to the Jirau HPPs Sustainability Committee as part of CDM specific local stakeholder consultation. This is referenced by the original documents, including signatures from 44 individuals which represent all key stakeholder groups (ESBR, 2010_01_07).</li> <li>• <u>9 March 2010</u>: First PDD draft delivered by Econergy, verified through the email exchanged on this date (Econergy, 2010).</li> <li>• <u>29 April 2010</u>: Meeting with the Brazilian DNA is referenced by a signed statement (ESBR, 2010_04_29).</li> <li>• <u>3 August 2011</u>: Agreement between ESBR and GDFSUEZ to finalize PDD and initiate validation on the basis of the revised project configuration (ESBR, 2011_08_03).</li> <li>• <u>17 August 2011</u>, third and revised Prior CDM Notification sent on 24 August 2009 to the UNFCCC and the Brazilian DNA, considering the revised installed capacity of 3,750 MW (50 turbines), verified on the UNFCCC webpage <a href="http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html">http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html</a></li> <li>• <u>24 April 2012</u>: submission to UNFCCC for global stakeholder consultation</li> </ul> <p>Conclusion: The items (a) and (b) discussed above demonstrate the compliance with VVS version 02.0, paragraph 108. The validation team concludes that real and continuous actions were undertaken by the project participants to secure CDM status. (CDM VVS, version 02.0, paragraph 109). LRQA has also confirmed that there is no gap greater than 2 years between the documented evidence (CDM VVS, version 02.0, paragraph 110 (a)).</p> <p>The references also illustrate the evolution of the project's conceptual design</p>	

	Validated situation	Conclusion
	from the original official configuration of 44 turbines to the Base Case assumption of 46 turbines and later to the optimisation of 50 turbines. Based on this evolution the PP also provided a clear explanation on why CDM development process was temporarily put on hold in April 2010 and reinitiated at the end of 2011. It was verified that a first PDD draft was completed on 9 March 2010 and included the base case configuration of 46 turbines, resulting in 3,450 MW and that validation was due to start in April 2010 on the basis of the Base Case configuration (46 turbines / 3.450 MW), but the process was then delayed until the project's definitive configuration and installed capacity of 3.750 MW was defined in October 2011.	
4. Describe the process for cross-checking the evidence. The assessment of real and continuing actions should focus on real documented evidence, including an assessment of the authenticity of the evidence, that is, letters, email exchanges and other documented communications. These shall be considered as evidence only after assessing the reliability and authenticity of them, inter alia through cross-checking (for example, interviews)	The reliability and authenticity of all evidence was cross-checked with the official sources and/or interviews during the desk review and the site visit. Key documents consist of signed contracts, were signed by the receiving third party, or were validated on the basis of valid e-mail archives which allow validating the date and identity of the documents. Consistency of the information and complementary references also corroborate the validity of the information and references provided. Please refer to the previous question, item 3 above, for details.	OK
5. The time gap between the documented evidence of prior CDM consideration and continuing and real actions shall be within the following period: a) Less than two years: continuing and real actions were taken to secure CDM status for the project activity; b) Greater than two years and less than three years: justify any positive or negative validation opinion based on the context of the evidence and information assessed; c) Greater than three years: continuing and real actions were not taken.	None of the time gaps between two consecutive items of documented evidence was greater than 2 years, as detailed in the response to the item 3 above:  22 July 2008 (project starting date) → 23 September 2008 (First request for CDM consultancy proposal) → 10 October 2008 (ESBR Board approval of terms for CDM management and commercialisation) → 13 February 2009 (1 <sup>st</sup> CDM Notification to the Brazilian DNA) → 2 March 2009 (Contract signed with Econergy for PDD development) → 24 August 2009 (2 <sup>nd</sup> and revised CDM notification sent to both DNA and UNFCCC) → 7 January 2010 (Presentation of the Jirau HPP CDM file in the first meeting of the Sustainability Committee) → 9 March 2010 (First PDD draft delivered by Econergy) → 29 April 2010 (Meeting with the Brazilian DNA) → 3 August 2011 (Contract signed between ESBR and GSELA for PDD development) → 17 August 2011 (3 <sup>rd</sup> and revised CDM notification to the UNFCCC Secretariat) → 24 April 2012 (global stakeholder consultation).	OK

	Validated situation	Conclusion
	Further details are also available in tables 6 and 7 of the PDD. All documented evidence for demonstrating the prior CDM consideration and continuing and real actions for the project has been accessed, confirmed and validated.	
6. If authentic evidence to support the serious prior consideration of the CDM as indicated above is not available, determine that the CDM was not considered in the decision to implement the project activity	Authentic evidence to support the serious prior consideration of the CDM is available, according to the Guidelines on the demonstration and assessment of prior consideration of the CDM, EB62 annex 13.	OK

	Validated situation	Conclusion
<b>SECTION 7b. Identification of alternatives</b>		
<p>1. Does the PDD identify credible alternatives to the project activity, to determine the most realistic baseline scenario?</p> <p>Assess this list of alternatives and ensure that:</p> <p>(a) The list of alternatives includes as one of the options that the project activity is undertaken without being registered as a proposed CDM project activity.</p> <p>(b) The list contains all plausible alternatives considered to be viable means of supplying the outputs or services that are to be supplied by the proposed CDM project activity.</p> <p>(c) The alternatives comply with all applicable and enforced legislation.</p> <p>If the Baseline scenario is prescribed in the approved methodology, no further analysis is required and this section is not applicable..</p>	N.A. The baseline scenario is prescribed in the methodology.	N.A.

	Validated situation	Conclusion
<b>SECTION 7c. Investment analysis</b>		
<p>1. Verify the accuracy of financial calculations carried out for the investment analysis:</p> <ol style="list-style-type: none"> <li>1. Conduct a thorough assessment of all parameters and assumptions used in calculating the relevant financial indicator, and determine the accuracy and suitability of these parameters.</li> <li>2. Cross-check the parameters against third-party or publicly available sources, such as invoices or price indices.</li> <li>3. Review feasibility reports, public announcements and annual financial reports related to the proposed CDM project activity and the project participants.</li> </ol>	<p>The financial calculations and all references were audited by an analysis of the investment analysis worksheet and all variables were validated against the respective references as described below.</p> <p>A Financial Investment Analysis Spreadsheet (Jirau HPP Investment Analysis, 2012) has been developed by the PP and was assessed and audited by the validation team. The Spreadsheet contains different tables, including:</p> <p>i) A CAPM model to calculate the Project Specific Benchmark and the Standard Benchmark for Baseline Conditions (table "CAPM"). All references and assumptions are detailed in the respective calculation tables ("ERP"; "EMBI+Brazil"; "beta").</p> <p>ii) The conversion of the basic interest rate TJLP (table "TJLP") from nominal to real terms, including the applicable references for the historic interest rates and inflation data.</p> <p>ii) A cash flow analysis (Jirau HPP Investment Analysis, 2012) for the calculation of the project's equity IRR from the perspective of the project activity's Base Case configuration (P1/S0) and the Optimized Configuration (P2/S0) under the hypothetical baseline conditions defined, i.e. without the financial support policies offered by the BNDES. For both scenarios, applicable standard sensitivities have been calculated to vary costs and revenues by +/- 10% (S1-S10). In addition, the variations needed for each variable to allow meeting the Standard Benchmark and the Default Benchmark are calculated (S11-S15). A macro allows parallel calculation of all scenario combinations and the results are displayed in a "Result and Sensitivity Table" on the valuation sheet. Specific Combinations can be chosen in cells E149 and E150, which was used to assess in detail the accuracy of each scenario combination.</p> <p>Furthermore, the model calculates the equity IRR from the perspective of full consideration of the investment incentives offered by the BNDES for the Base Case (P3) and the Optimized Case (P4), as well as under inclusion of the CDM revenues with CER prices (Table "CER Prices) as projected by the PP at the project starting date (E-mail Suez, 2008_02_14). These scenarios are P5 for the Base Case and P6 for the Optimized Project. Though the calculation of these</p>	<p>OK</p> <p>CAR 01, CAR 02, CAR 04, CAR 05, CAR 06 CAR 08 CAR 09 all closed.</p> <p>CL 01, CL 02, CL 03, CL 04, CL 05, CL 06, CL 07, all closed.</p>

	Validated situation	Conclusion
	<p>scenarios is not required by the current CDM rules, the validation team also assessed their accuracy.</p> <p>The validation team has assessed and confirms that in all scenarios, the equity IRR is calculated by considering only the portion of investment cost which is financed by equity as cash outflow, while debt financing, amortisation, interest payments and taxes are adequately contemplated before equity free cash flow and IRR are calculated in real terms. This is in line with Guidance 10 (CDM EB 62 Annex 5, 2011)</p> <p>All variables used in the valuation sheet are explained and referenced in the PDD while supporting tables calculate available electricity for sales (E-Gener); financing flows (Financing) and depreciation.</p> <p>The key reference for the Investment Analysis is the Feasibility Study Report (FSR, 2008) which was submitted to the Brazilian Development Bank on 24 June 2008 as a basis of the official process for requesting financing from the Bank. The FSR provides key investment assumptions and variables and a summary of the strategy and concept of the project activity. The identity of the FSR document was validated on the basis of a signed and officialised copy and all relevant variables were cross-checked and scrutinised for their plausibility by comparing them with sound financial knowledge, sector experience and against applicable relevant references as described below.</p> <p>The suitability of parameters used in the financial calculation has been assessed and considered reasonable by the validation team (CDM VVS, version 02.0, paragraphs 120-123 (a)).</p> <p>In the course of this validation a series of CARs and CLs have been raised on the basis of mistakes and flaws that were identified or to request clarifications and corrections where necessary.</p> <p>For more information on the CARs or CLs mentioned below, please refer to section Findings at the end of Appendix F.</p> <p><b>CAR 01:</b> the project's firm generation capacity in the ramp up phase, as considered in the financial analysis worksheet, was slightly different from the value supported by the FSR. The error in the financial analysis worksheet was amended by the PP.</p> <p><b>CAR 02:</b> the share of Civil Works as 38.2% of CAPEX, considered in the worksheet</p>	

	Validated situation	Conclusion
	<p>“CapEx&amp;Depreciation” cell B12, differed from the value (38.42%) calculated from the figures available in the FSR. The typo error was corrected by the PP in the worksheet.</p> <p><b>CAR 04:</b> some mistakes were identified with respect to the calculation of the interest in the capitalisation of the debt balance and regarding the calculation of the financial leverage. A miscalculation was corrected and additional clarifications were given by the PP.</p> <p><b>CAR 05:</b> some mistakes were identified with respect to the calculation of the investment benchmark. The errors were corrected and clarifications were given by the PP.</p> <p><b>CAR 06:</b> clarification or correction of the inflation adjustment of the variable UBP was requested and resulted in corrections.</p> <p><b>CAR 08:</b> additional explanation was requested to justify the leverage for the calculation of the benchmark under baseline conditions. Further it was requested that the PP clarify if an investment at a lower rate of return than the defined benchmark would not have been feasible</p> <p><b>CAR 09:</b> the PP was requested to include the transmission fees in the sensitivity analysis as they represent more than 20% of the revenues.</p> <p><b>CL 01:</b> additional information was requested with respect to the DSCR. The information was provided by the PP, which was assessed and confirmed by the validation team.</p> <p><b>CL 02:</b> additional information was requested regarding the risk spread charged by the private banks. The information was provided by the PP, which was assessed and confirmed by the validation team.</p> <p><b>CL 03:</b> additional information was requested regarding the federal tax incentives available for projects in the Amazon region. The information was provided by the PP, which was assessed and confirmed by the validation team.</p> <p><b>CL 04:</b> additional information was requested with respect to the Additional Firm Energy projected for sales to the Free Market (ACL). The information was provided by the PP and additional explanation was included in the PDD, which were assessed and considered appropriate by the validation team.</p> <p><b>CL 05:</b> additional information was requested regarding the reasoning followed in the estimation of the energy transmission losses, estimated at 2.5%. The information was provided by the PP, which was assessed and confirmed by the</p>	

	Validated situation	Conclusion
	<p>validation team.</p> <p><b>CL 06:</b> the reference for the value of the concession fee (UBP) was given by the PP, which was assessed and confirmed by the validation team.</p> <p><b>CL 07:</b> the references used in the determination of the TUST in real terms were provided by the PP in the response to the CL, which was assessed and confirmed by the validation team.</p>	
1.(continuation)	<p><b>CL 16:</b> additional information was requested with respect to the calculation of the Inspection Fee of Electric Energy Services (TFSEE) and the assets depreciation regime determined by the regulation. The PP has provided the references used for the determination of both parameters.</p> <p>As discussed during the site visit and the desk review and explained by the PP, although the references and assumptions were defined between May and June 2008, all monetary values are defined in real terms as of 30 April 2008. This reference date was adopted in order to bring a common and consistent reference for all parameters in the investment analysis. This practice, confirmed by the validation team, is in line with the requirements and operational practices of the BNDES and thus with the FSR as completed and submitted on 24 June 2008 (FSR, 2008).</p> <p>The validation team has checked the accuracy of financial calculations in the investment analysis.</p> <p>The table in item 3 below shows the thorough assessment of all the inputs to the investment analysis, with an explanation on how each parameter has been validated.</p>	<p>OK</p> <p>CL 16, closed</p>
2. Assess the correctness of computations carried out and documented by the project participants	The assessment of the correctness of calculations carried out and documented by the project participants is detailed in the table in item 3 below.	OK
3. Assess the sensitivity analysis by the project participants to determine under what conditions variations in the result would occur, and the likelihood of these conditions.	The validator confirms that the standard sensitivities of +/- 10 % as presented in the PDD are accurately calculated and that none of the scenarios reaches the project specific benchmark as defined by the PP, nor the default benchmark as adopted by the PP for cross-checking. In order to obtain a better view on the scenarios which would lead to a return equivalent to the benchmarks, the following	<p>OK</p> <p>CL10, closed</p>

	Validated situation	Conclusion									
	<p>clarification request was issued:</p> <p><b>CL 10:</b> the PP was asked to provide and has provided the sensitivity analysis of the parameters considered at the breakeven points (IRR = Benchmark), as well as the sensitivity analysis for changes in the debt cost.</p> <p>The statements and arguments made by the PP in the PDD regarding the sensitivity analysis, including the calculations made, were all verified by the validation team and considered reasonable and correct (CDM VVS, version 02.0, paragraph 120 (e)).</p> <p>For calculation of the breakeven points, the PP used the Standard Benchmark for Baseline Conditions as calculated using the CAPM as validated below (see item “1. Benchmark calculation” below), as well as the more conservative Default Benchmark of 11.75% given by the “Guidelines on the assessment of investment analysis” (version 05), Annex A (please refer to the validation of benchmark in the table below). The Investment Analysis Spreadsheet (table “Valuation”) calculates all results automatically and results are available in lines 166 to 170 for the Base Case and 182 to 186 for the Optimized Projects. Results for the Standard Benchmark of 12.46% are available in column D, while results for the Default Benchmark are available in Column E. Though both scenarios have been validated, the focus was on replicating and verifying the accuracy of the results in relation to the more conservative default benchmark. To reproduce this calculation, (Jirau HPP Investment Analysis, 2012), worksheet “Valuation”, cells P137 (OPEX), Q138 (CAPEX), R139 (Energy Price ACL &amp; SPOT), S140 (Interest rate) and T141(Firm Energy). The most conservative variation required for each parameter, considering the Base Case (P1) and the Optimized Project case (P2), under baseline conditions and in relation to the different Scenarios (S11-S15) was compared to the default benchmark value of 11.75%. The calculations conducted by the PP were found to be correct as replicated in the following table:</p> <table> <tr> <th></th><th>Parameter Variation necessary to IRR=11.75% (Base case)</th><th>Parameter Variation necessary to IRR=11.75% (Optimized project)</th></tr> <tr> <td>CAPEX</td><td>-13%</td><td>-12%</td></tr> <tr> <td>OPEX</td><td>-43%</td><td>-40%</td></tr> </table>		Parameter Variation necessary to IRR=11.75% (Base case)	Parameter Variation necessary to IRR=11.75% (Optimized project)	CAPEX	-13%	-12%	OPEX	-43%	-40%	
	Parameter Variation necessary to IRR=11.75% (Base case)	Parameter Variation necessary to IRR=11.75% (Optimized project)									
CAPEX	-13%	-12%									
OPEX	-43%	-40%									

	Validated situation			Conclusion
	Revenues (ACL & Spot market prices)	+32%	+30%	
	Revenues (Firm Energy)	+17%	+15%	
	Interest (TJLP)	-9% p.a. (negative TJLP)	-8% p.a. (negative TJLP)	
3.(continuation)	<p><u>CAPEX</u>: The original CAPEX as estimated by the PP at the project’s starting date 22 July 2008 (9 billion BRL) is accurate and in accordance with the FSR presented by the project participants to BNDES. The reliability of this document has been assessed as described above. In addition, this value has been publicly announced on the project starting date (Estadão, 2008_07_22). It is the validation team’s opinion, with input from the team’s sector expert, that investment costs lower than those initially estimated are not a scenario that could reasonably be expected by the PPs at the project’s starting date. Furthermore, the validation team confirmed from the communication to the public on the BNDES’s official webpage (BNDES, 2009), that the financing actually granted by BNDES shortly after, on 18 February 2009, was of 7.2 billion BRL, and that it represented 68.5% of the total investment. This information leads to a final projected Capital Expenditure of 10.5 Billion BRL (7.2 / 68.5%) agreed upon by BNDES on that date and the value is confirmed by the financing contract signed on 29 July 2009 (BNDES Financing 2009)</p> <p>As shown in the table above, a reduction of 13% of the CAPEX (Base case) or 12% (Optimized case) compared to the validated estimation on the project’s start date would be necessary to reach the Default Benchmark of 11.75%. The validation team considers that this would have been a very unlikely scenario from the PPs perspective on the project’s starting date.</p> <p><u>OPEX</u>: The analysis shows that only a significant reduction of 40 or 43% of the total Operational Costs including O&amp;M, SG&amp;A, sector fees and transmission fees would raise the project’s IRR to the Default Benchmark of 11.75%. This is not a reasonable assumption as Transmission Fees, which are the major cost item, as well as the sector fees, are fixed by the regulator. O&amp;M and SG&amp;A are only minor</p>			OK

	Validated situation	Conclusion
	cost items and their variations are irrelevant within the total operational cost package.	
3.(continuation)	<p><u>Revenues from change in electricity prices:</u></p> <p>As can be seen in the validation of the parameters “Electricity Price in the Regulated Market (ACR1)” and “Electricity Price in the Regulated Market (ACR2)” (please refer to the table below), the energy price for the energy sold to the regulated market (most of the energy to be generated by the project) is fixed. Consequently it is appropriate that the sensitivity analysis only considered variations in the ACL and the Spot market prices, which have not been fixed and thus are subject to variations.</p> <p>As shown by the results in the table above, free market prices (ACL) and spot market would have to rise by 30% to raise the Optimized Project IRR, and 32% to raise the Base Case IRR to the level of the Default Benchmark. Based on these limits, the validation team assessed whether these variations are possible or likely. For this purpose the following references have been analysed:</p> <ul style="list-style-type: none"> <li>- <u>ACL prices:</u> A cross-check reference is the article published in June 2009 in the Brazilian newspaper (Globo, 2009) on the PPA agreed between the Energy Company of the State of Minas Gerais (Cemig) and the Santo Antônio HPP (the other plant of the Madeira River). According to the article, the agreed value was 139.47 BRL/MWh. If adjusted for inflation to be comparable to the 134 BRL/MWh adopted by the PP in April 2008, this would represent about 131 BRL/MWh. and therefore less than estimated by the PP. Furthermore the article cites the president of ABRACE, "the price of energy sold to Cemig is very high.", and "the free consumers were unwilling to pay this price".</li> <li>- Another reference that confirms the original ACL price estimate and shows that it was conservative in the sense of the CDM is that ESBR, on 13 November 2010, conducted an attempt to sell Jirau HPPs free market electricity in an auction. As the prices offered by the market did not reach the original estimate, the auction did not conclude, which shows that the PPs original price estimates were ambitious when compared with the prices offered by the market (BIC, 2010).</li> <li>- <u>Spot market prices</u> : the monthly mean prices in the Spot market were checked by the validation team from the CCEE’s official webpage</li> </ul>	OK

	Validated situation	Conclusion
	<p><a href="http://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/produtos/precos/precos_medios?_afLoop=2371610126000&amp;_afWindowMode=0&amp;_afWindowId=f2y8r2e9w_1#%40%3F_afWindowId%3Df2y8r2e9w_1%26_afLoop%3D2371610126000%26_afWindowMode%3D0%26_adf.ctrl-state%3Df2y8r2e9w_21">http://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/produtos/precos/precos_medios?_afLoop=2371610126000&amp;_afWindowMode=0&amp;_afWindowId=f2y8r2e9w_1#%40%3F_afWindowId%3Df2y8r2e9w_1%26_afLoop%3D2371610126000%26_afWindowMode%3D0%26_adf.ctrl-state%3Df2y8r2e9w_21</a>. It is evident that the prices are highly volatile and that the mean value over the period from May 2003 to July 2008 is 58.5 BRL/MWh, well below the value of 90 BRL/MWh considered by the PP in the investment analysis. No trend has been observed in the historical data that could indicate to the investors that the prices would rise. In fact, as a secondary reference, it is possible to verify in the same webpage that the mean value over the period from August 2008 to August 2012 is 62.2 BRL/MWh, still well below the value of 90 BRL/MWh considered by the PP in the investment analysis, even in nominal terms.</p> <p><u>Change in Firm Energy:</u> Firm Energy available for sale in Brazil is ultimately defined by the regulator, but due to the change in project design as foreseen by the PP at the project starting date, an estimation above the value defined by the regulator was used. This was validated on the basis of the FSR (FSR, 2008). As a Firm Energy above the approved amount was considered, the validation team confirms its conservativeness in the terms of the CDM. Likewise, for the Optimized Project, the PP estimates a Firm Energy which is 94.8 MW above the currently approved value on the basis of the maximum value as calculated by the Governments Energy Research Company (EPE, 2011_11_07). This fact is also confirmed by press announcements which quantify this additional energy to be approximately 90 MW (Jornal da Energia, 2012), as well as by the approval of the supplementary financing which is partially depending of the approval of the projected Firm Energy (BNDES Decision 798, 2012).</p> <p>An analysis of the study developed by EPE shows that the regulator calculated the firm energy of the Jirau HPP with 50 turbines under different operational rules for the Santo Antonio Plant, but that the PP has chosen the option which maximised the Firm Energy. This is accurately defined in the PDD and is compatible with information exchanged with the BNDES to request additional financing (BNDES Decision 798, 2012; BNDES_ESBR, 2011). Therefore, the financial analysis already considers the maximum Firm Energy which could possibly be obtained from the project activity under the Base Case and the Optimized Case (please refer to the comments in the validation of the parameter “Maximum incremental Firm</p>	

	Validated situation	Conclusion
	<p>Energy”, in the table below). For this reason, the sensitivities calculated are unlikely to occur as an increase in firm energy by 15 or 17% as necessary to reach the Default Benchmark of 11.75% is not realistic.</p> <p><u>Interest rate</u>: as shown in the table above, the basic interest rates (TJLP) as necessary for the IRR to reach the most conservative benchmark of 11.75% are negative, which is not a reasonable scenario.</p> <p>The validation team checked and confirmed the accuracy of financial calculations in the investment analysis, as well as its compliance with the “Guidelines on the assessment of investment analysis” (version 5).</p>	

Use the table below to list all the inputs to the investment analysis and to describe how each parameter has been validated:

Parameter/input	Symbol/ Unit	Value	Source	Means of validation	Conclusion
<p>1. <b>Benchmark calculation:</b> The PP presented two different and mutually independent references for the benchmark:</p> <ol style="list-style-type: none"> <li>The <u>Default Benchmark</u> of 11.75%, from the Guidelines on the assessment of investment analysis Version 05, Annex A.</li> <li>The calculation of the <u>Standard Benchmark</u> value from government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, with the application of the Capital Asset Pricing Model (CAPM) under consideration of the default 50% debt and 50% equity financing structure as assumed under the baseline conditions. The validation team has validated that the benchmark of 12.46% has been correctly calculated, is based on sound references and assumptions and is suitable to the type of financial indicator (equity IRR after taxes).</li> </ol> <p>In addition to the Standard Benchmark and the Default Benchmark, the PP calculated the <u>Project Specific Benchmark</u> as applicable for the project specific incentive policies as established by the BNDES. As these are being neglected on the basis of the E- concept as validated in Section 6b, this Project Specific benchmark is not an appropriate criterion for judgement of additionality under baseline conditions, but only to judge the project activities profitability after investments incentives and CER revenues are fully included.</p>					
a. <u>Default value from the Guidelines on the assessment of investment analysis Version 05, Annex A (11.75%)</u>					
Benchmark value	% in real terms	11.75	Guidelines on the assessment of investment	The source used by the PP is in line with the “Guidelines on the assessment of investment analysis” (version 05), Annex A, which is considered valid. The validation team also considers that the Standard Benchmark calculated by the PP, based on CAPM (see below), is more specific and adequate for	OK

			analysis Version 05, Annex A	<p>additionality discussion. As referenced by the PP in the PDD, the Default Benchmark for equity as adopted by the EB and defined by the Meth Panel is based on some assumptions which do not apply for the Brazilian context ( <a href="http://cdm.unfccc.int/Panels/meth/meeting/11/050/mp50_an08.pdf">http://cdm.unfccc.int/Panels/meth/meeting/11/050/mp50_an08.pdf</a>)</p> <ul style="list-style-type: none"><li>• Page 9: “<i>Studies show that equity returns on utilities sector are historically lower than industrial sector since they are regulated and guaranteed by regulatory body. Historically in utility sector there has been no competition and it is a natural monopoly. Only in the developed countries, in recent years, by liberalizing power production and marketing has been made competitive. However in most developing countries, utility sector is still treated as monopoly with a guaranteed return. For these reasons, utility returns are less than industry return.</i>”</li></ul> <p>As has been validated below in this report, the prices and returns in the Brazilian energy generation sector are not regulated by the government, but defined by the free competition.</p> <ul style="list-style-type: none"><li>• Page 14: “<i>To apply the new default equity values, ...cash flow needs to be computed based on 100% equity to ensure consistency.</i>”</li></ul> <p>As confirmed by the validation team, BNDES’s participation for are 50% under baseline conditions (BNDES FINEM, 2012) and up to 70% for renewable energies. Depending on the leverage the expected return on equity has to be higher than 11.75% to compensate for the increased risk that leverage has on the equity investor.</p> <p>Despite the underestimation for the reasons mentioned above, the PP has chosen to conduct the sensitivity analysis in the investment analysis model considering also the benchmark value of 11.75%, which is conservative and adequate under the rules of the CDM.</p>	
<p>b. <u>Benchmark calculated using CAPM (parameter “K<sub>e</sub> - Cost of Equity”)</u></p> <p>The validation team assessed the benchmark model chosen, CAPM, whose usage is widespread in the financial market and after requesting several corrections which resulted from CAR 05 and CAR 08, the revised model was validated to be correct.</p> <p>The parameter’s sources have all been verified as shown below. The time period chosen by the PP for the estimation of each parameter was also appraised. In line with the approach considered by the Meth Panel in its Information Note (Annex 8, MP 50, 2012) the Risk-Free Rate (United States) was determined based on long term average (January 1954 to 31 December 2007) on the basis of an appropriate and solid reference. The Market Risk Premium was based on the average from 1928 to 2007 as published by Damodaran and the beta was based on a 5 year average from January 2003 to December 2007. For determination of the Brazilian Country Risk Premium, which is more specific and variable, a period from January 2005 to 31 May 2008 has been chosen to obtain an updated view which reflects the economic circumstances of the project starting date. This period is also in line with the valuation of the basic interest rate TJLP in real terms. This period is</p>					

considered appropriate as is based on the recent stable Brazilian economic circumstances, which differ significantly from the period before 2005 and thus from the mean behaviour in the long term historical data. This is also compatible with the period of constant and moderate Inflation Target Rates (IPCA) in Brazil, which was fixed to be a constant 4.5% p.a. by Brazil's Central Bank as of the year 2005, <http://www.bcb.gov.br/Pec/metast/TabelaMetaseResultados.pdf>. Country Risk premium was calculated from the EMBI+ Brazil risk spread as calculated by JP Morgan and published by the Brazilian Institute for Applied Economic Research (IPEA).

For the appropriate financial leverage, the PP had firstly proposed to use a 70% financial leverage based on the project specific indicative support conditions as published by the BNDES in April 2008 (BNDES, 2008), as well as the assumptions and results documented in the Feasibility Study Report (FSR, 2008). This was questioned by the validation team (CAR 08) not to be in line with Guidance 18 of the Guidelines on the assessment of investment analysis (Version 5), as well as to be in conflict with the baseline scenario of standard financing conditions as offered by the Brazilian Development Bank to GHG intensive generation technologies and thus ignoring the project specific investment incentives, such as increased leverage. As a consequence, the PP defined and calculated the Standard Benchmark as applicable additionality criteria under baseline conditions.

The validation team concludes that the Standard Benchmark as calculated by the PP is adequate and in accordance with the Tool for the demonstration and assessment of additionality, version 6.0.0, paragraph 30: "Discount rates and benchmarks shall be derived from government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data".

The validated Standard Benchmark value of  $K_e = 12.46\%$ , as calculated using CAPM, has been validated as shown in detail below.

In addition to this Standard Benchmark, the PP presented a Project Specific Benchmark, which considers the Brazilian Development Bank's investment incentive and thus is an applicable criterion to judge the return of the project activity if investment incentives and CERs are contemplated, as calculated in Scenarios P3 to P6. Furthermore, in order to confirm the validity of this Project Specific Benchmark, the PP has provided as an additional reference a study carried out by the World Bank. The study quotes on page 15, item 25, ("Main Conclusions") an official reference in Brazil, ANEEL: "The sector regulator (ANEEL) indicates that investors will only have motivation to invest in electricity generation if the rates of return are in the order of 15%" (World Bank, 2008). The file is also available on the webpage of an independent institute (Acende Brasil)

<http://www.acendebrasil.com.br/archives/WORLD%20BANK%20%20Licenciamento%20Ambienta%20de%20Empreendimentos%20Hidreletricos%20no%20Brasil.pdf>). The value of IRR is chronologically adequate as the study, published on 28 March 2008, is contemporaneous with the project's starting date (22 July 2008). It also has the necessary technological and geographic specificity, as the study refers to large hydroelectric projects in Brazil. The IRR value was confirmed by the World Bank, in response to a direct consultation from the PP, as having been expressed in real terms (World Bank, 2010).

In addition, after being questioned in CAR 08 if an investment would not be possible at a rate of return below this benchmark, the PP has provided further references that illustrate that the CAPM is effectively a standard method for the definition of the expected return on equity in Brazil and many other countries (Rocha, 2006).

The validation team checked and confirmed the accuracy of the benchmark calculations, as well as its compliance with the "Guidelines on the assessment of investment analysis" (version 5). As requested by CDM VVS, version 02.0, paragraphs 123: (a) it is confirmed that the Standard Benchmark of 12.46% and the Default Benchmark of 11.75% are suitable for the kind of financial indicator presented (equity IRR in real terms; (b) the risk premiums defined reflect the projects risk under the baseline conditions and (c) the validation team confirms that under the baseline scenario, investments below the Standard Benchmark of 12.46% are not a reasonable assumption, while it is appropriate to consider that investments on the basis of the increased leverage as offered by the BNDES for renewable energies would require a return comparable with the Project Specific Benchmark of 16.05%.

R <sub>fr</sub> - Risk-Free Rate (in real terms)	% in real terms	3.02	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C8	<p>The reference adopted by the PP for the value of 3.02% is the long-term compounded average real returns on T-Bonds for 1954-2007, as calculated in the study from Trevino and Yates (Trevino and Yates, 2007). The validation team has confirmed that the reference is reliable and the value has been correctly applied.</p> <p>The validation team has also confirmed the argument presented by the PP in the PDD to show the strength of this reference, highlighting that this study was mentioned by the CDM Meth Panel as reference for the long term risk free rate of return in real terms, which attests its credibility (Annex 8, MP 50, 2012) Table 1, page 4.</p>	OK
ERP - Equity Risk Premium	% in real terms	6.42	Jirau HPP Investment Analysis, 2012, worksheet "ERP", cell G90	<p>The value was verified in the site of Damodaran, Stern School of Business at New York University, <a href="http://pages.stern.nyu.edu/~adamodar/">http://pages.stern.nyu.edu/~adamodar/</a>. Select "Updated Data" → in the table "Data Sets" select "Annual Returns on Stock, T.Bonds and T.Bills – Download". The mean "Equity Risk Premium" in the period 1928 – 2007 can be calculated in the downloaded file "histretSP.xls", worksheet "Returns by year", column I "Stocks – T-Bonds".</p> <p>The validation team has confirmed that the Equity Risk Premium data from Damodaran was also adopted by the CDM Meth Panel (MP 50, 2012) page 7, third paragraph, which demonstrates that this source is considered legitimate and reliable for use under the CDM. Also, as can be seen in the fifth paragraph, the value for Equity Risk Premium cited in this reference (6.5%) is also comparable to the value adopted by the PP: "In conclusion, the use of Equity Risk Premium of 6.5% in the proposed model is supported by the arguments of different experts ...".</p>	OK
R <sub>c</sub> - Estimated Country Risk Premium	% in real terms	2.68	Jirau HPP Investment Analysis, 2012, worksheet "EMBI+Brazil", cell C6	<p>The PP provided a valid reference for the Country Risk Premium, the Brazilian Institute of Applied Economic Research (IPEA), a public foundation bound to the Federal Secretariat for Strategic Affairs of the Presidency. The value was calculated from the period between January 2005 and 31 May 2008 and thus is compatible with the calculation of the basic interest rate TJLP and the Project Starting Date. (<a href="http://www.ipeadata.gov.br/">http://www.ipeadata.gov.br/</a> . Select the links "Temas" → "Finaceiras" → JP Morgan → EMBI+).</p> <p>The validation team has cross-checked the value adopted by the PP by</p>	OK

				<p>comparing this specific risk premium estimate with the data published by Damodaran on the “Updated Data” site under the item “Risk Premium for Other Markets”. When choosing the Dataset for January 2008 to download the datasheet, Brazil is graded with a Baa1 default risk and the Country Risk Premium is defined to be 3% (Damodaran, 2008). If analysing recent data from 2012 (Damodaran, 2012), Brazil is graded with a Baa2 default risk and a 2.63% Country Risk premium.</p> <p>In conclusion, the validation team is of the opinion that the Country Risk premium has been estimated on the basis of valid standard market data, in line with the project starting date and that the value is comparable with other references of general reputation. Please refer to the references below:</p> <ul style="list-style-type: none"> <li>- Damodaran, 2008: Country Default Spreads and Risk Premiums, Last updated: January 2012, available under “Updated Data”/ Risk Premiums for Other Markets; 01/08, available at: <a href="http://pages.stern.nyu.edu/~adamodar/">http://pages.stern.nyu.edu/~adamodar/</a></li> <li>- Damodaran, 2012: Country Default Spreads and Risk Premiums, Last updated: January 2012, available at: <a href="http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html">http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html</a></li> </ul>	
$\beta$ - Unleveraged Industry Beta	-----	0.63	Jirau HPP Investment Analysis, 2012, worksheet “CAPM”, cell C11	<p>The data source, the Damodaran website, is reliable and a standard reference and source for financial data. The value of unleveraged beta was checked. The last 5 years of data are used for the estimation, as can be seen on <a href="http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html">http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html</a>. Here Damodaran follows standard practice as the US capital market is more mature. See on the webpage the table “Data Sets”, line “Total Beta by Industry Sector”, select the link “01/08”→ worksheet “totalbeta07.xls”. The beta considered is the mean value of cells C27 , C28 and C29 , respectively the Unlevered Beta corrected for cash for the sectors Electric Util. (Central), Electric Util. (East) and Electric Util. (West).</p> <p>The validator confirms that the vintage and the use of average Beta for electrical utilities is considered appropriate.</p> <p>The validation team has cross-checked the value of unlevered beta adopted by the PP against the value given in a study, from November 2007, on the valuation of hydro-electricity power projects (Otto, 2007). As can be seen on page 28, Table 3, the mean unlevered Beta for the selected hydro companies was 0.68. The Beta value for the Brazilian company considered in the study (CPFL Energia) was 0.77. The value adopted by the PP, 0.63, is more</p>	OK

				conservative from the CDM additionality standpoint.	
$W_d$ - Target Debt / Total Capital under baseline conditions	%	50.00	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C12	The value of $W_d$ of 50% is the standard leverage as defined by the BNDES for GHG intensive generation assets which do not get the investment incentive which is applicable for renewable generation sources ( <a href="http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energia_eletrica_geracao.html">http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energia_eletrica_geracao.html</a> ). This value is also in line with Guidance 18 (CDM EB 62 Annex 5, 2011). As the value of the parameter is defined by an official body, and therefore a primary source, no further cross-check was deemed necessary by the validation team.	
$W_d$ - Target Debt / Total Capital under project specific conditions	%	70%	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C12 cell 25	The value of $W_d$ under the condition of full consideration of the investment incentives with increased financial leverage was validated from the Feasibility Study Report submitted to BNDES (FSR, 2008), table " <i>Principais Premissas</i> " (main assumptions) on page 49, by the name of " <i>Recursos de Terceiros</i> " (third party funds). The value in this document is 70.4%, slightly higher than the value adopted by the PP in the benchmark calculation. Furthermore, the PP announced the intention to obtain 70% of its funding from the BNDES on the project starting date (Estadão, 2008_07_22)  Additionally, as a secondary evidence post the project's starting date, it is possible to see in the official BNDES webpage published on 18 February 2009, the communication that the BNDES financing would be 68.5% of the total investment (BNDES, 2009). The validation team concluded that the assumption that the project owners considered the BNDES financing participation as 70% is credible and applicable.	OK
$W_e$ - Target Equity / Total Capital	%	50% (baseline conditions)  30% (project specific conditions)	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C13	This value is the portion of shareholder equity to finance the project after BNDES debt, and is calculated from the parameter validated above.	OK
$t$ - Marginal Tax Rate	%	34.00	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C14	The value of Income Tax and Social contribution tax rates in Brazil is the sum of the parameters "Income Tax", 25% and Social Contribution, CSLL, 9%, which are both validated below in this table from the official data (Brazilian Revenues Service). Additionally, this value was checked in the Damodaran's webpage: <a href="http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/countrytaxrate.htm">http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/countrytaxrate.htm</a>	OK

$\beta$ - Adjusted Industry Beta under baseline conditions	%	1.05	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C15	The calculation of the adjusted Beta was verified and deemed adequate. It is calculated from the unleveraged Beta, considering the return reduction due to the application of the Marginal tax rate and leveraging the investment according to the capital structure under baseline conditions of 50% debt and 50% equity. The parameters unleveraged Beta, Marginal tax rate, $W_d$ and $W_e$ are validated above.	OK
$\beta$ - Adjusted Industry Beta under project specific conditions	%	1.61	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C28	The calculation of the adjusted Beta for project specific conditions was verified and deemed adequate. It is calculated from the unleveraged Beta, considering the return reduction due to the application of the Marginal tax rate and leveraging the investment according to the expected project specific capital structure of 70% debt and 30% equity as defined by the FSR (2008) on the basis of the Brazilian development Banks investment incentives.	OK
$K_e$ - Cost of Equity under baseline conditions	%	12.46	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C16	The calculations were made by the PP according to the CAPM and were verified by the validation team.	OK
$K_e$ - Cost of Equity under project specific conditions	%	16.05	Jirau HPP Investment Analysis, 2012, worksheet "CAPM", cell C29	The calculations were made by the PP according to the CAPM and were verified by the validation team.	OK

## 2. IRR Calculation

### A. Incoming cash flow

#### A.1 Base case scenario (46 turbines)

The key reference for all investment assumptions of the base case is the Feasibility Study Report submitted by the PP to BNDES on 24 June 2008 (herein referred to as FSR, 2008), which represents an official document submitted to the Brazilian Development Bank to address its requirements for assessing and approving the financing for the project activity. As such, the document represents a reliable reference of the PP's business model and views as applicable at the project starting date which occurred less than one month later than the official submission of the FSR to the Brazilian Development Bank as validated on behalf of a copy which was signed by the Head of the Bank's Department for Infrastructure and Electric Energy (FSR, 2008). Moreover, the intention to finance 70% of the 9 billion BRL project investment with the BNDES was publicly announced on the project starting date (Estadão, 2008\_07\_22), which confirms the documents content and purpose. Therefore the FSR is compatible with the project starting date and the key reference for the characteristics and assumptions of the "Base Case" configuration, which

considered the installation of 46 turbines and an overall installed capacity of 3,450 MW. Moreover, the firm energy, which represents the effective generation capacity and thus contains the plant load factor, informed by this document is in line with the provisions of the “Guidelines for the reporting and validation of plant load factors” version 1 as it fulfils the criteria to be “*The plant load factor provided to banks [...] while applying the project activity for project financing*”. Due to gradual progress in construction, the effective firm energy grows in parallel to the stepwise implementation of the turbines and generators.

To further validate the assumptions contained in the FSR and thus to confirm its assumptions, the relevant variables have been cross-checked against other applicable references such as those issued by the regulators or against general market references. A summary of the validation process of each of the revenue variables is offered below.

Total Firm Energy defined by EPE as a basis for the first auction (ANEEL auction 05/2008), considering 44 turbines	MWh/year	The value increases during the construction period due to ramp up (installation of turbines over the time) as projected by EPE, until the full generation value of 17,303,628 MWh/year (1,975.3 MW x 8760 h/year) is reached in Sept 2015.	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener", line 9	<p>The total firm energy as defined by the regulator (ANEEL) according to the official project implementation timeline is needed to calculate the incremental energy which the PP projected to be obtained on the basis of its optimisations and therefore does not correspond to the plant's effective firm energy as projected by the PP at the project starting date.</p> <p>With this purpose, the value was correctly used in the FSR, which is the reference cited in the PDD and in the Investment Analysis worksheet.</p> <p>To cross-check that the values considered in the FSR are correct and correctly used in the PDD and Investment Analysis, the validation team has undertaken the following actions:</p> <p>The total volume of firm energy the regulator had projected for sales as of September 2015 is in compliance with the auction notice (ANEEL Auction Notice, 2008), page 5 item 3.5. Considering the gradual implementation of the turbines which, according to EPE, would start in January 2013, the regulator has defined incremental values of commercially available firm energy for each month of the construction schedule (Table 6 of Annex II of the auction notice). The values defined by the regulator were correctly used in the FSR, in the PDD and in the Investment Analysis worksheet.</p> <p>As the value of the Total Firm Energy is defined by the regulator, and therefore the primary source, no further cross-check was deemed necessary by the validation team.</p> <p>The Investment Analysis worksheet (Jirau HPP Investment Analysis, 2012), table "E-Gener" line 9 "EPE firm energy projection" shows the sum of the increasing monthly firm energy production volume (MWh) considered in the cells H105 to AM165. These monthly energy production values (MWh), in their turn, are calculated from the firm energy generation capacity (MW average) shown in the cells E107 to E165. All figures are accordingly reflected in the FSR submitted to the BNDES, table page 46 "Cronograma ANEEL" (FSR,</p>	OK
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				2008).	
Total Firm Energy produced (Firm energy projected by the PP with 46 turbines)	MWh/year	The value varies during the construction ramp up (installation of turbines over the time) projected by the PP, until the projected value of <b>17,650,524</b> MWh/year (i.e., 2,014.9 MW x 8760 h/year) is reached on Sept 2012	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener", line 3	<p>The FSR, as cited in the PDD and in the Investment Analysis worksheet is the reference for the PP's specific assumptions about the increased installed capacity, the total firm energy and therefore also the increased firm energy and the accelerated construction and implementation schedule. The FSR, which was provided to the Brazilian Development Bank to apply for project financing complies with the "Guidelines for the reporting and validation of plant load factors" and therefore is a valid reference for the ex ante definition of the plant load factor.</p> <p>The values between the FSR and the PDD and Investment Analysis were compared and the correction of an inconsistency was requested and addressed in CAR 01.</p> <p>In addition, the following actions were undertaken as cross checks:</p> <p>According to MMEs Ordinance 13 of 18 March 2008 (MME Portaria 13, 2008_03_18), the annual Firm Energy of the Jirau HPP is a function of the number of turbines commissioned. Therefore the Firm Energy available for sale in each month depends on the number of turbines that are commissioned according to the PP's development timeline, which considers and anticipation when compared to the official timeline, as demonstrated by the FSR. This was accurately reflected in the Investment Analysis worksheet, table "E-Gener" to calculate the projected firm energy production (MWh). The annual values are shown in the lines 39 to 100, cells H to AM. The values are the sum of ramp up's monthly energy generation values considered in the cells H39 to AM99. These monthly energy production values, in their turn, are calculated from the firm energy generation capacity shown in the cells D41 to D99, whose figures were validated against the FSR submitted to BNDES, table of page 46 "Cronograma ESB" (FSR, 2008).</p> <p>The comparison with the original firm energy and implementation timeline as projected by EPE shows that the PP's projections and assumptions were ambitious but technically consistent.</p> <p>The projected energy generation for the base case, 3,450 MW, is based on a Firm Energy generation of 2,014.9 MW (FSR, 2008), which corresponds to a load factor of 58.4%. Although this is a plant specific factor, the value can be cross-checked by comparing it to the Brazilian average for comparable plants.</p> <p>According to EPE, 2007b (page 114) the Brazilian load factor for 2010 was</p>	OK

				<p>projected to be on average 57%. The study (table 2) also defines the average load factor for run-of-river hydro power plants without any regulation up stream (as it is the case for the Jirau HPP) to be on average 50.5%, while run-of-river hydro power plants with up-stream regulation reach on average 59.9%.</p> <p>According to an article about the cost of run-of river hydro power plants published by Brasil Economia Governo (2012), an independent think tank, the Brazilian average load factor is 50 to 55% and the load factor of a run-of river hydro power plant is mostly influenced by the natural hydrology. The article also refers to the Jirau hydro power plant's load factor as 58%, which is comparable with the value which had been estimated for the Base Case (58.4%).</p> <p>Overall, these references confirm that the Firm Energy and the Load Factors of the Base Case as referenced by the FSR, 2008, have been estimated at the upper limit of comparable values and therefore are deemed conservative in the terms of the CDM.</p>	
Firm Energy sold to the regulated market (ACR1)	MWh/year	12,112,540 MWh/year (70% x 1,975.3 MW x 8760 h/year)	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener", line 18	<p>This parameter is directly calculated from the parameter "Total Firm Energy defined by EPE" validated above. The FSR, as referenced in the PDD and in the Investment Analysis worksheet, defines that 70% of the Total Firm Energy as projected by the regulator shall be sold to the regulated market.</p> <p>To cross-check this assumption, this has been compared with the ANEEL's auction notice (ANEEL Auction Notice, 2008), page 31 item 13.3.1, which defines that a minimum of 70% of the firm energy, which gives 12,112,540 MWh/year (70% x 1,975.3 MW x 8760 h/year) shall be sold to the regulated market. See the validation of the parameter "Total Firm Energy defined by EPE" above. The 70% value was also defined by the notice of homologation of the auction, issued by ANEEL on 22 July 2008, page 1 (ANEEL Homologation, 2008_07_22). The homologation implies that this amount of energy is then effectively sold under a 30 year long PPA, which occurred on 10 October 2008 (ANEEL 2011_10_18).</p>	OK
Firm Energy available for sales to the Free Market (ACL)	MWh/year	5,191,088 MWh/year (30% x 1,975.3 MW x 8760 h/year)	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener", line 17	<p>This parameter is directly calculated from the parameters "Total Firm Energy defined by EPE" and "Firm Energy sold to the regulated market", validated above. The FSR, as referenced in the PDD and in the Investment Analysis worksheet defines that 30% of the Total Firm Energy as projected by the regulator shall be sold to the liberalised market.</p> <p>Therefore the energy sold to the free market is the remaining energy</p>	OK

				committed in the auction and not sold to the regulated market, i.e., is 30% x 1,975.3 MW x 8760 h/year = 5,191,088 MWh/year. See the validation of the parameters "Firm Energy sold to Regulated Market" and "Firm Energy defined by EPE" above. The FSR submitted to the BNDES, page 47, "Preço ACL" (FSR, 2008) confirms the PP's intention to deliver to the Free Market the maximum possible 30% of the project's firm energy generation capacity as defined by the regulator. This assumption is conservative in the context of the CDM as the price in the free market is above the price in the regulated market.	
Additional Firm Energy projected for sales to the Free Market (ACL)	MWh/year	<u>Additional energy:</u> 346,896 MWh/year <u>Anticipated energy generation:</u> variable according to the implementation timeline projected by the PP.	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener", line 16	This parameter is directly calculated from the parameters "Total Firm Energy produced" and "Total Firm Energy defined by EPE", validated above. As described by the Feasibility Study Report and adequately referenced in the PDD and in the Investment Analysis worksheet, the additional firm energy produced from the additional 2 turbines, as well as from the anticipated energy generation equals the "Total Firm Energy produced" as projected by the PP minus the "Total Firm Energy defined by EPE" (which is composed in the relation of 70/30 by the "Firm energy sold to Regulated Market" and the "Firm Energy available for sales to the Free Market" (please refer to the validation of these parameters above)). The Feasibility Study Report submitted to the BNDES, page 47, "Preço ACL" (FSR, 2008) confirms the PP's intention to deliver 100% of the additional firm energy related to the anticipation and expansion to the Free Market. After September 2015, with the ending of the implementation phase as planned by EPE, the energy anticipation is zero, and the value of this parameter corresponds solely to the production of the 2 additional turbines: (2,014.9 MW - 1,975.3 MW) x 8760 h/year = 346,896 MWh/year.	OK
Secondary energy	%	1.5% of the Total Firm Energy produced, only after the plant is fully operational	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener", line 12	The value of this parameter was validated from the Feasibility Study Report submitted to the BNDES, page 49, table "Resumo das principais premissas adotadas", 8 <sup>th</sup> line, "Energia Secundária" (FSR, 2008). The calculations in the worksheet were verified.  In addition, the amount of secondary energy as projected by the PPs was compared to the historic average and the 1.5% as projected by the PPs was deemed reasonable (ESBR Memo, 2012).  The plant load factor in the Base Case, if only the Total Firm Energy produced is considered, is 58.4 %%. If the estimated 1.5% secondary energy is added, the plant load factor increases to 59.3%.	OK
Electricity Price in the Regulated	BRL/MWh	71.37	Jirau HPP Investment	This value is referenced by the Feasibility Study Report and was correctly applied in the PDD and the Investment Analysis. It is also in compliance with	OK

Market (ACR1)			Analysis, 2012, worksheet "Valuation", cell Z6	the notice of homologation of the auction, issued by ANEEL on 22 July 2008, page 1 (ANEEL Homologation, 2008_07_22).	
Electricity Price in the Free Market (ACL)	BRL/MWh	134.00	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell Z9	<p>The value was estimated by the PP based on its experience in the market and on long term data, and was validated from the Feasibility Study Report submitted to the BNDES, page 47, "Preço ACL" (FSR, 2008).</p> <p>The figure above has been cross-checked with a press announcement from 3 June 2009 where CEMIG announces to have purchased the electricity from the Santo Antonio hydro power plant at 139,47 BRL/MWh (Globo, 2009). As inflation in the period between 30 April 2008 and 1 June 2009 was 6.61% (IPCA_April_08_June_09) the value corresponds to 131 BRL/MWh, which is below the PPs assumptions as referenced by the FSR. Moreover the press article mentions that <i>"The price is very high [...] participants in the liberalized markets were not prepared to pay this price"</i>.</p> <p>Further the Article explains: <i>"During several months the energy had been offered on the free market, but did not spark interest of buyers. The concessionaries of the Santo Antonio HPP already had a pre-arrangement with Cemig, who is a shareholder of the project and now, due to demands from the BNDES, the contract had to be formalized"</i></p> <p>Therefore the validator concludes that the value as referenced by the FSR was defined at a level which is to be deemed conservative in the terms of the CDM.</p>	OK
Electricity Price in the Spot Market	BRL/MWh	90.00	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell Z12	<p>The value adopted in the investment analysis was estimated by the PP based on its experience in the market and on long-term data, and was validated from the Feasibility Study Report submitted to the BNDES, page 49, table "Resumo das principais premissas adotadas", 9th line, "Preço de venda da energia secundária" (FSR, 2008).</p> <p>As explained in the PDD, the revenue generated from the sale of secondary energy is not a conventional direct income of a HPP, but a payoff obtained through the Brazilian Energy Reallocation Mechanism (MRE - Mercado de Realocação de Energia) where hydro power plants swap and diversify their hydrologic risks according to their firm energy. This explanation was confirmed by the validation team through consultation to the official CCEE webpage <a href="http://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/produtos/precos?_afLoop=19917937592000&amp;_afWindowMode=0&amp;_afWindowId=null#%40%3F_afWindowId%3Dnull%26_afLoop%3D19917937">http://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/produtos/precos?_afLoop=19917937592000&amp;_afWindowMode=0&amp;_afWindowId=null#%40%3F_afWindowId%3Dnull%26_afLoop%3D19917937</a></p>	OK CL 06, closed

				<p><a href="#">592000%26_afrWindowMode%3D0%26_adf.ctrl-state%3D17e4seddp0_29.</a></p> <p>The Electricity Price in the Spot Market is determined by CCEE, from the same models used by the ONS, on a weekly basis. Based on hydrological conditions, energy demand, fuel prices, the cost of energy supply deficit, the planned starting of new projects and the availability of generation and transmission equipment, the pricing model calculates the optimal dispatch (generation) for the period under study, defining the hydraulic generation and thermal generation for each submarket. As a result of this process, the marginal operation costs for the period studied are obtained for each load level and for each submarket.</p> <p>The monthly mean prices in the Spot market were checked by the validator from the CCEE's official webpage  <a href="http://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/produtos/precos/precos_medios?_afLoop=2371610126000&amp;_afWindowMode=0&amp;_afWindowId=f2y8r2e9w_1#%40%3F_afrWindowId%3Df2y8r2e9w_1%26_afrLoop%3D2371610126000%26_afrWindowMode%3D0%26_adf.ctrl-state%3Df2y8r2e9w_21">http://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/produtos/precos/precos_medios?_afLoop=2371610126000&amp;_afWindowMode=0&amp;_afWindowId=f2y8r2e9w_1#%40%3F_afrWindowId%3Df2y8r2e9w_1%26_afrLoop%3D2371610126000%26_afrWindowMode%3D0%26_adf.ctrl-state%3Df2y8r2e9w_21</a>. It is possible to see that the prices are highly volatile and that the mean value over the period from May 2003 to July 2008 is 58.5 BRL/MWh, well below the value of 90 BRL/MWh considered by the PP in the investment analysis.</p> <p>Based on this explanation and data, the value as referenced by the FSR was cross-checked and deemed conservative.</p>	
Revenues (Energy Sales adjusted for transmission)	kBRL/year	The revenues vary during the construction ramp up as projected by EPE, until stabilisation on Sept 2015. From 2016 on the value is fixed at <u>1,571,261</u>	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", line 33	<p>The value of Revenues is calculated from the parameters validated above (energy generation and energy prices). The calculations in the Jirau HPP Investment Analysis, 2012, worksheet "Valuation", line 33, were verified. The value of energy transmission losses in the Brazilian Interconnected Grid System of 2.5% was estimated by the PP based on historic data (CCEE, 2009) and based on its experience in the market. These transmission losses are not project specific, but apply to all generation assets in the Brazilian SIN and are defined by the CCEE. Historic values are comparable with the 2.5% estimate as applies by the PP. The value is therefore comparable with public historic data and was validated from the Feasibility Study Report submitted to the BNDES, page 49, table "Resumo das principais premissas adotadas", 16<sup>th</sup> line, "Perdas na Transmissão" (FSR, 2008).</p> <p>As the value of the parameter was based on historic data from CCEE, which is a primary source, no further cross-check was deemed necessary by the</p>	OK

				validation team.	
<b>A2. Optimised scenario (50 turbines):</b>					
<p>The optimised scenario consists of an increase of the project's total installed and Firm Energy generation capacity. The potential for such an optimization was identified by the PP in March 2010 and its implementation was effectively decided in October 2011, when the sales of a part of the incremental Firm Energy was homologated by the regulator (ANEEL, 2011_10_18). To adequately address this change in project configuration, the validation team considered that the CDM EB 48 Annex 67 "Guidelines on Assessment of Different Types of Changes from the Project Activity as described in the Registered PDD", although meant to be applied in situations of project changes identified after the project registration, are also meaningful and adequate in situations of changes occurred during the development of the project activity. In the present case, aiming to show that the conclusion about the additionality would not have been affected even if the PP had considered the possible increase of the project's output already at the project's starting date, a new calculation was provided by the PP, only modifying the energy generation capacity, with the inclusion of the three parameters described below: 1) Incremental Firm Energy sold to the Regulated Market as well as Maximum Incremental Firm Energy for sales to the Free Market; 2) The price of the Firm Energy sold to the regulated market in the second auction (auction 02/2011 of 17 August 2011, homologated on 22 October 2011); 3) The incremental Investment necessary to finance the additional generation capacity. For all other figures, such as, energy price for the Free Market, the percentage of Secondary Energy or the energy price for the Free Market, the original assumptions have been maintained as required by CDM EB 48 Annex 67. Cost overruns not related to the incremental generation capacity have been disregarded.</p> <p>Regardless of this exercise, the PP has provided numerous documents and references that show that its effective investment assumption at the project starting date was to implement the project with 46 turbines and an installed capacity of 3.450 MW. This is referenced by the FSR from 24 June 2008 (FSR, 2008), by the second and revised notification on CDM consideration which was sent to the UNFCCC on 24 August 2009 (CDM Notification 2009_08_24) by the validation proposal submitted by LRQA on 8 July 2009 (LRQA, 2009) and by the financing agreement with the BNDES (2009). It is therefore credible and reasonable to assume that the PP at the project start was not aware about the possibility to further increase the generation capacity of the plant.</p> <p>In addition to this, it has been validated from communication submitted to the Brazilian Development Bank on 12 August 2011, that the decision for an expansion of the project activity also considered the revenues from generation and sales of CERs (BNDES_ESBR, 2011). Furthermore, on the same day of the auction for the sale of the additional firm energy which was defined for the expansion, i.e. on 17 August 2011, the PP immediately informed the UNFCCC about the revised project configuration with an installed capacity of 3,750 MW, thus manifesting its CDM consideration for the full generation capacity (CDM Notification 2011_08_17).</p> <p>Therefore the expansion that occurred should not affect the Additionality Assessment which shall be developed from the perspective of the project starting date, but in order to conduct an assessment according to the provisions of CDM EB 48 Annex 67, specific variables that define the "Optimized Project" have been validated as follows.</p>					
Incremental Firm Energy sold to the Regulated Market (ACR2) in the second auction (2011 A-3 auction)	MWh/year	1,833,468	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener", line 10	This incremental Firm Energy is not contemplated in the Feasibility Study Report as it was not known at the time of the project starting date. Nevertheless it is well defined by the regulator as it was published before the follow-up auction of 17 August 2011 took place. The incremental firm energy approved was 209.3 MW (or 209.3 MW x 8760 h/year = <b>1,833,468 MWh/year</b> ), as validated from the decree of the Ministry of Mines and Energy, annex I (MME Portaria 26, 2011_08_01), also available on	OK

				<p><a href="http://www.aneel.gov.br/cedoc/prt2011026spde.pdf">http://www.aneel.gov.br/cedoc/prt2011026spde.pdf</a>. This additional energy was only valid if effectively and fully sold to the Regulated Market, as shown in the same document, paragraph 2 article 4.</p> <p>As the value of the parameter was based on a decree of the Ministry of Mines and Energy, no further cross-check was deemed necessary by the validation team.</p>	
Maximum incremental Firm Energy	MWh/year	483,552	<p>Study from EPE (2011_11_07)</p> <p>The document provides the maximum possible Firm Energy for a configuration of 50 x 75MW Turbines and the operating upstream and downstream water levels of 90m and 70m respectively, as calculated by EPE.</p> <p>This incremental energy is yet to be approved by the Ministry for Mines and energy, but has been considered by the PP in the investment analysis.</p>	<p>Based on the Optimized Project Design, ESBR expects to be granted with additional firm energy, but so far the regulator has only awarded the value defined by MME Portaria 26 (2011_08_01). The PP's expectation has been publicly announced (Jornal da Energia, 2012). This assumption is confirmed by a study developed by the governmental Energy Research Company EPE to calculate Jirau HPPs Firm Energy under different assumptions. This reference was used by the PP to reference the maximum Firm Energy possible for the Optimized Project as calculated by EPE for JHPP's configuration with 50 x 75MW turbines and the operating upstream and downstream water levels of 90m and 70m respectively, as calculated by EPE. This choice is conservative in the context of the CDM as the study also indicates lower values and therefore there is risk that this maximum value is not achieved.</p> <p>Though EPE is a governmental research company and thus was not contracted by the PPs, the validation team is of the opinion that the reference is in line with the <i>"Guidelines for the reporting and validation of plant load factors"</i>. In fact EPE, under the Brazilian regulation, is responsible to conduct the technical study which subsidises the regulator's final decision. Moreover, as the technical maximum has been chosen for the evaluation, any uncertainty about the regulator's final decision has been conservatively addressed.</p> <p>Therefore, according to the reference, 2,279.4 MW average (19,967,544 MWh/year) is the maximum Firm Energy possible and therefore above the Firm Energy approved so far. This was validated from the document "Studies for the expansion of generation", pag 11 table 3 (EPE, 2011_11_07). As mentioned in the study, the presented energy of 2,279.4 MW is merely indicative, in the sense that the project owners had not yet been granted the right to sell this amount of energy.</p> <p>As the firm energy approved so far is lower, <math>(1,975.3 + 209.3) \text{ MW} = 2,184.6 \text{ MW}</math>, and the PP is still seeking the official approval of the 2,279.4 MW as total project's firm energy, this incremental firm energy has to be complemented for</p>	OK

				<p>a conservative investment analysis for the scenario of the optimised scenario. This was achieved on the basis of the following rationale:</p> <p><u>Energy for the Free Market in the Base case scenario:</u> As validated above, the "Firm Energy available for sales to the Free Market (ACL)" in the Base Case is 5,191,088 MWh/year and the "Additional Firm Energy projected for sales to the Free Market (ACL)" is 346,896 MWh/year. The total energy to be sold to ACL in the Base Case is then 5,191,088 + 346,896 MWh/year = 5,537,984 MWh/year.</p> <p><u>Energy for the Free Market in the Optimised scenario:</u> As validated above, the PP was awarded a total of 2184.6 MW average of Firm Energy (MME Portaria 26, 2011_08_01). 1,382.71 MW average (12,112,540 MWh/year) were sold to the ACR1 and an additional 209.3 MW average (1,833,468 MWh/year) to the ACR2, while 592.59 MW (5,191,088 MWh/year) are available to the Free Market. In addition the PP expects to be awarded with an additional 94.8 MW average (830,448 MWh/year) for sale to the Free Market. This maximum incremental energy for the free market is <b>483,552 MWh/year above the expectation of the Base Case.</b></p> <p>The fact that the technical maximum firm energy as estimated in the EPE study (EPE, 2011_11_07) is an adequate reference for the investment analysis has been confirmed by analysing the BNDES supplementary finance approval of 31 July 2012 (BNDES Decision 798, 2012). As can be seen on page 38, clause VIII of the document, part of the loan is conditional to the approval of the maximum Firm Energy as projected. Only if this incremental Firm Energy of more than 90 MW is approved by the regulator, the full loan amount will be given. In other words, part of the Brazilian Development Bank's supplementary loan is conditional of the approval of the full amount of Firm Energy as projected and requested by the PP.</p> <p>The projected energy generation for the Optimized Project with an installed capacity of 3,750 MW is a maximum Firm Energy of 2,279.4 MW (EPE, 2011), which corresponds to a load factor of 60.8%. Although this is a plant specific factor, the value can be cross-checked by comparing it to the Brazilian average for comparable plants.</p> <p>According to EPE, 2007b (page 114) the Brazilian average load factor for 2010 was projected to be on average 57%. The study (table 2) also defines the average load factor for run-of-river hydro power plants without any regulation up stream (as it is the case for the Jirau HPP) to be on average 50.5%, while</p>	
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				<p>run-of-river hydro power plants with up-stream regulation reach on average 59.9%.</p> <p>According an article about the cost of run-of river hydro power plants published by Brasil Economia Governo (2012), an independent think tank, the Brazilian average load factor is 50 to 55% and the load factor of a run-of river hydro power plant is mostly influenced by the natural hydrology. The article also refers to the Jirau hydro power plant's load factor as 58%, which is comparable for the value which had been estimated for the Optimized Project (60.8%).</p> <p>Overall, these references confirm that the Firm Energy and the Load Factor of the Optimized Project as referenced by EPE, 2011_11_07, have been estimated at the upper limit of comparable values and therefore are deemed conservative in the terms of the CDM.</p>	
Secondary energy	%	1.5% of the Total Firm Energy produced, only after the plant is fully operational	Jirau HPP Investment Analysis, 2012, worksheet "E-Gener" , line 12	<p>This value is a percentage of the Total Firm Energy produced. The value in terms of percentage did not change for the assumptions of the Optimized Project, but the effective volume of Secondary Energy will increase as a consequence of the Incremental Firm Energy sold to the Regulated Market and the Maximum incremental Firm Energy for sales to the Free Market. The percentage of 1.5% was validated above for the Secondary energy in the Base Case.</p> <p>The plant load factor in the Optimised Project, if only the Total Firm Energy produced is considered, is 60.8 %%. If the estimated 1.5% secondary energy is added, the plant load factor increases to 61.7%.</p>	OK
Electricity Price in the Regulated Market (ACR2)	BRL/MWh	88.08	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell Z7	<p>The price of the energy as defined on 17 August 2011 is 102.00 BRL/MWh (ANEEL, 2011_10_18).</p> <p>To make this value comparable with the context of the Investment Analysis as conducted in real terms of 30 April 2008, the PP discounted the inflation over the period from April 2008 to August 2011 (40 months), considering Brazil's inflation target of 4.5% per year (the forecasting value was available to the PP on April 2008, the base date for the investment analysis). The history of inflation targeting was verified by the validation team on the site of the Central Bank of Brazil (Banco Central, 2012) and was confirmed to be 4.5% in 2008. The calculation was verified by the validation team: <math>\text{Price April08} = 102.00 \times (1.045)^{\text{Exp}-(40/12)} = 88.08 \text{ BRL/MWh}</math></p> <p>The validation team considers this approach correct as it allows evaluating the</p>	OK

				Optimized Project activity in the context of the original project starting date.  As the value of the Electricity Price in the Regulated Market was based on the result of the auction conducted by the regulator (ANEEL), no further cross-check was deemed necessary by the validation team.	
Electricity Price in the Free Market (ACL)	BRL/MWh	134.00	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell Z9	The values of energy price were not changed in relation to the values considered at the project's starting date (base case scenario). This is in compliance with the guidance that "The re-assessment of additionality shall be based on all original input data, thereby – in case of investment analysis – in principle only modifying the changed key parameters in the original spreadsheet calculations." See above, in the Base case scenario (46 turbines), the validation of this parameter.	OK
Revenues (Energy Sales (adjusted for transmission))	kBRL/year	The value varies during the construction ramp up (installation of turbines over the time) projected by EPE, until the revenue stabilises at <u>1,792,915 BRL/year</u> on 2016.	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", line 33	The value of Revenues is calculated from the parameters validated above (energy generation and energy prices). The calculations in the worksheet (line 33) were verified.  The values of energy price were not changed in relation to the values considered at the project's starting date (base case scenario). This is in compliance with the guidance that "The re-assessment of additionality shall be based on all original input data, thereby – in case of investment analysis – in principle only modifying the changed key parameters in the original spreadsheet calculations." See above, in the Base case scenario (46 turbines), the validation of this parameter.	OK
<b>B. Outgoing cash flow</b> All outgoing cash flows, such as CapEx for construction of the plant, as well as variable and fixed costs for Operation and Maintenance were defined by the Feasibility Study Report. Following a detailed description of the variables as well as a description of the activities that were undertaken to cross-check them.					
CapEx (46 turbines)	kBRL	9,000,000	Jirau HPP Investment Analysis, 2012, worksheet "CAPEX & Depreciation",	The Value of CapEx is shown in the project's Feasibility Study Report submitted to BNDES by the PP on 24 June 2008 to apply for financing of the project activity on page 51, last line, "Total Geral Direto" (FSR, 2008). As the FSR represents the Base Case assumptions with 46 turbines, this CapEx is compatible with the installed capacity of 3,450 MW as considered by the PPs at the project starting date. This was the effective assumption for the	OK

			cell C4	<p>investment decision, as confirmed by a press announcement made by the PP on the project starting date (Estadão, 2008_07_22).</p> <p>The actual CAPEX then increased during the negotiation of the financing arrangement and the final value considered afterwards by BNDES for the determination of the financing amount was in fact higher, as can be seen on a secondary source, from after the project's starting date, issued by BNDES after the financing approval (BNDES, 2009). According to this official webpage, the total amount of financing approved was of BRL 7.2 billion (BRL 3.635 billion directly by BNDES and BRL 3.585 billion by a pool of private banks). According to this document the amount financed represents 68.5% of the total investment, which means that the CapEx actually considered by BNDES on this date was of BRL 10.5 billion. This is also confirmed by the effective financing contract as signed on 29 June 2009 (BNDES Financing 2009). A cross-check has been made with values from an independent reference, the International Renewable Energy Agency (IRENA), which gives the specific investment cost for hydro power plants in Brazil. According to the reference (IRENA, 2012), Figure 4.2 of page 25, the specific investment cost for hydro power plants in Brazil range from about <u>1200 USD/KW to 2400 USD/KW</u>. These values have been confronted with those of Jirau, as shown below:</p> <table><tr><th>Variable</th><th>Base Case (46 Turbines / 3,450 MW)</th><th>IRENA Reference value</th></tr><tr><td>CapEx</td><td>9000 Million BRL (FSR, 2008)</td><td rowspan="4"><b>1200 USD/KW to 2400 USD/KW</b></td></tr><tr><td>BRL/USD</td><td>1.579002<sup>#</sup></td></tr><tr><td>CapEx USD</td><td>5699 Million USD</td></tr><tr><td>CapEx /MW</td><td><b>1,650 USD/kW</b></td></tr></table> <p><sup>#</sup>Exchange rates on the specific date, as obtained from: <a href="http://www.x-rates.com/historical/?date=2008-07-22">http://www.x-rates.com/historical/?date=2008-07-22</a></p> <p>Based on these facts the validator deems that the CapEx estimate as defined in the FSR is conservative in terms of the CDM as it represents the lowest possible estimate of the time, which had to be increased shortly thereafter.</p>	Variable	Base Case (46 Turbines / 3,450 MW)	IRENA Reference value	CapEx	9000 Million BRL (FSR, 2008)	<b>1200 USD/KW to 2400 USD/KW</b>	BRL/USD	1.579002 <sup>#</sup>	CapEx USD	5699 Million USD	CapEx /MW	<b>1,650 USD/kW</b>	
Variable	Base Case (46 Turbines / 3,450 MW)	IRENA Reference value															
CapEx	9000 Million BRL (FSR, 2008)	<b>1200 USD/KW to 2400 USD/KW</b>															
BRL/USD	1.579002 <sup>#</sup>																
CapEx USD	5699 Million USD																
CapEx /MW	<b>1,650 USD/kW</b>																
Incremental investment	kBRL	871,593	Jirau HPP	The estimated value of the incremental investment defined by the	OK												

(CapEx), 4 additional turbines in the Optimized scenario			Investment Analysis, 2012, worksheet "CAPEX & Depreciation", cell C5	<p>governmental Energy Research Company EPE on July 2011 in preparation of the energy sales auction which took place on 17 of August 2011 was 1,514,278,640.00 BRL), as evidenced in the EPE's Technical Data Sheet for the expansion, page 10, "Custo Total do Empreendimento" (EPE, 2011). This value corresponds to 6 turbines. Adjusting the value to 4 turbines, the investment on July 2011 was estimated as 1,009,519,093.00 BRL. In line with the procedure already adopted for the ACR energy price of the follow up auction, the PP discounted the inflation over the period from April 2008 to August 2011 (40 months), considering Brazil's inflation target of 4.5% per year to make it comparable to the original Investment Analysis which was based on real values as of April 2008, (the base date for the investment analysis as referenced by the FSR). The history of inflation targeting was verified by the validation team on the site of the Central Bank of Brazil (Banco Central, 2012) and was confirmed to be 4.5% in 2008.</p> <p>As the value was defined by the EPE, the official energy research company which corresponds to the Brazilian Ministry for Mines and Energy, it represents a solid reference. Nevertheless the following cross-check has been conducted:</p> <ol style="list-style-type: none"> <li>1) The Unit Cost of each additional turbine is <math>(871.593/4) = 217.9</math> MBRL per Turbine. This can be compared with the unit cost of the original 46 turbines as contemplated in the "Base Case", which is calculated to be <math>(9000/46) = 195.6</math> MBRL per Turbine. In conclusion, the values are comparable, though the new units are about 11% more expensive per unit. Part of this difference was clarified in an interview with the Engineering Director who explained that an exceptional cost for civil works of 60 Million BRL was necessary to allow for the possibility to include the additional turbines.</li> <li>2) If the Unit cost calculated when considering the value referenced in the BNDES financing contract is <math>(10,310/46) = 229</math> MBRL per turbine. This unit cost is slightly above the unit cost of the additional turbines, but as it is based on a final CapEx estimate it also allows a more accurate comparison.</li> <li>3) The value is compatible with Press announcements made by the PP in February 2011 (Jornal da Energia, 2012). The announcement explained that the total projected capital expenditure had been revised to 15.1 Billion BRL. Further it clarifies that one billion is related to the additional turbines, which confirms the value defined by EPE <math>(1.5 \times 4/6) = 1</math> Billion BRL. In addition the communication explains that there were other cost increases related to environmental and other additional investments.</li> </ol>	
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				<div>4) Furthermore, just as made above for the parameter CapEx (46 turbines), a comparison has been made between the unit turbine cost for the 50 turbines configuration and the reference values obtained from IRENA:</div> <table><tr><th>Variable</th><th>Optimized Case (50 Turbines / 3,750 MW)</th><th>IRENA reference value</th></tr><tr><td>CapEx</td><td>15,100 Million BRL (Jornal da Energia, 2012)</td><td rowspan="4">1200 USD/KW to 2400 USD/KW</td></tr><tr><td>BRL/USD</td><td>1.718206<sup>#</sup></td></tr><tr><td>CAPEX USD</td><td>8473 Million USD</td></tr><tr><td>CapEx /MW</td><td>2,259 USD/kW</td></tr></table> <div>#Exchange rates on the specific Dates, as obtained from: <a href="http://www.x-rates.com/historical/?date=2008-07-22">http://www.x-rates.com/historical/?date=2008-07-22</a></div> <div>In conclusion, the value for the 4 additional turbines has been accurately calculated from an official reference. Furthermore it is comparable with the original investment assumption and compatible with external independent references.</div>	Variable	Optimized Case (50 Turbines / 3,750 MW)	IRENA reference value	CapEx	15,100 Million BRL (Jornal da Energia, 2012)	1200 USD/KW to 2400 USD/KW	BRL/USD	1.718206 <sup>#</sup>	CAPEX USD	8473 Million USD	CapEx /MW	2,259 USD/kW	
Variable	Optimized Case (50 Turbines / 3,750 MW)	IRENA reference value															
CapEx	15,100 Million BRL (Jornal da Energia, 2012)	1200 USD/KW to 2400 USD/KW															
BRL/USD	1.718206 <sup>#</sup>																
CAPEX USD	8473 Million USD																
CapEx /MW	2,259 USD/kW																
Variable O&M costs	BRL/MWh	2.05	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell C13	<div>The Value of variable O&amp;M is shown in the project’s Feasibility Study Report submitted to BNDES by the PP on 24 June 2008 on page 49, last line, item "d) Custos Gerenciáveis, table "Resumo das principais premissas adotadas"</div> <div>According to the DOE’s sectoral experience this is a reasonable estimate and the figure is of minor relevance for the total outcome of the investment analysis as is shown by the sensitivity analysis.</div> <div>Although the Feasibility Study Report submitted to BNDES applying for project financing can be considered a strong reference, the validation team has cross-checked the total (O&amp;M + S,G&amp;A) costs against external independent references. According to the IPCC (2011), chapter 5, section 5.8.2, about the Cost for Operation and Maintenance of hydro power plants: “Once built and put in operation, hydropower plants usually require very little maintenance and operation costs can be kept low, since hydropower plants do not have recurring fuel costs. O&amp;M costs are usually given as a percentage of</div>	OK												

			<p>investment cost per kW. The EREC/Greenpeace study (Teske et al., 2010) and Krewitt et al. (2009) used 4%, which may be appropriate for small-scale hydropower but is too high for large-scale hydropower plants. The IEA WEO used 2.5% (IEA, 2008a) and 2.2% for large hydropower increasing to 3% for smaller and more expensive projects in IEA-ETP (IEA, 2008b). A typical average O&amp;M cost for hydropower is 2.5% [...]'. It is possible to see that the lower reference value is above 2% of the investment costs.</p> <p>The (O&amp;M + S,G&amp;A) costs are calculated below in terms of BRL/installed MW per year:</p> <p><b>Base Case:</b> The specific investment cost per MW for the Base Case is 9,000 MBRL/3,450 MW = 2.6 MBRL/installed MW. The projected O&amp;M cost is 2.05 BRL/MWh, or (2.05 x 8760) = 17,958 BRL/installed MW per year, and the S,G&amp;A (service, general and administration) costs are 27.44 MBRL/year, or 27,440,000/3,450 = 7,954 BRL/installed MW per year. Therefore, the total estimated (O&amp;M + S,G&amp;A) costs are 25,912 BRL/installed MW per year, or 1 % of the specific investment cost per MW, well below the reference figures shown above (more than 2% of the specific investment cost), which shows that the number as defined in the FSR is conservative in the terms of the CDM.</p> <p><b>Optimised Project:</b> Likewise, the specific investment cost per MW for the Optimised Project is 9,871,593/3,750 = 2.6 MBRL/installed MW. The projected O&amp;M cost is 2,05 BRL/MWh, or (2.05 x 8760) = 17,958 BRL/installed MW per year and the S,G&amp;A (service, general and administration) costs are 27.44 MBRL/year, or 27,440,000/3,750 = 7,317 BRL/installed MW per year. Therefore, the total estimated (O&amp;M + S,G&amp;A) costs are 25,275 BRL/installed MW per year, which is less than 1% of the specific investment cost per MW.</p> <table><tr><th></th><th>Specific investment cost per installed MW</th><th>Specific (O&amp;M + S,G&amp;A) cost per installed MW</th><th>(O&amp;M + S,G&amp;A) / Investment</th></tr><tr><td>Base Case</td><td>2.6 MBRL/installed MW</td><td>25,912 BRL/installed MW per year</td><td>1%</td></tr><tr><td>Optimised project</td><td>2.6 MBRL/installed MW</td><td>25,275 BRL/installed MW per year</td><td>&lt; 1%</td></tr></table> <p>As can be seen in the table above, in both project configurations the cost of</p>		Specific investment cost per installed MW	Specific (O&M + S,G&A) cost per installed MW	(O&M + S,G&A) / Investment	Base Case	2.6 MBRL/installed MW	25,912 BRL/installed MW per year	1%	Optimised project	2.6 MBRL/installed MW	25,275 BRL/installed MW per year	< 1%	
	Specific investment cost per installed MW	Specific (O&M + S,G&A) cost per installed MW	(O&M + S,G&A) / Investment													
Base Case	2.6 MBRL/installed MW	25,912 BRL/installed MW per year	1%													
Optimised project	2.6 MBRL/installed MW	25,275 BRL/installed MW per year	< 1%													

				(O&M + S,G&A) as a percentage of investment costs is well below the reference values. The O&M and S,G&A costs adopted by the PP in the investment analysis were then considered conservative.	
S,G&A service, general and administration (despesas gerais e administrativas)	MBRL/year	27.44	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell C14	The Value of fixed O&M, SG&A and Administrative cost is referenced by the project's Feasibility Study Report submitted to BNDES by the PP on 24 June 2008 on page 49, last line, item "d) Custos Gerenciáveis, table "Resumo das principais premissas adotadas" According to the DOEs sectoral experience this is a reasonable estimate and the figure is of minor relevance for the total outcome of the investment analysis as is shown by the sensitivity analysis. Furthermore, this value has been cross-checked with other independent references (please refer to the validation of the parameter "Variable O&M costs" above).	OK
TUST	BRL/kW.month	Variable (see the validation comments)	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cells from H14 to M14 (taxes), and line 45 (tariff calculation)	The values of TUST are referenced in the Feasibility Study Report and are in accordance with Annex XII of the auction notice (ANEEL Annex XII, 2008). As the value of TUST is defined by an official body, and therefore a primary source, no cross-check was deemed necessary by the validation team. As the TUST values are from June 2007 and the base date for the investment analysis is April 2008, the calculations considers the correction of inflation according to the variation of the IGPM index period 01.06.2007 - 30.04.2008), 9.01%, as can be seen in the cell H15. The variation of IGPM in the period (9.01%) was verified in the site <a href="http://www.calculoexato.com.br/parprima.aspx?codMenu=FinanVariacaoIndice">http://www.calculoexato.com.br/parprima.aspx?codMenu=FinanVariacaoIndice</a> The calculations of TUST in real terms (see line 45 of the worksheet "Valuation") were verified.	OK CL 07, closed
TFSEE	BRL/kW	316.48	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell S7	The Inspection Fee of Electric Energy Services (TFSEE) is referenced by the Feasibility Study Report as defined by ANEEL dispatch number 3731 of 27 December 2007 (ANEEL, 2007_12_27), paragraph II. As the value of TFSEE is defined by an official body, and therefore a primary source, no cross-check was deemed necessary by the validation team. According to the booklet from ABRACE, document "Cartilha ABRACE Encargos Setoriais.pdf", page 20, also available on <a href="http://www.abrace.org.br/download/cartilha%20de%20encargos.pdf">www.abrace.org.br/download/cartilha%20de%20encargos.pdf</a> , the TFSEE value increases above the IGPM inflation indicator which has been used to adjust the value in the period from 31 December 2007 to 30 April 2008. The correction for inflation in this period according to IGPM (4.18%) was verified in the webpage <a href="http://www.calculoexato.com.br/result.aspx?codMenu=FinanVariacaoIndice">http://www.calculoexato.com.br/result.aspx?codMenu=FinanVariacaoIndice</a> .	OK CL 16, closed

				The calculations were checked and are in accordance with the Law N° 9427/1996 (303.78 BRL/kW x 4.18% x 0.5% x Installed Capacity) BRL/kW = 316.48 BRL/kW.	
UBP concession fee (Utilização de bem publico),	kBRL/year	7,873	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell S14	<p>The concession fee (UBP) is referenced by the Feasibility Study Report, but to obtain further clarification and to solve some doubt about the correct inflation adjustment one CAR and one CL were raised:</p> <p><b>CAR 06:</b> The PP was asked regarding the correction for inflation applied on the UBP value, as if this value presented in the reference document (auction notice) were from December 2007. The PP found out that the correction for inflation was in fact undue, as the reference document was published on April 2008 and therefore is compatible with the base date of the Investment Analysis, 30 April 2008. The value was corrected in the investment analysis and in the PDD.</p> <p><b>CL 08:</b> The PP was asked to provide additional reference for the value of the concession fee (UBP). The nominal value of UBP, as already reflected in the FSR, was also validated based on the ANEEL Auction Notice (2008) paragraphs 12.9.1 to 12.9.3. As the value of UBP is defined by an official body, and therefore a primary source, no further cross-check was deemed necessary by the validation team. The value considered in the financial analysis model (worksheet) was verified to be correct and correctly applied.</p>	OK  CAR 06, closed CL 08, closed
Royalties Compensation for the use of hydro resources ("Taxa de compensação pela utilização de recursos hídricos")	BRL/MWh	62.55	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell S10	<p>The payment and value of Royalties is referenced by the Feasibility Study Report, but to obtain further clarification and to solve some doubt about the correct inflation adjustment, one CL was raised:</p> <p><b>CL 09:</b> The PP was asked to provide and has provided the reference for the value of the Updated Reference Tariff (TAR) and the calculation of the royalties due. As confirmed by the validator, the value of royalties is calculated as 6.75% times the Energy generated in the month, times the TAR. See <a href="http://www.aneel.gov.br/area.cfm?idArea=42">http://www.aneel.gov.br/area.cfm?idArea=42</a>. The value of TAR was determined on 11 Dec 2007 by the ANEEL Homologating Resolution 586 ( <a href="http://www.aneel.gov.br/cedoc/reh2007586.pdf">http://www.aneel.gov.br/cedoc/reh2007586.pdf</a>) as 60.04 BRL/MWh. As the value of the Royalties Compensation is defined by an official body, and therefore a primary source, no further cross-check was deemed necessary by the validation team.</p>	OK  CL 09, closed

				<p>The PP corrected the TAR for inflation in the period from 31 Dec 2007 to 30 April 2008 according to the IGPM (4.18%). The validation team confirmed that IGPM is an adequate inflation index for this purpose, based on information given by ABRACE (Brazilian association of large industrial energy consumers and free energy consumers), in the ABRACE booklet, file "Cartilha ABRACE Encargos Setoriais.pdf", page 38, also available on <a href="http://www.abrace.org.br/download/cartilha%20de%20encargos.pdf">www.abrace.org.br/download/cartilha%20de%20encargos.pdf</a></p> <p>The calculations in the worksheet were checked and found to be correct.</p>	
CCEE Fee	BRL/MWh	0,0833	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell S11	<p>The rate is calculated specifically for each market participant according to the regulation of the Chamber for Commerce of Electric Energy. The value had been estimated by the PP on the basis of the circumstances at the Project Starting Date. This has been cross-checked with an updated calculation and was found to be consistent (CCEE, 2010).</p>	OK
R&D fee (research and development fee)	% of the net operating revenue	1.0	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell S13	<p>The payment and value of the R&amp;D fee is referenced by the Feasibility Study Report, but the following actions for cross-checking were undertaken:</p> <p>The calculation was checked in the worksheet and is according to the Law 9991 of 24 July 2000, article 2, which determines that "The generation companies authorised to produce independent power are required to apply annually an amount of at least 1% (one percent) of its net operating revenue in research and development for the power sector", (Law 9991, 2000). As the value of the parameter is defined by law, no further cross-check was deemed necessary by the validation team.</p>	OK
PIS/COFINS	%	9.25	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell C17	<p>The payment and values of PIS/COFINS is referenced by the Feasibility Study Report, but the following actions for cross-checking were undertaken:</p> <p>The values of PIS (1.65% over the gross revenues) and COFINS (7.60% over the gross revenues) are in accordance, respectively, with the federal Laws 10637 (2002) and Law 10833 (2003). As the value of the parameter is defined by law, no further cross-check was deemed necessary by the validation team.</p>	OK
Income tax (25%), with the tax benefit being considered for 10 years as of 2013	%	25	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell	<p>The values and rules for calculation of Income Tax as well as the specific exemption as applicable for investments in the Amazon region are referenced by the Feasibility Study Report, but the following actions for cross-checking were undertaken:</p> <p><a href="#">The income tax calculation was verified through the consultation to the official</a></p>	OK CL 03, closed

			C18	<p><a href="http://www.receita.fazenda.gov.br/Aliquotas/ContribPJ.htm">site of the Federal Revenue Service (Receita Federal), <a href="http://www.receita.fazenda.gov.br/Aliquotas/ContribPJ.htm">http://www.receita.fazenda.gov.br/Aliquotas/ContribPJ.htm</a> : "the value of the income tax is 15% (fifteen percent) on taxable income, assumed or arbitrated, calculated by corporations in general". The portion of taxable income which exceeds 240,000.00 BRL per year is subject to the impact of the additional tax at the rate of 10%. The calculation in the financial worksheet line 73 was validated and found to be correct.</a></p> <p>The PP transparently and adequately considered (over 10 years in the period from 2013 to 2022) the tax benefit conferred by the Law No. 11.196, of 21 November 2005, which gives a 75% reduction of income tax for companies classified in sectors of the economy considered, in an act of executive power, priority for the regional development. The deadline for the fruition of tax benefit will be 10 (ten) years, counted from the calendar year of commencement of fruition (Law 11196, 2005, Article 32).</p> <p>As the value of the parameter is defined by law, no further cross-check was deemed necessary by the validation team.</p>	
Social Contribution (CSLL)	%	9	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell C19	<p>The value of CSLL was verified in the official site of Internal Brazilian Revenue Service (<i>Receita Federal</i>). According to the reference, the value is defined by the Law 11727 (2008), which has been in force since 1 May 2008 and therefore was applicable at the project starting date.</p> <p><a href="http://www.receita.fazenda.gov.br/Aliquotas/ContribCsl/Aliquotas.htm">http://www.receita.fazenda.gov.br/Aliquotas/ContribCsl/Aliquotas.htm</a></p> <p>As the value of the parameter is defined by law, no further cross-check was deemed necessary by the validation team.</p>	OK
Depreciation	years	10 years for equipment and 25 years for civil works	Jirau HPP Investment Analysis, 2012, worksheet "CapEx & Depreciation" cells I18 to AM18 and I22 to AM22, and worksheet "Valuation", cells	<p>The depreciation regime for the purpose of tax calculation was confirmed from the official site of Internal Brazilian Revenue Service (Receita Federal), <a href="http://www.receita.fazenda.gov.br/legislacao/ins/ant2001/1998/in16298.htm">http://www.receita.fazenda.gov.br/legislacao/ins/ant2001/1998/in16298.htm</a> and <a href="http://www.receita.fazenda.gov.br/legislacao/ins/ant2001/1998/in16298ane2.htm">http://www.receita.fazenda.gov.br/legislacao/ins/ant2001/1998/in16298ane2.htm</a>.</p> <p>As the value of the parameter is defined by as official body, and therefore a primary source, no further cross-check was deemed necessary by the validation team.</p>	OK

			H71 to AL71.		
Residual Value	---	zero	Jirau HPP Investment Analysis, 2012	<p><b>CL 18:</b> Project participants were requested to provide information about the age and average lifetime of the equipment based on manufacturer's specifications and industry standards. Additional information has been included in section A.3 of the revised PDD.</p> <p>The concession contract which refers to the auction won by the PP (auction 005/2008) mentions in clause 12, sub-clause 1: "In the advent of the final term of this Contract, all property and facilities related to HPP will become part of the patrimony of the Union by indemnification of the parcels of investments, not yet amortized or depreciated, which have been performed in order to ensure continuity and timeliness of the service provided, .... The value will be determined by an audit carried out by the Grantor."</p> <p>The "investments performed in order to ensure continuity and timeliness of the service provided" are equipment or installation refurbishments carried out to ensure their continued operation.</p> <p>As the project activity does not include any future investment performed in order to ensure continuity of the service after the final term of the contract, the validation team concludes that the PP cannot count on any indemnification for the facilities or equipment described in the PDD.</p> <p>For the concession contract, please refer to <a href="http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos_editais.cfm?IdProgramaEdital=63#">http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos_editais.cfm?IdProgramaEdital=63#</a> . Select "Anexo IV – Minuta do Contrato de Concessão").</p> <p>As the value of the parameter is defined by an official source, and therefore a primary source, no further cross-check was deemed necessary by the validation team.</p>	CL 18, closed OK

### C. Financing Conditions

Leverage	%	<b>50%</b> in the Base case and <b>50%</b> in the <u>Optimized case</u>	Jirau HPP Investment Analysis, 2012, worksheet "Valuation" , cells I119 and I120	The amount financed depends on the ability of PP to pay the debt, and is evaluated by BNDES as the debt service coverage ratio (DSCR), the ratio of cash available for debt servicing to interest and principal payments, which measures the project's ability to produce enough cash to cover the debt payments. The maximum value of funding released by BNDES is such that, in any given year, the value of DSCR cannot be less than 1.2 (i.e., the operational cash flow must be at least 20% greater than the due interest and principal payments). Please refer to the validation of the parameter DSCR,	OK
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				<p>below. The PP, then, calculated in the worksheet "Financing" the value of maximum leverage (cell B7) according to the results of DSCR (cell B50). The calculations were checked by the validation team.</p> <p>For the Optimised Project, the leverage is also limited by the cap of 50% imposed by the BNDES for financing GHG intensive generation activities, while participation for renewable and hydro power are up to 70% or above as referenced by the Brazilian Development Bank (BNDES, 2008; BNDES, 2012; BNDES FINEM, 2012). The validation team confirms that this BNDES policy is post 11 November 2001 and gives comparative advantage to less emissions-intensive technologies over more emissions-intensive technologies (E- policy) and, then, needs not be taken into account in developing a baseline scenario, according to the clarification of CDM EB22 Annex3.</p> <p>As the value of the parameter has been verified from the consultation to an official source, and therefore a primary source, no further cross-check was deemed necessary by the validation team.</p>	
DSCR (debt service coverage ratio)	-----	1.2		<p>It was confirmed in the official site of BNDES that the DSCR adopted for the Jirau project was 1.2 (BNDES, 2008; BNDES FINEM, 2012) and the same value applies for thermal power plants as confirmed by the BNDES (BNDES, 2012)</p> <p>As the value of the parameter has been verified from the consultation to an official source, and therefore a primary source, no further cross-check was deemed necessary by the validation team.</p>	OK

**Total Financial Costs:** according to the official site of Brazilian Development Bank (BNDES Loan Composition, 2012; BNDES, 2012), the total financing costs with BNDES funds consist of:

a. for direct operations = BNDES Financing Cost + BNDES Basic spread + Credit Risk Spread.

b. for indirect operations = BNDES Financing Cost + BNDES Basic spread + BNDES Financial Intermediation Fee + Private Banks Risk Spread. These parameters are validated below.

BNDES Financing Cost (long term interest rate)	%	3.40_(real terms)	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell AG15	<p>The long term interest rate adopted in the financial analysis is of 50% of TJLP plus 50% of the TJ-462, which is the rate adopted by BNDES for projects of thermal generation from coal or oil as referenced by BNDES (BNDES FINEM, 2012) and as confirmed by a specific statement (BNDES, 2012). In comparison to this, the Brazilian Development Bank incentivises the project activity by offering 100% TJLP financing, which was validated as an E- policy and was not considered by the PP in the investment analysis. For the validation of this E- policy, refer to the item 6.b.7 of this protocol.</p> <p>The TJ-462 is the TJLP plus 1 percentage point (BNDES Loan Composition,</p>	OK
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				<p>2012; BNDES, 2012).</p> <p>The Project's starting date is 22 July 2008. The PP estimated the TJLP on real terms based on the values over the last three years (from January 2005 to December 2007), discounting the inflation over the same period based on the IPCA (see calculation sheet "TJLP" in the Jirau HPP Investment Analysis (2012). The monthly values of TJLP were validated from the site <a href="http://www.debit.com.br/consulta30.php?indice=tjlp">http://www.debit.com.br/consulta30.php?indice=tjlp</a>. The monthly values of IPCA were validated from the site <a href="http://www.debit.com.br/consulta30.php?indice=ipca">http://www.debit.com.br/consulta30.php?indice=ipca</a>.</p> <p>The calculations on the sheet "TJLP", which lead to a mean TJLP in real terms equal to 2.90% (Jirau HPP Investment Analysis, 2012, worksheet "TJLP", cell E5, connected to sheet "Valuation", cell AG6, were checked by the validation team and found correct. Moreover, any uncertainty or possible fluctuation is covered by the sensitivity analysis. (Please refer to Section 7c. Investment analysis, item 3)</p> <p>As the TJ-462 is the TJLP plus 1 percentage point, the value of the BNDES Financing Cost defined under the hypothetical baseline condition (<math>0.5 \times 2.90 + 0.5 \times 3.90</math>) is 3.40% and is considered correct and adequate.</p> <p>As the information needed to validate the parameter has been taken from an official source, and therefore a primary source, no further cross-check was deemed necessary by the validation team.</p>	
BNDES Basic Spread (BNDES remuneration)	%	1.80	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell AG16	<p>The official webpage of the Brazilian Development Bank (BNDES FINEM, 2012) informs the Basic Spread both for fossil fuel and renewable technologies: for thermal generation from coal or oil the basic spread is 1.80% and for the other energy sources it is 0.9%. In addition, as referenced by the Bank's announcement of the support conditions for the Jirau HPP (BNDES, 2008), the spread for the Jirau HPP was further reduced to 0.5%. This policy, as well as the intention to provide sufficient support to make the project viable, was referenced by a specific statement issued by the BNDES (2012). As this policy provides a specific comparative advantage to the project activity when compared to GHG intensive generation alternatives, it was not considered under the baseline conditions and therefore in the financial analysis. By application of the value of 1.80%, the PP adopted a hypothetical baseline condition which is adequate to neglect the comparative advantage which this differential spread represents for the project activity.</p>	OK

				<p>The fact that this policy already applied at the time of the Jirau HPP financing, but not before the year 2006 is referenced by a specific statement provided by the Brazilian Development Bank (BNDES, 2012). For other references and for a detailed summary of the validation of this E- policy, please refer to the item 6.b.7 of this protocol.</p> <p>As all information needed to validate the parameter has been taken from an official source, and therefore a primary source, no further cross-check was deemed necessary by the validation team.</p>	
BNDES Credit Risk Spread	%	1.50	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell AG8	<p>The value of BNDES Credit Risk Spread adopted by the PP at the project's starting date was the mean value of the spread determined by BNDES for the Jirau project. The risk spread value for the project is shown in the BNDES' disclosure, on 28 April 2008, of the supporting conditions for Jirau plant on the Madeira River (BNDES, 2008). See the item "Custo", where it is determined that the risk spread may vary from 0.46% to 2.54%. The PP adopted the mean value 1.50%, which was considered reasonable by the validation team. In fact, as a secondary reference, the effective value of the risk spread in the final loan agreement which was signed on 29 June 2009, was 1.58% (BNDES Financing, 2009, page 4). As BNDES is an official source of information, no further cross-check was deemed necessary by the validation team.</p> <p>Furthermore, the effects of variations in the cost of debt on the conclusion of the investment analysis were considered in the sensitivity analysis.</p>	OK
Private Banks Risk Spread (Accredited Financial Institution Fee)	%	1.75	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell AG10	<p>As determined by BNDES, 50% of the project financing is to be intermediated by private banks, sharing the loan's risk. The PP, at the project's starting date, estimated a value of 1.75% for the risk spread to be charged by these intermediating banks. This is slightly higher than the risk spread charged by BNDES (1.5%, see above). The overpricing of 0.25 percentage point adopted by the PP can be considered reasonable. In fact, the real value of the private banks risk spread in the final loan agreement which was signed on 29 June 2009, was 1.65% (Financing, 2009), see file "2009_06_29 JIRAU - Contrato de Repasse 29 06 2009.pdf", page 8 and therefore slightly lower than expected. Such minor differences can be considered reasonable and are in fact offset by the fact that the BNDES Credit Risk Spread had been underestimated. Furthermore, any uncertainty or variation in the cost of debt on the conclusion of the investment analysis was also considered in the sensitivity analysis.</p>	OK
BNDES	%	0.50	Jirau HPP	This is referenced by the official webpage of BNDES (BNDES FINEM, 2012).	OK

Intermediation Fee private banks (amount charged by BNDES for the intermediation with the private banks)			Investment Analysis, 2012, worksheet "Valuation", cell AG9	The website defines the intermediation Fee charged by BNDES (see item "c. Taxa de Intermediação Financeira". As BNDES is an official and primary source of information, no further cross-check was deemed necessary by the validation team.	
Participation Private Banks	%	50	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell AG11	According to the rules adopted by the board BNDES, half of the funding will be made directly by BNDES, and half through the transfer of accredited financial institutions. This was declared by the Bank when the support conditions for the Jirau HPP had been announced. (BNDES, 2008). As BNDES is an official and primary source of information, no further cross-check was deemed necessary by the validation team.	OK
Loan amortization	years	14	Jirau HPP Investment Analysis, 2012, worksheet "Valuation", cell AG17	The official webpage of BNDES, <a href="http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financieiro/Produtos/FINEM/energia_eletrica_geracao.html">http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financieiro/Produtos/FINEM/energia_eletrica_geracao.html</a> gives the maximum amortization period for thermal generation from coal or oil ( <u>14 years</u> ) and for hydroelectric plants of an installed capacity of 1000 MW or higher (20 years). This advantage given to the project activity was not taken into account and the value of 14 years was considered in the financial analysis. For the validation of this E- policy, refer to the item 6.b.7 of this protocol. As BNDES is an official and primary source of information, no further cross-check was deemed necessary by the validation team.	OK

Validated situation	Conclusion
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	Validated situation	Conclusion
<p>4. Confirm the suitability of any benchmark applied in the investment analysis (CDM VVS, version 02.0, paragraphs 121 and 123 (b)):</p> <p>(a) Determine whether the type of benchmark applied is suitable for the type of financial indicator presented.</p> <p>(b) Ensure that any risk premiums applied in determining the benchmark reflect the risks associated with the project type or activity.</p> <p>(c) Determine whether it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark by, for example, assessing previous investment decisions by the project participants involved and determining whether the same benchmark has been applied or if there are verifiable circumstances that have led to a change in the benchmark.</p> <p>(d) Confirm the suitability of the benchmark (WACC) by checking that its components are calculated using reasonable vintage years that are consistent with the investment horizon and the period for risk free rate. Guidance 15 of the Guidelines on the Assessment of Investment Analysis should be taken into account for estimating the market return rate.</p>	<p>(a) The validation team has validated the Standard Benchmark of 12.46% and the Default Benchmark of 11.75% as suitable to the type of financial indicator (equity IRR in real terms after taxes) as calculated under the defined baseline scenario, The return risks in the benchmark are comparable with the risks in the project's sector.</p> <p>Furthermore the validation team has validated the Project Specific Benchmark of 16.05% as suitable to judge the profitability of the project activity if the investment incentives offered by the BNDES, including the increased financial leverage of 70%, are fully considered.</p> <p>(b) The risk premiums applied in determining the benchmark reflect the risks associated with the specific project type or activity. Please refer to the validation of the benchmark, in the table above.</p> <p>(c) It is reasonable to assume that no investment would be made at a rate of return lower than the benchmark, as explained in the validation of the financial parameters and assumptions shown above.</p> <p>(d) The equity benchmark in real terms was calculated according to best financial practice and the periods determined for all risk premiums have been validated to be adequate and correct.</p> <p>The validation team checked and confirmed the accuracy of the benchmark calculations, as well as its compliance with the "Guidelines on the assessment of investment analysis" (version 5).</p>	OK

	Validated situation	Conclusion
<p>5. If the project participants rely on values from a Feasibility Study Report (FSR) approved by any national authority, the team is required to ensure that (CDM VVS, version 02.0, paragraph 122):</p> <p>(a) The FSR has been the basis of the decision to proceed with the investment in the project, that is, that the period of time between the finalization of the FSR and the investment decision is sufficiently short for the DOE to confirm that it is unlikely in the context of the underlying project activity that the input values would have materially changed.</p> <p>(b) The values used in the PDD and associated annexes are fully consistent with the FSR and, where inconsistencies occur, the DOE should validate the appropriateness of the values.</p> <p>(c) On the basis of its specific local and sectoral expertise, confirmation is provided, by cross-checking or other appropriate manner, that the input values from the FSR are valid and applicable at the time of the investment decision.</p> <p>Use the table below to cross-check input values and describe here the results of the comparison.</p>	<p>The Feasibility Study Report submitted to and approved by the BNDES on 24 June 2008 is the basis for obtaining the financing of the Brazilian Development Bank and therefore the effective investment decision, financing and implementation of the project activity. The reception of the document was duly acknowledged by the BNDES on 24 June 2008 and therefore less than a month before the investor was granted with the rights to the concession, which marks the project starting date and the start of the activities that led to the construction start on 14 November 2008. Shortly after that, on 18 February 2009, the BNDES financing was approved. Based on these facts the validation team conclude that:</p> <p>(a) There has been a very short time interval between conclusion and submission of the Feasibility Study Report and the project starting date and it is unlikely that any input values would have materially changed. This can also be affirmed on the basis of the cross-checks of the variables with other references. In addition to that, the data from the final financing agreement as approved in February 2009 (BNDES, 2009) and the final contract as signed in 29 June 2009 (<i>BNDES Financing 2009</i>) confirm key assumptions, such as interest rates. It also shows that Capital Expenditures had slightly increased in this interval, and that the assumptions of the FSR were conservative in this respect.</p> <p>(b) On 22 July 2008, the date of the homologation and therefore the project starting date, the PP announced publicly that the total investment is 9 billion BRL and that 70% of financing will be requested from the Brazilian Development Bank, which confirms the validity of the FSR (2008)</p> <p>(c) The validation team can confirm that the PDD and associated annexes are fully consistent with the FSR and where divergences were identified they were questioned and resolved (see CAR 01; CAR 02). Furthermore the appropriateness and conservativeness of the values have been validated and cross-checked by the DOE.</p> <p>(d) The validation team confirms that all relevant variables have been cross-checked as detailed in this validation report and that the assumptions documented in the FSR are reasonable, valid and applicable at the time of the project starting date.</p>	OK

**Comparison to similar registered project in the region:** No similar CDM registered project was found in the region. The only two other project activities with a scale similar to that of Jirau Hydro Power Project are [Santo Antonio Hydro power Project](#) and [Teles Pires Hydro power Plant Project Activity](#), whose construction and CDM validation processes are still ongoing.

**CapEx:** In order to cross check the CapEx estimate with applicable third party references the validation team analysed pertinent sources as summarised in the validation of the parameters “CapEx (46 turbines)” and “Incremental investment (CapEx), 4 additional turbines”. Please refer to the table above.

**OpEx:** In order to cross-check the O&M cost estimate (2,05 BRL/MWh) and the S,G&A service, general and administration costs (27.44 MBRL/year) with applicable third party references, the validation team has analysed pertinent sources as summarised in the validation of the parameter “Variable O&M costs”. Please refer to the table above. In both project configurations the cost of (O&M + S,G&A) as a percentage of investment costs is well below the reference values.

	Validated situation	Conclusion
<b>SECTION 7e. Common practice analysis</b>		
1. Describe how the geographical scope of the common practice analysis has been validated. Assess whether the geographical scope (for example, the defined region) of the common practice analysis is appropriate for the assessment of common practice related to the project activity's technology or industry type (CDM VVS, version 02.0, paragraph 129 (a)).	<p><u>Step 1:</u> “Calculate applicable output range as +/-50% of the capacity of the proposed project activity”.</p> <p>The range considered by the PP (from 1,725 MW to 5,625 MW) is adequate, as it encompasses all plants over the range 50% below the installed capacity in the Base Case (3,450 MW) and 50% above the installed capacity in the Optimised Case (3,750 MW).</p> <p><u>Step 2:</u> “In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number <math>N_{all}</math>”.</p> <p>The geographical area considered, the whole Brazil's territory, is adequate considering that the plant will be connected to the SIN (National Interconnected Electric Energy Generation and Transmission System).</p> <p>The number of plants in the geographic area and within the calculated output range was verified in the official ANEEL's webpage <a href="http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp">http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp</a>, and was confirmed to be <math>N_{all} = 4</math>. The plants and their audited installed capacity are:</p> <ul style="list-style-type: none"> <li>- Ilha Solteira, with 3,444 MW</li> <li>- Itumbiara, with 2,080.5 MW</li> <li>- Paulo Afonso IV, with 2,462.4 MW</li> <li>- Xingó, with 3,162 MW</li> </ul>	OK

	Validated situation	Conclusion
	<p><u>Step 3:</u> “Within plants identified in Step 2, identify those that apply technologies different than the technology applied in the proposed project activity. Note their number <math>N_{diff}</math>”</p> <ul style="list-style-type: none"> <li>- Ilha Solteira, construction starting year 1965, (CESP) (<a href="http://www.cesp.com.br/portalCesp/portal.nsf/V03.02/Empresa_Usinallha?OpenDocument">http://www.cesp.com.br/portalCesp/portal.nsf/V03.02/Empresa_Usinallha?OpenDocument</a> and <a href="http://pt.wikipedia.org/wiki/Usina_Hidrel%C3%A9trica_de_Ilha_Solteira">http://pt.wikipedia.org/wiki/Usina_Hidrel%C3%A9trica_de_Ilha_Solteira</a>)</li> <li>- Xingó, construction starting year 1987, (CHESF) (<a href="http://www.chesf.gov.br/portal/page/portal/chesf_portal/paginas/sistema_chesf/sistema_chesf_geracao/conteiner_geracao?p_name=8A2EEABD3BFAD002E0430A803301D002">http://www.chesf.gov.br/portal/page/portal/chesf_portal/paginas/sistema_chesf/sistema_chesf_geracao/conteiner_geracao?p_name=8A2EEABD3BFAD002E0430A803301D002</a>)</li> </ul>	
1.(continuation)	<ul style="list-style-type: none"> <li>- Paulo Afonso IV, construction starting year 1972 (CHESF) (<a href="http://www.chesf.gov.br/portal/page/portal/chesf_portal/paginas/sistema_chesf/sistema_chesf_geracao/conteiner_geracao?p_name=8A2EEABD3BF8D002E0430A803301D002">http://www.chesf.gov.br/portal/page/portal/chesf_portal/paginas/sistema_chesf/sistema_chesf_geracao/conteiner_geracao?p_name=8A2EEABD3BF8D002E0430A803301D002</a>)</li> <li>- Itumbiara, construction starting year 1974(FURNAS)</li> </ul> <p>As verified in the official site of ANEEL (<a href="http://www.aneel.gov.br/area.cfm?idArea=427&amp;idPerfil=2">http://www.aneel.gov.br/area.cfm?idArea=427&amp;idPerfil=2</a>), the law No. 8987 of 13 February 1995 provided for the concession permission system and the provision of public services according to the art.175 of the Federal Constitution and other provisions. The law No. 9427 of December 26, 1996, established the National Agency of Electric Energy - ANEEL and the concession permission system of public services, including electricity.</p> <p>The validation team confirms that the 4 plants had their investment decisions carried out under a completely different investment climate, where the electricity generation, transmission and distribution were state owned.</p> <p>Thus, it has been confirmed that <math>N_{diff} = 4</math>.</p> <p>As <math>F = 0</math> (i.e. lower than 0.2) and <math>N_{all} - N_{diff} = 0</math> (i.e. lower than 3), the proposed project activity is not a common practice within the sector in the applicable geographical area.</p> <p>This demonstrates that the project activity is not the common practice.</p>	OK

	Validated situation	Conclusion
2. Determine to what extent similar and operational projects (for example, using similar technology or practice), other than CDM project activities <sup>6</sup> ; have been undertaken in the defined region (CDM VVS, version 02.0, paragraph 129 (b)).	As shown above, no project with a scale similar to that of Jirau has been installed in the geographical area (Brazil) since 1987 (the start up year of Xingó hydro power plant, with 3.162 MW), hence under a completely different investment climate, where the electricity generation, transmission and distribution were state owned.	OK
3. If similar and operational projects, other than CDM project activities, are already widely observed and commonly carried out in the defined region, assess whether there are essential distinctions between the proposed CDM project activity and the other similar activities (CDM VVS, version 02.0, paragraph 129 (c)).	The validator confirmed that there are no similar and operational projects widely observed and commonly carried out in Brazil.	OK

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<sup>6</sup> Registered CDM project activities and CDM project activities that have been published on the UNFCCC website for global stakeholder consultation as part of the validation processes

			Validated situation	Conclusion
<b>SECTION 8. Monitoring plan</b>				
1. <i>Compliance of the monitoring plan with the approved methodology and the applicable tools.</i> Confirm that the MP contains all the necessary parameters and that they are monitored in accordance to the approve Methodology and the applicable tools using the following table (CDM VVS, version 02.0, paragraph 132 (a)):				
Parameter	Monitoring Methodology / Tools description	PDD description	Validated situation	Conclusion
EG <sub>facility,y</sub>	<p><b>Data unit:</b> MWh/yr</p> <p><b>Description:</b> Quantity of net electricity generation supplied by the project plant/unit to the grid in year y</p> <p><b>Source of data:</b> Electricity meter(s)</p> <p><b>Measurement procedures (if any):</b> The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid</p>	<p><b>Data unit:</b> MWh/yr</p> <p><b>Description:</b> Quantity of net electricity generation supplied by the project plant/unit to the grid in year y</p> <p><b>Source of data:</b> Electricity meter(s)</p> <p><b>Measurement procedures (if any):</b> The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid. The electricity meters to be installed in the project activity will be “bidirectional” type, therefore, being able to continuously and automatically measure both electricity supplied by the project plant/unit to the grid and the electricity delivered to the project</p>	<p><b>CL 12:</b> an explanation was requested regarding the assurance of the data reliability level required by the methodology. ACM0002 determines that, for the parameter EG<sub>facility,y</sub>, the measurement results must be cross-checked with records for sold energy. Nevertheless, the PDD section B.7.1 says that the sales receipts for sold electricity cannot be used for cross-checking purposes as the sales receipts will only indicate the monetary amount to be paid and not the amount of electricity sold to the grid. The PP explained that the measurements’ reliability level will be assured even in the absence of a cross-check with records for sold energy, as the quantity of net electricity generation supplied by the project activity to the grid needs to be checked through the CCEE’s database, which is the official and the most credible source of information for this purpose. The validation team agrees that the methodology’s implied intent is achieved through this alternative approach.</p> <p>The validation team confirms the role of CCEE (2012) which, as defined per Law No 10848 of March 15, 2004, which authorises the creation of the Energy Commercialization Chamber - CCEE, under regulation and oversight by ANEEL, shall facilitate the trading of electricity between dealers and authorised service and electricity facilities, as well as those with their consumers, in the</p>	<p>OK</p> <p>CL12, closed</p>

		plant/unit from the grid. Moreover, it is expected to occur that the “bi-directional” power meters would directly deliver data already considering the net amount of electricity supplied by the project plant/unit to the grid and without distinction between (i) and (ii) as described above, i.e. by automatically discounting eventual electricity consumptions from the grid from the amount of electricity dispatched to the grid.	National Interconnected System – SIN.	
EG <sub>facility,y</sub> (cont.)	<p><b>Monitoring frequency:</b> Continuous measurement and at least monthly recording</p> <p><b>QA/QC procedures:</b> Cross check measurement results with records for sold electricity</p>	<p><b>Monitoring frequency:</b> Continuous measurement and at least monthly recording</p> <p><b>QA/QC procedures:</b> 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. Sales receipts for sold electricity cannot be used for cross-checking purposes as the sales receipts will only indicate the monetary amount to be paid and not the amount of electricity sold to the grid. Nevertheless, this will 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</p>	<p>The validation team confirms that the parameter “EG<sub>facility,y</sub>” will be continuously measured and at least monthly recorded.</p> <p>Regarding the QA/QC procedures, the quantity of net electricity generation supplied by the project activity to the grid needs to be checked through the CCEE’s database, which is the official and the most credible source of information for this purpose.</p>	OK

		System.		
Cap <sub>PJ</sub>	<p><b>Data unit:</b> W</p> <p><b>Description:</b> Installed capacity of the hydro power plant after the implementation of the project activity</p> <p><b>Measurement procedures (if any):</b> Determine the installed capacity based on recognized standards</p> <p><b>Monitoring frequency:</b> Yearly</p> <p><b>QA/QC procedures:</b> ----</p>	<p><b>Data unit:</b> W</p> <p><b>Description:</b> Installed capacity of the hydro power plant after the implementation of the project activity</p> <p><b>Measurement procedures (if any):</b> Visual inspection of the power generation equipment (turbines) installed at the project facility as well as their technical specification available at the nameplates.</p> <p><b>Monitoring frequency:</b> Yearly monitored</p> <p><b>QA/QC procedures:</b> Can be cross-checked through the inspection of the technical specification documents or manuals of the power units at the project site.</p>	The simple visual inspection of the nameplates capacities of the power units installed at the project facility and their technical specification documents or manuals available on site adequately address the monitoring plan determined by the methodology. No recognised standard is applicable for this purpose.	OK
A <sub>PJ</sub>	<p><b>Data unit:</b> m<sup>2</sup></p> <p><b>Description:</b> 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</p> <p><b>Measurement procedures (if any):</b> Measured from topographical surveys, maps, satellite pictures, etc.</p>	<p><b>Data unit:</b> m<sup>2</sup></p> <p><b>Description:</b> 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</p> <p><b>Measurement procedures (if any):</b> Calculated based on a Quota x Area x Volume curve, being the quota directly measured on the reservoir. The water</p>	<b>CAR 07:</b> The original monitoring plan mentioned that the area would be calculated based on a curve, but did not describe the procedure followed to yearly update (or calibrate) the data. The PDD has been amended to describe, in the QA/QC procedures, the yearly calibration of the Quota x Area curve and, consequently, to update the value of the water surface area on a yearly basis.	CAR 07, closed  OK

	<p><b>Monitoring frequency:</b> Yearly</p> <p><b>QA/QC procedures:</b> ----</p>	<p>level will be measured by electronic sensors and specific rules for this purpose.</p> <p><b>Monitoring frequency:</b> The monitoring frequency will be at least once a year.</p> <p><b>QA/QC procedures:</b> As required by the ANA (the National Water Resources Agency), through its Resolution No 269 from 27 April 2009 (Art. 6o, VI), the Quote-Area-Volume curve will be annually updated. The monitoring data will be annually reported to ANA, with the objective of fulfilling controlling and compliance supervision of the conditions established in the concession rights for the use of water resources granted to ESBR.</p>		
EF <sub>grid,OM-DD</sub>	<p><b>Data unit:</b> tCO<sub>2</sub>/MWh</p> <p><b>Description:</b> Dispatch data analysis operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh)</p> <p><b>Measurement procedures (if any):</b> calculated according to the “Tool to calculate the emission factor for an electricity system”</p>	<p><b>Data unit:</b> tCO<sub>2</sub>/MWh</p> <p><b>Description:</b> Operating margin emission factor of the Brazilian grid.</p> <p><b>Measurement procedures (if any):</b> 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”.</p> <p><b>Monitoring frequency:</b> The emission</p>	<p>The operating margin emission factor adopted by the PP is a dispatch data analysis operating margin emission factor (EF<sub>grid,OM-DD,y</sub>) calculated and published by the DNA on a monthly basis. The annual operating margin emission factor, as stated in the PDD Appendix 4, will be calculated by the PP as the simple arithmetic average of the monthly EF<sub>grid,OM</sub> values published by the Brazilian DNA. This calculation method is coherent with the DNA’s practice, which calculates the monthly EF<sub>grid,OM</sub> from the simple arithmetic average of the daily values, and was deemed appropriate by the validation team.</p> <p>The ex-ante calculation of the value of EF<sub>grid,OM-DD</sub> (0.4787) was checked with the values available in the official site of the Brazilian DNA (CIMGC), <a href="http://www.mct.gov.br/index.php/content/view/327118.html#ancora">http://www.mct.gov.br/index.php/content/view/327118.html#ancora</a></p>	OK

	<p><b>Monitoring frequency:</b> ----</p> <p><b>QA/QC procedures:</b> ----</p>	<p>factor is calculated ex-post, as described in B.6.3.</p> <p><b>QA/QC procedures:</b> Apply procedures in the “Tool to calculate the emission factor for an electricity system”.</p>	<p>According to the PP, by the time of submission of the PDD to global stakeholder consultation, 24 April 2012, the <math>EF_{grid,BM,y}</math> (build margin) value of 2011 had not yet been published by the DNA, which was verified and confirmed by the validation team. For this reason, the PP adopted the values of 2010 for the operating margin emission factor as well.</p>	
$EF_{grid,CM,y}$	<p><b>Data unit:</b> tCO<sub>2</sub>/MWh</p> <p><b>Description:</b> 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”</p> <p><b>Measurement procedures (if any):</b> As per the .Tool to calculate the emission factor for an electricity system.</p> <p><b>Monitoring frequency:</b> As per the .Tool to calculate the emission factor for an electricity system.</p> <p><b>QA/QC procedures:</b> As per the “Tool to calculate the emission factor for an electricity system”.</p>	<p><b>Data unit:</b> tCO<sub>2</sub>/MWh</p> <p><b>Description:</b> 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”</p> <p><b>Measurement procedures (if any):</b> 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.</p> <p><b>Monitoring frequency:</b> At least once a year.</p> <p><b>QA/QC procedures</b> Apply procedures of “Tool to calculate the emission factor for an electricity system”.</p>	<p><b>Measurement procedures:</b> The Brazilian DNA publishes the operating and the build margin emission factors, which are calculated as per the latest version of the “Tool to calculate the emission factor for an electricity system” (see the official webpage <a href="http://www.mct.gov.br/index.php/content/view/74689.html">http://www.mct.gov.br/index.php/content/view/74689.html</a>).</p> <p><b><math>EF_{grid,OM,y}</math>:</b> The operating margin emission factor calculated by the DNA is a dispatch data analysis operating margin emission factor (<math>EF_{grid,OM-DD,y}</math>) and is published on a monthly basis. The annual operating margin emission factor, as stated in the PDD Appendix 4, will be calculated by the PP as the simple arithmetic average of the monthly <math>EF_{grid,OM}</math> values published by the Brazilian DNA. This calculation method is coherent with the DNA’s practice, which calculates the monthly <math>EF_{grid,OM}</math> from the simple arithmetic average of the daily values, and was deemed appropriate by the validation team.</p> <p><b><math>EF_{grid,BM,y}</math>:</b> The build margin emission factor is published by the DNA on a yearly basis. As explained in the PDD, the PP chose to calculate the build margin emission factor ex-ante, based on the most recent information available (option 1 in the Tool). According to the PP, the values of 2010 were adopted because, by the time of submission of the PDD to global stakeholder consultation, on 24 April 2012, the <math>EF_{grid,BM,y}</math> value of 2011 had not yet been published, which was verified and confirmed by the validation team.</p> <p>The <math>EF_{grid,CM}</math> will be calculated according to the “Tool to calculate the emission factor for an electricity system”:</p> $EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$ <p>where, for all projects except wind and solar power</p>	OK

			<p>generation project activities: <math>w_{OM} = 0.5</math> and <math>w_{BM} = 0.5</math> for the first crediting period.</p> <p>The ex-ante calculation of the value of <math>EF_{grid,CM,y}</math> was checked with the values available in the official site of the Brazilian DNA (CIMGC), <a href="http://www.mct.gov.br/index.php/content/view/327118.html#ancora">http://www.mct.gov.br/index.php/content/view/327118.html#ancora</a></p>	
TEG <sub>y</sub>	<p><b>Data unit:</b> MWh/yr</p> <p><b>Description:</b> Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year <i>y</i></p> <p><b>Measurement procedures (if any):</b> Electricity meters</p> <p><b>Monitoring frequency:</b> Continuous measurement and at least monthly recording</p> <p><b>QA/QC procedures:</b> ----</p>	<p><b>Data unit:</b> MWh/yr</p> <p><b>Description:</b> Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year <i>y</i></p> <p><b>Measurement procedures (if any):</b> Electricity meters</p> <p><b>Monitoring frequency:</b> Continuous measurement and at least monthly recording</p> <p><b>QA/QC procedures:</b> ----</p>	<p>The monitoring plan reflects exactly the same monitoring requirements of the adopted methodology. The energy supplied to the grid is the parameter <math>EG_{facility,y}</math>. The validation team deems perfectly feasible the installation of an additional electricity meter to determine the electricity supplied to internal loads.</p>	OK
<p>2. <i>Implementation of the plan:</i> confirm that the monitoring arrangements described in the monitoring plan are feasible within the project design (CDM VVS, version 02.0, paragraph 132 (b) (i)).</p> <p>Described the steps undertaken to assess this.</p>			<p>The arrangements proposed in the PDD are common practice and must follow, for all grid connected projects in the country, the procedures of Brazil's electric energy national agency for the monitoring of <math>EG_{facility,y}</math>. The values of <math>EF_{grid,OM,y}</math> and <math>EF_{grid,BM,y}</math> are obtained by all projects from the same source, the Brazilian Interministerial Commission on Global Climate Change. The validation team concluded that the arrangements proposed in the PDD are sound.</p>	OK
<p>3. <i>Implementation of the Plan:</i> confirm that the means of implementation of the MP, including the data management and quality assurance and quality control procedures, are sufficient to ensure that the emission reductions achieved</p>			<p>The validation team concluded that the arrangements proposed in the PDD section B.7 are sound.</p> <p><b>EG<sub>facility,y</sub>:</b> the fact that the produced energy will be sold to the National Electric</p>	OK

<p>by / resulting from the proposed CDM project activity can be reported ex post and verified (CDM VVS, version 02.0, paragraph 132 (b) (ii)).</p>	<p>System Operator (ONS) binds the PPs to its official monitoring and measurement procedures (ref.: “Grid Procedures Module 12, Measurement for Invoicing”), which covers in detail, among others, the arrangements and procedures required for</p> <ul style="list-style-type: none"> <li>• Installation of measurement system for invoicing</li> <li>• Maintenance of measurement system</li> <li>• Measuring data collection</li> <li>• Certification of work measurement standards</li> <li>• Configuration of measurement system for invoicing</li> </ul> <p>Measurement: technical requirements according to the Brazilian Association of Technical Standards and the International Electrotechnical Commission – IEC.</p> <p>Accuracy of energy meters according to Metrological Technical Regulation (<i>Regulamento Técnico Metrológico – RMT</i>) for Class 0.2 of energy meters (error in measurements of up to <math>\pm 0.2\%</math>).</p> <p>QA/QC: electricity measurements cross checked with the data provided by the Electricity Commercialization Chamber (<i>Câmara de Comercialização de Energia Elétrica – CCEE</i>) database.</p> <p>Verified source of Grid Procedures Module 12:  <a href="http://www.ons.org.br/procedimentos/modulo_12.aspx">http://www.ons.org.br/procedimentos/modulo_12.aspx</a></p> <p><b>EF<sub>grid,CM,y</sub></b>: The Brazilian DNA is responsible for calculating the OM and BM emission factors in Brazil. It applies the Tool to calculate the emission factor for an electricity system. <a href="http://www.mct.gov.br/index.php/content/view/74689.html">http://www.mct.gov.br/index.php/content/view/74689.html</a></p> <p>For details on the validation of each monitored parameter please refer to the table above.</p>	
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3.(continuation)	Based on the monitoring arrangements, required monitoring procedures by the ONS and the experience of PPs in operation of power plants connected to the grid, the validation team confirms the ability of project participants to implement the monitoring plan.	OK
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	Validated situation	Conclusion
<b>SECTION 9. Local stakeholder consultation</b>		
1. Determine whether comments by local stakeholders that can reasonably be considered relevant for the proposed CDM project activity, have been invited (CDM VVS, version 02.0, paragraph 139 (a)).	<p>With respect to the Brazilian DNA requirements, as determined by the DNA's (CIMGC) resolution No. 7 of 05 March 2008, article 3, project proponents must send to CIMCG the invitations for comments, as well as their respective notices of receipt, submitted by project proponents to the parties involved, interested and / or affected by project activities under the Clean Development Mechanism. Calls for comments must be sent at least to the following recipients: Mayor and city council of the municipality, the Brazilian forum of NGOs, and Social Movements for the Environment and Development, the Environmental agencies involved, the Federal Public Attorney and the State Public Attorney.</p> <p>The PDD is available for download in the PP's webpage <a href="http://www.energiasustentaveldobrasil.com.br/dcp.asp">http://www.energiasustentaveldobrasil.com.br/dcp.asp</a>.</p> <p>It was found evident that the PP invited Local Stakeholders to comment on the proposed project activity on 27 March 2012, prior to the publication of the PDD version 1 on the UNFCCC website, on 24 April 2012. Copies of the invitations for comments, hand delivered by the PP to the local stakeholders, with the corresponding acknowledgments of receipt, were assessed and found in accordance with the Brazilian DNA's resolution.</p> <p>Evidence was found of invitations for comments made by the PP to the:</p> <ul style="list-style-type: none"> <li>- Porto Velho City Hall</li> <li>- City council of Porto Velho</li> <li>- City Council and Environment Secretary</li> <li>- Brazilian forum of NGOs, and Social Movements for the Environment and Development</li> <li>- Federal Public Attorney</li> <li>- State Public Attorney</li> <li>- Brazilian Institute of Environment and Natural Resources – IBAMA</li> <li>- Rondônia State Secretary of Environmental Development</li> <li>- Rural Workers Trade Union of the City of Porto Velho</li> <li>- Association of Mutum Paraná inhabitants and riverside population</li> </ul>	OK

	Validated situation	Conclusion
1.(continuation)	<p>The references to the files with the above mentioned letters can be found in the item 7.2 of this report, Appendix B, “List of documents reviewed “. The following evidence was assessed:</p> <ul style="list-style-type: none"> <li>• Invitation letter sent to the Association of Mutum Paraná inhabitants and riverside population, ( ESBR, AJ/TS 619-2012)</li> <li>• Invitation letter sent to the Brazilian forum of NGOs, and Social Movements for the Environment and Development, ( ESBR, AJ/TS 612-2012)</li> <li>• Invitation letter sent to the City Council and Environment Secretary (ESBR, AJ/TS 615-2012)</li> <li>• Invitation letter sent to the City council of Porto Velho, (ESBR, AJ/TS 614-2012)</li> <li>• Invitation letter sent to the Federal Public Attorney (ESBR, AJ/TS 617-2012)</li> <li>• Invitation letter sent to IBAMA (ESBR, AJ/TS 611-2012)</li> <li>• Invitation letter sent to the Porto Velho City Hall, file (ESBR, AJ/TS 613-2012)</li> <li>• Invitation letter sent to the Rondônia State Secretary of Environmental Development (ESBR, AJ/TS 616-2012)</li> <li>• Invitation letter sent to the Rural Workers Trade Union of the City of Porto Velho, file (ESBR, AJ/TS 620-2012 )</li> <li>• Invitation letter sent to the State Public Attorney, file (ESBR, AJ/TS 618-2012)</li> </ul> <p>According to the PP personnel interviewed during the site visit, no comment was received during the local stakeholder consultation process above.</p>	OK
1.(continuation)	<p>The local stakeholder consultation process is closely linked to the project's environmental licensing process and requirement and procedure for local stakeholder engagement are defined by the Brazilian regulation of the environmental licensing process. According to these rules, four public hearings were promoted by IBAMA for the presentation and discussion of EIA's results. The EIA addresses all possible socio-environmental impacts and mitigation principles and also made clear reference to the importance of the CDM for</p>	OK

	Validated situation	Conclusion
	<p>financing the project implementation. To make it more accessible and understandable, a simplified Environmental Impact Assessment Report (RIMA) is also presented to stakeholders and as a basis for public hearings. These public hearings were carried out in the project's neighbouring municipalities of Porto Velho (the state's capital), Mutum Paraná, Abunã and Jaci Paraná. The public notice for the hearings was published in the federal government official journal on 24 October 2006 (DOU, 2006). The handwritten documents with the questions raised by the local stakeholders during the public hearings constitute primary records of their concerns and were therefore sampled by the validation team and considered in the site visit planning. The references to the files with the questions can be found in the item 7.2 of this report, Appendix B, "List of documents reviewed" / "Local stakeholders consultation".</p> <p>The following evidence was assessed:</p> <ul style="list-style-type: none"> <li>• Public hearing of Abunã, Attendance list &amp; questions raised (IBAMA, 2006_11_29)</li> <li>• Public hearing of Mutum Paraná, Attendance list &amp; questions raised (IBAMA, 2006_11_30)</li> <li>• Public hearing of Jaci Paraná, Attendance list &amp; questions raised, file (IBAMA, 2006_11_10)</li> <li>• Public hearing of Porto Velho, Attendance list &amp; questions raised, file (IBAMA, 2006_11_11)</li> </ul>	
2. Confirm that the summary of the comments received as provided in the PDD is complete (CDM VVS, version 02.0, paragraph 139 (b)).	<p><b>CL 14:</b> The PP was asked to give and has sent to the validation team a summary of the consultation process under the IBAMA licensing process and to clarify if comments have been received.</p> <p>The validation team confirms that the summary of the comments received as provided in the PDD is complete and takes account of the comments received from the fulfilment of the environmental licensing process.</p>	<p>OK</p> <p>CL 14, closed</p>
3. Confirm that the project participants have taken due account of any comments received and have described this process in the PDD (CDM VVS, version 02.0, paragraph 139 (c)).	<p><b>CL 13:</b> The validation team asked the PP to provide the latest semi-annual reports of the Basic Environmental Program (PBA) sent to IBAMA, as a further evidence of the continuous implementation of the actions determined in the PBA. The reports were provided by the PP.</p> <p>The concessions of the preliminary and installation environmental licenses by</p>	<p>OK</p> <p>CL 13, closed</p>

	Validated situation	Conclusion
	<p>IBAMA attest its agreement regarding the compliance to the legal requirements, including the consultation to stakeholders. The references to the files with the permits can be found in the item 7.2 of this report, Appendix B, "List of documents reviewed".</p> <p>The Jirau Hydro Power Plant project, due to its size and to the environmental and socio-economic impacts related to the construction of dams, has attracted numerous comments. A thorough and comprehensive approach to all the environmental and socio-economic concerns raised is beyond the scope of the CDM validation process. Nevertheless, complementary to the consultation process included in the DNA's requirements and the environmental licensing regulation, research was carried out by the validation team, prior to the site visit, on the news published on the project, with the aim of identifying the relevant local stakeholders and their main concerns with a perspective independent from that presented by the PP and the environmental licensing procedure. Several concerns were identified, such as those with the displacement of the population living on the banks of the Madeira river, the possible displacement of un-contacted indigenous ethnic groups living near the area of power plant construction, the loss of income of farmers displaced by the project, the potential increase of prevalence of malaria in areas of the Madeira River valley due to the water impoundment caused by the project, the possible rise of mercury concentrations, used in gold mining, in the river due to the effects of the dam, and the claims for improvement of the health care and education provided to the indigenous ethnic groups living close to the project. This research formed the basis for the choice of the stakeholders' representatives to be consulted during the site visit (refer to the site visit plan for this report, item 3.2).</p> <p>The validation team interviewed representatives from the urban and riverside population, the indigenous people Uru-eu-wau-wau, the local farmers and the local retailers. In order to hear the opinion of local authorities, representatives of the State Public Prosecutor and the Town Hall of Porto Velho (City Office of Special Programs) were also interviewed.</p>	
3.(continuation)	<p>From the evidence found through documental review, site visit and interviews with stakeholders, the validation team concluded that the whole process of consultation to stakeholders followed by the PP, which encompassed the compliance to the DNA's and the federal environmental agency's (IBAMA) requirements, is lawful and sufficient. The consultation procedure was sufficiently comprehensive and complied with the host country legal requirements, including</p>	OK

	Validated situation	Conclusion
	the due account of all comments received.	

	Validated situation	Conclusion
<b>SECTION 10. Environmental Impacts</b>		
1. Is an EIA required by the environmental legislation of the host country? Describe the legislation applicable.	<p>The EIA is required by the host country and was carried out by Leme Engenharia Ltda., between 2003 and 2005 (the simplified environmental assessment report is available in Portuguese (see RIMA, 2005)</p> <p>The environmental licensing process in Brazil, regarding the issuance of environmental permits in each stage (preliminary, installation or operating license) is described and regulated by the CONAMA resolution 237 of 19 December 1997, which determines that:</p> <ul style="list-style-type: none"> <li>Article #3: "The environmental license for projects and activities deemed effective or potentially causing significant degradation of the environment <u>will depend on prior environmental impact study (EIA) and its environmental impact report (RIMA)</u>, to which will be given publicity, <u>guaranteed the realization of public hearings</u>, when appropriate, in accordance with the regulations"</li> <li>Article #4: on the licensing competence, "It is incumbent upon the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) the environmental licensing of projects and activities whose direct environmental impacts go beyond the boundaries of the country (the area potentially affected by the environmental impacts of the project goes beyond the border between Brazil and Bolivia).</li> <li>Article #10: The environmental licensing procedure shall comply with the following steps: <ul style="list-style-type: none"> <li>I - Definition by IBAMA, with the participation of the entrepreneur, of the documents, projects and environmental studies needed to initiate the process</li> <li>II - Application for the environmental permit by the contractor, together with the documents, relevant projects and environmental studies, <u>to which must be given due publicity</u>;</li> <li>III - Analysis by IBAMA of the documents, projects and environmental studies presented and the realization of technical inspections when</li> </ul> </li> </ul>	OK

	Validated situation	Conclusion
	necessary; IV- Public hearing, when applicable, in accordance with relevant regulations;	
1.(continuation)	<p>V- Request for clarification and additional information by IBAMA resulting from the public hearings,  VI- Issue of technical opinion and, where applicable, a legal opinion;  VII- <u>Approval or rejection of the license application</u>, to which must be given due publicity.</p> <p>The project activity, as verified during the site visit, is in the Installation phase. The concession of the preliminary and installation environmental licenses by IBAMA attests its agreement regarding the compliance to the legal requirements.</p> <p>A. <u>Preliminary Licence (LP)</u>: the concession of the preliminary environmental license by IBAMA attests its agreement with the project's environmental and socio-economic viability. It was granted by IBAMA to both hydro power projects of Madeira river (Jirau and Santo Antônio projects) on 09 July 2007 (IBAMA, 2007_07_09).</p> <p>B. <u>Installation Licence (for the construction site)</u>: Environmental installation permit for the construction site (IBAMA Installation License 563, 2008_11_14)</p> <p>C. <u>Installation Licence</u>: the Installation License number 621/2009 was granted by IBAMA on 03 June 2009, authorising the start of the project's installation works, (IBAMA, 2009_06_03) This license was granted after the approval of the Environmental Basic Plan (PBA).</p> <p>D. <u>Update of Installation License to authorise expansion to 3,750 MW</u>: The official Note was issued by IBAMA on 19 April 2011 to approve the expansion to 50 turbines, i.e. a total installed capacity of 3,750 MW (IBAMA License 361, 2011_04_26)</p> <p>From this evidence, the validation team concluded that the project activity was duly licensed on the basis of a valid Environmental Impact Assessment in accordance with the procedures required by the host Party. This is also demonstrated based on the fact that and installation license is only granted if a valid Preliminary License on the basis of a valid EIA is in place and once the</p>	OK

	Validated situation	Conclusion
	Basic Environmental Plan can demonstrate that all conditions of the EIA are effectively and continuously being met, and the required Socio-Environmental programs have been established.	
2. Confirm whether the project participants have undertaken an analysis of environmental impacts and, if required by the host Party, an environmental impact assessment.	The EIA is required by the host country and was carried out by Leme Engenharia Ltda., between 2003 and 2005 (the simplified environmental assessment report is available in Portuguese (RIMA, 2005)).	OK
3. Confirm that environmental impacts considered significant by the PPs or the Host country are described in the PDD, including mitigation measures.	<p>The concession of the preliminary environmental license (LP) by IBAMA attests its agreement with the project's environmental and socio-economic viability. The LP defined the socio-environmental conditions to be met by the projects' owners (see item 2 of LP, "Specific Conditions") regarding, among other issues, the monitoring of the drift of eggs, larvae and juvenile specimens of migratory fish, the executive project of a fish transposition system, the monitoring and modelling of the process of sedimentation of reservoirs, monitoring of the bioavailability of mercury in streams, epidemiologic surveillance of the surrounding communities, monitoring of avifauna, deployment of a herbarium and a germplasm bank, and the observation of the recommendations from FUNAI in the definition of the Program of Support to Indigenous Communities, though they are not directly affected by the Project.</p> <p>The Installation permit was granted by IBAMA after the approval of the Environmental Basic Plan (PBA). The adequate implementation of the PBA is controlled by IBAMA, and covers all the relevant environmental and socio-economic impacts identified by the EIA. The PBA consists of several programs, which comprise the mitigation measures covering each relevant environmental and socio-economic concern.</p> <p>Some of the programs, whose implementation was observed during the site visit and discussed with the personnel involved are:</p> <ul style="list-style-type: none"> <li>- Social Communication Program</li> <li>- Support Program for the Indigenous Communities</li> <li>- Program for the Relocation of the Affected Population</li> <li>- Social Compensation Program</li> <li>- Water Sedimentology Monitoring Program</li> <li>- Hydro biogeochemical Monitoring Program</li> <li>- Monitoring and Support Program for Fishing Activities</li> </ul>	OK

	Validated situation	Conclusion
	<p>- Public Health Program</p> <p>The references to the files with the above mentioned programs' base documents (in Portuguese) can be found in the item 7.2 of this report, Appendix B, "List of documents reviewed".</p> <p>The validation team confirms that all significant environmental impacts and the corresponding mitigation measures, which are implemented by the environmental programs, are thoroughly described in the PDD section D.2.</p>	

## Findings

1. Grade / Ref:	CAR 01	2. Date:	18 June 2012	3. Status:	Closed (27 June 2012)
4. Requirement:		VVS v02.0 paragraph 120.d and 122.b			
5. Nature of the Issue Raised:					
The value of the project's Firm Energy generation capacity on September 2012 in the financial analysis (worksheet "E-Gener", table "Initial Implementation timeline ESBR", cell D49, file "Jirau HPP CDM Model2012-04-24-v1.1.xls"), is not in accordance with the Feasibility Study Report submitted to BNDES, "2008_06_24 Roteiro BNDES_Jirau v05 (24-jun-08).pdf" page 46.					
6. Nature of responses provided by the project participants:					
Unfortunately the value of the Feasibility Study Report is wrong as 28 turbines do not yet yield the 2014.9 MW average. Nevertheless the difference is small and based on the principle of conservativeness, the model was adapted to reflect the values that are referenced by the FSR. As this increases revenues in the year 2013 this is a conservative adjustment.					
7. Assessment of such responses:					
The amendment was made to the investment analysis worksheet, in accordance with the Feasibility Study Report submitted to BNDES, "2008_06_24 Roteiro BNDES_Jirau v05 (24-jun-08).pdf" page 46. The CAR was closed.					
8. References to resulting changes in the PDD or supporting annexes:					
Updated Document: Investment Analysis, file "Jirau HPP CDM Model2012-07-02 v2.1"					

1. Grade / Ref:	CAR 02	2. Date:	18 June 2012	3. Status:	Closed (27 June 2012)
4. Requirement:		VVS v02.0 paragraph 120.d and 122.b			
5. Nature of the Issue Raised:					
The participation of Civil Works as 38.2% of CAPEX, considered in the financial analysis worksheet “CapEx&Depreciation” cell B12, slightly differs from the value (38.42%) calculated from the figures available in the Feasibility Study Report submitted to BNDES, “2008_06_24 Roteiro BNDES_Jirau v05 (24-jun-08)”.					
6. Nature of responses provided by the project participants:					
Response from PP: The typo was corrected and the Investment Analysis updated accordingly. Impact on the results is minimal and reflected in the results of the new version of the Investment Analysis.					
7. Assessment of such responses:					
The typo error was corrected in the Investment Analysis worksheet, according to the figures available in the Feasibility Study Report submitted to BNDES,					

"2008_06_24 Roteiro BNDES_Jirau v05 (24-jun-08)". The CAR was closed.	
<b>8. References to resulting changes in the PDD or supporting annexes:</b>	
<b>Updated Document:</b>	
Investment Analysis, (Jirau HPP Investment Analysis, 2012)	

<b>1. Grade / Ref:</b>	CAR 03	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (12/07/2012)
<b>4. Requirement:</b> ACM0002 v13.0.0, Project Emissions					
<b>5. Nature of the Issue Raised:</b>					
<p>Please explain and give reference for the calculation of the additional flooded area caused by the project activity.</p> <p>As stated in the PDD, footnote 16 page 8, "the reservoir area increase was calculated as the surface of the full reservoir at maximum level, 361.60 km<sup>2</sup>, minus the average surface of the river before the project activity, 153.86 km<sup>2</sup>". Nevertheless, the methodology (ACM0002, v 12.2.0 or v 13.0.0) determines that, for new reservoirs, the area of the surface of the water before the project activity (<math>A_{BL}</math>) is zero. Please clarify. Explain and give reference for the calculation of the additional flooded area caused by the project activity.</p>					
<b>6. Nature of responses provided by the project participants:</b>					
<p>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 [Reference 1] 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 [Reference 2] 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".</p> <p>Based on this concept, the Project Participants understand that the Reservoir Area for the calculation of the Power Density should be net of the original river bed as this does not represent "flooded surface area". In fact this interpretation is of special relevance to projects which were developed with the specific objective to minimize the additional flooded area by generating electricity with low head directly in the river bed. This arrangement avoids diversion of the river and does not alter flow volumes and the additional flooded area is minimal as most of the run-of-river reservoir is contained to the original river bed. In addition to these general features of low head run-of river hydro power plants, the Jirau HPP adopts an innovative operational rule with variable quota in order to mimic the rivers' original hydrology with high floods in January to March and lower level during the rest of the year. Therefore an accurate calculation of the reservoir area created by the project would take into account the variation of the reservoir according to the specific season in comparison to the average natural river surface. As shown in Table 2 of this PDD, the reservoir in the dry season is only marginally bigger than the natural river bed and even in the wet season, when the natural river would anyway flood large areas, the increased flooded area is comparable in surface to the average natural river surface.</p> <p>In this context, abandoning the original principle of calculating Power Density on the basis of the "increased flooded area" provides an undue distortion for projects which were optimized to generate electricity with low head and thus lower installed capacity and energy yield in order to minimize the additional flooded area when the original riverbed itself already corresponds to most of the reservoir surface.</p>					

In spite of this view and in response to the doubt about the correct interpretation of the respective Provision of ACM0002, version 13.0.0, the Project Participants decided to calculate the minimum possible Power Density on the basis of the full reservoir surface, including the surface of the original river, at the maximum quota of 90 m.a.s.l. as defined by the operational rules. The data for this calculation were elaborated by Topocart, an independent consulting company, specialized in this field, on the basis of topographical survey. [Reference 3]

In addition, ESBR will continuously monitor and report the reservoir quota (water level in the reservoir) and the corresponding reservoir surface during the projects operational lifetime, according to the Brazilian regulatory requirements. The results will be continuously reported to the Electric System National Operator (Operador Nacional do Sistema – ONS). In addition, the methodology will be annually revised according to the requirements of the National Water Resources Agency (Agência Nacional de Águas – ANA). This methodology will allow a continuous monitoring of the project activities' Power Density on the basis of the measurement of the reservoir quota and the corresponding reservoir surface on the basis of an official and annually revised methodology.

References used for this response:

Reference 1: Thresholds and criteria for the eligibility of hydroelectric power plants with reservoirs as cdm project activities, Annex 5, EB 23, available from: [http://cdm.unfccc.int/EB/023/eb23\\_repan5.pdf](http://cdm.unfccc.int/EB/023/eb23_repan5.pdf)

Reference 2: F-CDM-AM-Clar Resp ver 01.1 - AM CLA 0049, available from: [http://cdm.unfccc.int/UserManagement/FileStorage/AM\\_CLAR\\_T74PW4LBX5ZQRSRV57CR6RIKBALHHE](http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_T74PW4LBX5ZQRSRV57CR6RIKBALHHE).

Reference 3: Planilha Informações da Usina ANEEL 24 out 2011 and topographic study prepared by Topocart (received by ESBR on 3 July 2012 and confirmed with signature of the responsible engineer on 22 August 2008), available in the data room in folder Shared Documents \Findings\CAR3 file "Area\_Reservatório\_Cotas 82 5-85-90m"

#### 7. Assessment of such responses:

The PP has changed the area of the surface of the water before the project activity ( $A_{BL}$ ) which is now considered as zero. The PDD sections B.6 and B.7 have been changed accordingly. The PP has given the reference for the additional flooded area caused by the project activity. The CAR was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

##### Updated Document:

Jirau HPP PDD, file "20120711\_Jirau\_PDD\_v2.1\_wtc"

<b>1. Grade / Ref:</b>	CAR 04	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (02/07/2012)
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<b>4. Requirement:</b>	VVS v02.0 paragraph 120.d
<b>5. Nature of the Issue Raised:</b>	
<p>a. It seems to be, in the investment analysis, some double counting of the interest in the capitalisation of the debt balance in the first operational year (worksheet "Financing, row 9, year 2013), once the interest payments were projected to start in 2013 (line 44 of the worksheet).</p> <p>b. In the Financing worksheet, the PP calculates the project leverage for the Base case (48.0%) and the Optimized case (50%) considering minimum DSCR values of 1.22 and 1.26, respectively. Nevertheless, once BNDES requires a minimum DSCR of 1.2, the calculated leverage values would be a bit higher. Please explain why the PP did not consider leverage values which lead to the DSCR of 1.2 required by BNDES.</p>	
<b>6. Nature of responses provided by the project participants:</b>	
<p>a) In fact there was a mistake which considered full capitalisation of interest in 2013 in spite of the fact that interest payments were projected to start in 2013. The mistake was corrected in version 2.1 of the investment analysis.</p> <p>b) Under version 1.1 of the Investment Analysis the limitation to 48% of third party financing is a result of the fact that 49% of leverage would lead to a DSCR below 1.2, i.e. 1.19. This now changed as a result of the other corrections which were implemented in response to the different findings. The maximum leverage admitted for the Base Case and the Optimized Project now is 50%. As explained in the PDD, the leverage under baseline conditions is limited by the specific limit imposed by the BNDES for financing GHG intensive generation activities, while participation for renewable and hydro power is up to 70% of financial leverage. This represents a comparative advantage granted to Emission Reducing Technologies such as renewable energies and thus has to be adjusted under baseline assumptions. Now when calculating the equity IRR under E- conditions, i.e. with BNDES incentives, the maximum leverage of 70% is not reached for the Base Case as the DSCE of 1,2 is not met under these conditions. Therefore the leverage was limited to 69%. Only with CERs the full leverage of 70% as projected in the FSR is possible.</p>	
<b>7. Assessment of such responses:</b>	
<p>a) The investment analysis worksheet was corrected regarding the capitalisation of the debt balance (worksheet "Jirau HPP CDM Model2012-07-02 v2.1.xls")</p> <p>b) The leverage considered in the Base Case was corrected. The leverage of 50% adopted for the Optimised Case was satisfactorily explained.</p> <p>The CAR was closed.</p>	
<b>8. References to resulting changes in the PDD or supporting annexes:</b>	
<p><b>Updated Document:</b>  Investment Analysis, file "Jirau HPP CDM Model2012-07-02 v2.1"  Jirau HPP PDD, file "20120711_Jirau_PDD_v2.1_wtc"</p>	

<b>1. Grade / Ref:</b>	CAR 05	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (06/08/2012)
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<b>4. Requirement:</b>	VVS v02.0 paragraph 120.b and d
<b>5. Nature of the Issue Raised:</b>	<p>a. The validation team did not manage to reproduce the value of ERP (Equity Risk Premium) adopted by the PP (6.2%) from the reference given (Damodaran Website: Historical data on Stocks, Bonds and Bills – US, data from 1928-2007, available at: <a href="http://pages.stern.nyu.edu/~adamodar/">http://pages.stern.nyu.edu/~adamodar/</a>). Please clarify.</p> <p>b. The validation team did not manage to reproduce the value of Country Risk Premium (Equity Risk Premium) adopted by the PP (2.73%) from the reference given (GP Morgan Market Data 3 year average of historical data from EMBI+ Brazil, calculated from January 2005 to December 2007, available at: <a href="http://www.cbonds.info/all/eng/index/index_detail/group_id/1/">http://www.cbonds.info/all/eng/index/index_detail/group_id/1/</a>). Please clarify.</p> <p>c. The time periods adopted for the estimation of Market Risk Premium, Beta, Country Risk Premium and TJLP and IPCA do not seem to be internally coherent. Please clarify.</p>
<b>6. Nature of responses provided by the project participants:</b>	<p>a) The mistake for the calculation Equity Risk Premium was corrected and the effective value was adopted in the revised version of the CAPM. As a consequence the benchmark increased slightly.</p> <p>b) Unfortunately the original source for the EMBI+ is no longer publicly available, but the same data can be obtained from IPEA under <a href="http://www.ipeadata.gov.br/">http://www.ipeadata.gov.br/</a> where the updated Data was downloaded for the period between 01 January 2005 and 31 December 2007.</p> <p>c) In fact there was a mistake in the description of the period for the definition of the Country Risk Premium and the period for determination of the TJLP was not coherent with this data. The correct approach to assure both consistency of the dataset as well as use of the latest available data at project start was defined as follows:</p> <ul style="list-style-type: none"> <li>i) For more stable US Economy derived standard economic indicators as used by the CAPM, such as Risk Free Rate, Market Risk Premium and beta, the latest available data from January 2008 from reputed sources were used. As a result, The Risk free rate covers a period from 1954 to December 2007 and was published by a reputed source. Market Risk Premium reflects the long term average from January 1928 to 31 December 2007 as published by Damodaran, which represents a reputed public standard source for such data. For beta the same source is used and Damodaran calculates betas on the basis of a five-year average, which is compatible with the more stable economic environment in this period in the United States. As the beta chosen for Electric Utilities in the US describes the general systematic risk exposure of the electricity generation business. In summary, using publicly available year end data for these variables is a sound standard approach and as they are not related the host country risk or inflation profile and there is no rationale to require that both variables should be based on the identical time frame as explained below.</li> <li>ii) For more volatile and Brasil specific variables with less history, such as Inflation, the basic interest rate TJLP and Country Risk, the latest coherent data set as available at Project Starting Date has been used. The calculation of the TJLP, which defines the basic cost of the Brazilian Development Bank's financing, in real terms requires comparing historic TJLP rates with the historic inflation rates. Such a calculation makes sense if data as of January 2005 until the most recent available data set is used. To use a period starting before January 2005 would not make sense as the Brazilian economic circumstance before 2005 were different as exemplified by the fact that inflation target of 4.5% is constant since 2005 (Reference 1). Now to include the most recent estimates before the Project Starting Date makes sense in order to capture recent circumstances. As the TJLP is always</li> </ul>

defined 3 month ahead and takes into account the evolution of the inflation, the use of the latest available inflation data is necessary. This was made public by the Brazilian Central Bank's Inflation Report of June 2008 and provides inflation data until 31 May 2008 (Reference 2). Data for June were not yet available at the Project DStarting Date as the next Inflation report was only issued in September. Based on this rationale Data for TJLP were sourced from the National Institute of Applied Economics (IPEA). Therefore both datasets cover 41 month between January 2005 and May 2008 and allow to define the TJLP in real terms independently of the evolution of inflation.

For coherence, the Host Country Risk was calculated from the EMBI+, also sourced from IPEA, for the same period, i.e. from January 2005 to 31 May 2008.

For details and complete references please refer to the Jirau HPP Investment Analysis Spreadsheet which now aggregates the calculation of the TJLP, the CAPM and the Investment Analysis.

#### References used in this response:

Reference 1: "Histórico de Metas para a Inflação no Brasil", available in the data room in folder Shared Documents\Findings 1\CAR 5, or from <http://www.bcb.gov.br/Pec/metase/TabelaMetaseResultados.pdf>

Reference 2: "Brazilian Central Bank Inflation Report", available at <http://www.bcb.gov.br/htms/relinf/port/2008/06/ri200806c2p.pdf>

To facilitate validation of beta, the document "2012\_07\_02 Screenshot Beta Electric Utilities January 2008" is available in data room in folder Shared Documents\Findings 1\CAR 5

#### 7. Assessment of such responses:

- a) The miscalculation of the Equity Risk Premium has been corrected and the new value adopted in the revised version of the CAPM
- b) The PP has provided a valid reference for the Country Risk Premium (<http://www.ipeadata.gov.br/> , links "Temas" → "Financeiras" → JP Morgan.
- c) The time periods adopted by for the estimation of the parameters Market Risk Premium, Beta, Country Risk Premium, TJLP and IPCA have been revised and are internally coherent.

The CAR was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

##### Updated Documents:

Calculation of benchmark according to the CAPM, as well as calculation of TJLP in real terms, part of the Investment Analysis Spreadsheet, file "Jirau HPP Investment Analysis Spreadsheet v4"

1. Grade / Ref:	CAR 06	2. Date:	11 July 2012	3. Status:	Closed (12/07/2012)
4. Requirement:	VVS v02.0 paragraph 120.d				
5. Nature of the Issue Raised:					

Please clarify why the value of UBP shown in the reference given by the PP (the auction notice) has been corrected for inflation in the period from 31 Dec 2007 to 30 April 2008. There was no evidence that the reference was from December 2007.

#### 6. Nature of responses provided by the project participants:

Payment for the Use of the Public Good or *Uso de Bem Publico* - UBP is a fee defined by the rules of the concession as already referenced in the FSR, page 48 and the amount is defined by the Invitation to Bidding (Edital) §: 12.9.1-3 to be BRL 7.873.150,74 per year [Reference 1]. The document further defines that the fee is adjusted for inflation by IPCA and due as from the commissioning of the first generator.

According to the Invitation to Bidding, the value was defined by Annex V, which was published in April 2008 and therefore is compatible with the base date of the Investment Analysis.

As a result, the inflation adjustment as applied in version one of the Investment Analysis was wrong and had to be removed.

#### References used for this response:

Reference 1: Edital Leilão Jirau, available in the data room, folder Shared Documents\Section B.5\Step 2 Investment Analysis, document “2008\_05\_12 Edital Leilão Jirau”, also available from: [http://www.aneel.gov.br/aplicacoes/editais\\_geracao/documentos/052008-Edital%2010-4\\_%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf](http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Edital%2010-4_%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf)

#### 7. Assessment of such responses:

The PP found out that the correction for inflation was in fact inappropriate, as the reference document was published on April 2008 and therefore is compatible with the base date of the Investment Analysis, 30 April 2008. The value was corrected in the investment analysis and in the PDD. The CAR was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

##### Updated Documents:

Investment Analysis, file “Jirau HPP CDM Model2012-07-11 v2.1”  
Jirau HPP PDD, file “20120711\_Jirau\_PDD\_v2.1\_wtc”

1. Grade / Ref:	CAR 07	2. Date:	12/07/2012	3. Status:	Closed (13/07/2012)
4. Requirement:	VVS v02.0 paragraph 131				
5. Nature of the Issue Raised:	<p>a. The monitoring plan of the parameter <math>A_{PJ}</math> (area of the reservoir measured in the surface of the water when the reservoir is full) says that the area will be calculated based on a Quota x Area curve. This curve, however, may change over the project's lifetime. Please clarify how the actual area will be yearly monitored, as determined by ACM0002.</p> <p>b. The monitoring plan for the parameter <math>Cap_{PJ}</math> includes the visual inspection of the turbines' nameplates. Please clarify why this same visual inspection is included in the MP as a QA/QC procedure.</p> <p>c. The monitoring plan names the Operating margin emission factor of the Brazilian grid as <math>EF_{grid,OM-DD,2010}</math>. The year 2010 in specified in the parameter's name, although this is a parameter to be monitored over the whole crediting period. Please clarify.</p>				

#### 6. Nature of responses provided by the project participants:

- Additional text has been included in the field "QA/QC procedures" at the table of the parameter " $A_{PJ}$ " in section B.7.1, as well as in section B.7.3 of the PDD in order to explain and clarify how the actual area will be yearly monitored. In this regard, as required by the ANA (the National Water Resources Agency), through its Resolution No 269 from 27 April 2009 (Article 6, VI), the Quota-Area-Volume curve will be annually updated. The monitoring data will be annually reported to ANA, to allow control and supervision of the conditions established in the concession rights for the use of water resources granted to ESBR.
- The information previously provided in both fields "Measurement methods and procedures" and "QA/QC procedures" in the table of the parameter " $Cap_{PJ}$ " in section B.7.1 of the PDD, was redundant, indeed. Therefore, the referred "QA/QC procedures" has been revised in the PDD and the parameter " $Cap_{PJ}$ " can be cross-checked through the inspection of the technical specification documents or manuals of the power units at the project site.
- The parameter "Operating margin emission factor of the Brazilian grid" has been revised in the table of section B.7.1 of the PDD from "EFgrid,OM-DD,2010" to "EFgrid,OM-DD,y" in order to avoid misunderstandings. The name of the parameter when indicated as "EFgrid,OM-DD,2010" corresponds to OM emission factor in Brazil for the year 2010, which has been used during the validation process for emission reductions estimate purposes only. However, for the verification purposes, the OM emission factor will be annually updated.

#### 7. Assessment of such responses:

The PP has satisfactorily explained in the PDD the monitoring procedure for the parameter  $A_{PJ}$ .  
The redundancy in the description of the QA/QC procedure for the variable  $Cap_{PJ}$  was amended in the PDD.  
The symbol adopted for the emission factor operating margin was amended in the PDD.  
The CAR was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

The parameter "Operating margin emission factor of the Brazilian grid" has been revised in the table of section B.7.1 of the PDD

1. Grade / Ref:	CAR 08	2. Date:	11/08/2012	3. Status:	Closed 06/08/2012
4. Requirement:	VVS v02.0 paragraph 121				
5. Nature of the Issue Raised:	<p>The PP has considered a 70% leverage for the calculation of the investment benchmark, which differs from the 50% leverage adopted for the calculation of equity IRR as per the financing conditions offered by the Brazilian Development Bank under the chosen hypothetical baseline scenario. Please explain why two different leverages have been adopted, taking into consideration the Guidance 18 of the Guidelines on the assessment of investment analysis (version 05). In addition, justify the differences, the applicability and the validity of the benchmark referenced from the World Bank Study. Furthermore, justify if an investment at a lower rate of return would not have been feasible, especially considering the comment received under the global stakeholder consultation process: <i>"In fact, construction of the Jirau HPP began in 2009 based on an equity IRR estimate of 12%, promoted to Enersus shareholders in 2008"</i>. This value is compatible with the default value as defined by the Guidelines on Investment Analysis and therefore justify why it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark.</p>				
6. Nature of responses provided by the project participants:	<p>First we would wish to clarify that the Project Specific Benchmark used in the Jirau HPP PDD as calculated with the Capital Asset Pricing Model (CAPM) represents the cost of equity (<math>K_e</math>) in real terms as calculated i) considering project specific circumstances and financing conditions offered by the Brazilian Development Bank, ii) using standard market references and data sources valid for the project starting date and iii) using best financial practice in line with applicable references. Therefore</p>				

Investment Analysis and benchmark are compatible and have been defined in line with the “Tool for the demonstration and assessment of additionality” (Annex 21, EB65, 2011) and the “Guidelines on the assessment of investment analysis” (Annex 5, EB62, 2011).

On the other hand, the PPs agree, that it is not correct to use this Project Specific Benchmark as additionality criteria under baseline conditions, which imply that leverage is limited to 50% of the total capital expenditures, as offered by the BNDES to GHG intensive generation sources. A strict interpretation of Guidance 18 also requires the use of the 50% default leverage. For this purpose the PP changed the calculation to define a Standard Benchmark under Baseline Conditions, which is a more appropriate criterion to judge the project’s additionality under the hypothetical baseline scenario defined. On the other hand, the Project Specific Benchmark is necessary to judge the profitability of the Jirau HPP under the project’s specific financial incentive policy offered by the Brazilian Development Bank. As these conditions offer increased financial leverage this has to be complemented for the calculation of the expected risk and return of an equity investor.

#### **i) Consideration of project specific financing conditions**

In order to assure that the Project Specific Benchmark is specific to the project activity a financial leverage of 70% as estimated at the time of the project starting date based on the indicative conditions published by the BNDES on 28 April 2008 has been used [Reference 1]. This leverage is also in line with the Feasibility Study Report which was submitted to the BNDES as basis for the project financing, Press Announcements made on the Project Starting Date [Reference 2] and is compatible with the final figure finally agreed with in the loan agreement (68,5%) [Reference 3]. Now as mentioned above, the PP’s agree that this is not the appropriate criteria to judge the project additionality under standard baseline conditions, but it is of relevance to judge the Project’s financial return when these promotion policies and the CERs are fully contemplated. For this purpose the Project Specific Benchmark is being maintained in the PDD, but the final value has slightly changed after corrective action requests, After correcting minor mistakes identified by the DOE (CAR 5), the Project Specific Benchmark obtained is 16.05%.

#### **ii) Use of standard market references and data sources valid for the baseline conditions and the project starting date**

Also, the calculation of the benchmark is based on parameters that are standard in the market and does not consider subjective profit expectations of any particular investor, as required by Guidance 13. This is further regulated by Guidance 15, which allows defining the cost of equity on the basis of simple default values offered by the IA Guidelines (and which will be discussed below), *“or by calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors”*. In addition, Guidance 18 has now been taken into account, which requires that the typical debt/equity structure as observed in the sector of the country, or a 50% debt and 50% equity financing structure should be used. As 50% debt and 50% equity structure has been defined by the BNDES as standard financing condition for GHG intensive generation assets, this value is now used to calculate the expected return on equity under baseline conditions. With this adjustment a Standard Benchmark for Baseline Conditions has been calculated to be 12,46% This option was chosen by the PP and after corrective action requests, related to minor mistakes identified by the DOE (CAR 5), the project specific benchmark obtained is 16.02%.

#### **iii) Use of best financial practice in line with applicable references**

According to Rocha (2006) [Reference 42], who offers an excellent and very didactic introduction to the use of the CAPM in the Brazilian perspective, the CAPM is the standard methodology to estimate the cost of equity, also for the purpose of regulation and it is used in countries like the UK, Australia, the US, Spain, Argentina and Chile. Now in the case of Brazil, the power generation sector is not regulated, but based on free competition and therefore a governmentally defined hurdle rate does not exist. In contrast, the electricity distribution business is regulated and the government does calculate and define the appropriate rate of return on equity invested and the result can serve as a comparator. The economic rationale used by the regulator ANEEL, together with the applicable financial theory, is explained in detail by a technical note issued in March 2007 (ANEEL, 2007 – Reference 5). This technical note and the values are result of a broad public consultation process and the value was defined to calculate distribution tariffs for the years 2007-2009 and therefore was valid at the time of the Jirau HPP project starting date.

As can be seen from the reference, the expected return on equity invested in the distribution sector is 13.75% and thus compatible with the Standard Benchmark and

Project Specific Benchmark calculated for the Jirau HPP project activity if different leverage assumptions are taken into account. Differences can be explained by the fact that i) the Generation business has a higher exposure to systematic risk and therefore a higher beta, ii) the financial leverage of the Jirau HPP is assumed to be 50% under baseline conditions and 70% under project specific conditions, versus a 57% average in the distribution sector and iii) the data sets are not fully compatible as the regulators benchmark was calculated 15 month before the project starting date. In addition to that, ANEEL makes specific adjustments for regulatory and exchange risks, which, if applied for Jirau, would increase the benchmark. Another interesting reference and discussion of the value and assumptions made by ANEEL is offered by Rocha (2006). In her study she comes to the conclusion that different assumptions would lead to estimated required return on equity in the range between 13.4 and 15.4%. Again it is important to emphasize that these values are specific for the risk and average leverage of the distribution business and not for investments in generation activities, but they illustrate the use of the CAPM in the context of the Brazilian reality.

In addition, considering that the distribution business earns a regulated return of 13.75% for equity investments, this represents an interesting opportunity cost for any investor as he could always invest in the distribution business instead of the more risky generation business. To assume a lower benchmark for hydro power investments would thus not be reasonable. In fact, as already cited before (World Bank, 2000 – Reference 4) hydro power investments have a very specific risk profile, which require an increased expected rate of return to compensate for this risk. Some examples for such risks are cost overruns, construction delays, difficulties with Environmental Licensing, geological risks. With a specific reference to the risks, costs and difficulties for environmental licensing, the World Bank study has cited that a return of approximately 15% is required by an equity investor to invest in such project activities, but the same number is also cited to be the expected rate of return in the Brazilian energy sector by another more recent study about the Economics of Climate Change in Brazil (Economia do Clima, 2010 – Reference 6).

In conclusion we hope to have shown that the Project Specific Benchmark as calculated in the PDD is based on best financial practice, is specific for the project activity in relation to the project starting date and the specific assumptions for financial leverage and that the results are compatible with other references. In addition the definition of the Standard Benchmark for Baseline Conditions in fact represents a more adequate criteria to judge the project's financial additionality if the 50% leverage as applicable for GHG intensive generation assets is taken into account and the PDD was adapted accordingly.

Now when it comes to the question in relation to the investor pronouncement of GDF SUEZ on 30 March 2008, where a 12% return was cited as projected return from the investment, depending on the final CapEx estimate, anticipation of the construction timeline and other variables we would like to provide the following comments: To understand this figure it is important to consider that this is not an investment benchmark, but the probable outcome as calculated on the basis of scenario analysis, which considers that not all assumptions will materialize as expected, and therefore allows for some specific risk adjustments. Given the uncertainty of many of the variables that define the Base Case as defined in the project PDD, especially considering that they were estimated according to their most ambitious value (maximum revenues and minimum cost estimates), which is conservative in terms of the CDM, it makes sense, especially for communication to shareholders, to calculate the expected outcome of an investment with some more cautious assumptions in order to take some possible contingencies, such as cost overruns or construction delays into account.

In fact, both perspectives and options are recognized techniques for risk evaluation under the financial theory: In a standard free cash flow analysis, the project's non diversifiable exposure to market risk is evaluated in the benchmark, while no risk adjustments are made to the cash flow. As an alternative to this technique, it is also possible to adjust the cash flow for specific risks and scenarios in order to then calculate the probable outcome. Both techniques are accepted, but there is a clear rule not to mingle these approaches as this would lead to double counting or to ignoring of risks. This is for example referenced by Moore Stephens (Reference 7) when they highlight the following points of attention for asset valuation:

*• The valuation should reflect the expectation of variations in the timing and quantum of cash flows. This can be achieved by building additional risk premium into the discount rate to reflect the uncertainty of the cash flows or by preparing a cash flow based on the weighted average possible cash flows. Both methods have their*

advantages and disadvantages however either method can be used as long as the risk and uncertainty is reflected in either the discount rate or the cash flow forecasts. A common error in valuations is double counting risk by adjusting cash flows and the discount rate.

• The discount rate should reflect all of the risks and uncertainties specific to the asset and its cash flows. This requires the risks and uncertainties to be identified and a premium quantified and allocated to the risk.

For this reason the 12% which have been mentioned in the interview do not represent the project specific cost of equity for a standard cash flow analysis, but the projected average return expected under different scenarios, such as delays in plant commissioning, CapEx increase or Energy and CER prices lower than originally estimated. Such a scenario analysis is not foreseen under the CDM rules, which require that investment analysis shall be developed on the basis of assumptions which are conservative in the terms of the CDM, i.e. maximize the investment return.

Furthermore, the Additionality Tool explicitly requires that *“the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer.”* Consequently, the number cited is neither comparable nor applicable under the CDM.

Now with regards to the question if an investment at a lower benchmark, compatible with the default benchmark as defined by the Guidelines of Investment Analysis would be a reasonable assumption, we would like to provide the following views:

The default equity benchmark of 11,75% was defined by the EB on the basis of the Information Note “Default Values for equity return of CDM projects” as developed by the Meth panel. Now when analysing the premises that were made by the Meth Panel to define this default value, there are two fundamental reasons which require a more specific approach for the Jirau HPP project activity:

i) **On page 9 the Information Note explains:**

*Studies show that equity returns on utilities sector are historically lower than industrial sector since they are regulated and guaranteed by regulatory body. Historically in utility sector there has been no competition and it is a natural monopoly. Only in the developed countries, in recent years, by liberalizing power production and marketing has been made competitive. **However in most developing countries, utility sector is still treated as monopoly with a guaranteed return. For these reasons, utility returns are less than industry returns.***

In fact this does not apply for the liberalized Brazilian energy generation business where agents have to compete in a free market and where no minimum returns are being granted by the state or regulator. To the contrary, any cost overrun or delay has to be borne by the generator and energy sales under the regulated or liberalized market have to be honoured on the basis of firm financial guarantees. For this reason the 1% downward adjustment made by the Meth Panel is not justified in the case of energy generation projects in Brazil.

ii) **On page 14 the Information Note explains:**

*“To apply the new default equity values, [...] **cash flow needs to be computed based on 100% equity to ensure consistency.**”*

This situation does also not apply for the Jirau HPP as the project is financed up to 70% by the BNDES and, due to the high capital requirement, would not

make sense from a pure equity perspective. As shown in the PDD, project financing is necessary to make the project viable and the low interest rates offered by the BNDES are necessary to raise the equity return to a level which offers acceptable returns. On the other hand this increases the equity investor's risk and therefore expected return as referenced by the financial literature already cited above.

### Conclusion:

We hope to have shown that the Project Specific Benchmark as calculated in the PDD is in compliance with the CDM rules, good standard financial practice and compatible with other comparable references if the project specific financial support policies are taken into account. On the other hand it is acknowledged that a Standard Benchmark for Baseline Conditions should only consider the 50% leverage applicable to GHG intensive generation assets and represents a more adequate criterion for additionality evaluation under this perspective. The value of 12,46% is already close to the value of the Default Benchmark, but in addition we would like to demonstrate that the conclusion about the project's additionality is solid even if the lower default benchmark is considered as in any case the project requires CDM revenues to reach any of the benchmarks. The respective amendments have been made in the PDD and clearly show that, without CERs neither the Standard Benchmark of 12,46%, nor the Default Benchmark of 11.75% is reached. This is not only true for the Base Case and the Optimized Project under baseline conditions, but also if the full investment incentive is considered for both perspectives. In fact even if the Optimized Project is evaluated on the basis of full consideration of all investment incentives offered by the Brazilian Development Bank, without CERs the equity IRR reaches only 10.9% and therefore does not meet the neither the Standard, nor the Default Benchmark, and much less the Project Specific Benchmark of 16,05% which is compatible with the financial leverage that applies to renewable energies.

### References used in this response:

Reference 1: "BNDES divulga condições de apoio para usina Jirau, no rio Madeira", issued on 28 April 2008, file "2008\_04\_28 www bndes gov br - BNDES divulga condições de apoio para usina Jirau no rio Madeira".

Reference 2: Consortium to request BNDES to finance 70% of the total of 9 billion R\$, available from [http://www.estadao.com.br/economia/not\\_econ210078,0.htm](http://www.estadao.com.br/economia/not_econ210078,0.htm)

Reference 3: BNDES communication on the loan approval, file "2009\_02\_18 BNDES aprova financiamento de R\$ 7,2 bilhões para Jirau.pdf", available at [http://www.bndes.gov.br/SiteBNDES/bndes/bndes\\_pt/Institucional/Sala\\_de\\_Imprensa/Noticias/2009/Energia/20090218\\_jirau.html](http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2009/Energia/20090218_jirau.html)

Reference 4: Rocha, 2006: ROCHA K, CAMACHO F. FIUZA G (2006). "Custo de Capital das Concessionárias de Distribuição de Energia Elétrica no Processo de Revisão Tarifária 2007-2009". Available at: [http://www.ipea.gov.br/082/08201008.jsp?ttCD\\_CHAVE=2512](http://www.ipea.gov.br/082/08201008.jsp?ttCD_CHAVE=2512);

Reference 3: ANEEL, 2007: ANEEL's Technical Note N° 68/2007-SRE/ANEEL, dated 21 March 2007. Available at: <http://www.aneel.gov.br/cedoc/nren2007259.pdf>;

Reference 5: World Bank, 2000: World Bank Discussion Paper No. 420, "Financing of Private Hydro power Projects", July 2000; Section 8, Page 65, 2<sup>nd</sup> paragraph. Available at: <http://www.chrishead.co.uk/pdfs/3-Financing-of-Private-HydropowerProjects.pdf>;

Reference 6: Economia do Clima, 2010: "Estudo Econômico das Mudanças Climáticas no Brasil", 2010, available at: <http://www.economiadoclima.org.br/site/?p=>.

Reference 7: Moore Stephens: "Valuation of Assets", available from <http://moorestephensresources.com.au/articles/337/1/Valuation-of-assets/Page1.html>.

### 7. Assessment of such responses:

The PP has adjusted the benchmark for investment analysis under baseline conditions to reflect standard financial leverage conditions. Furthermore the PP has included in the PDD, as an additional source for the benchmark, the default value given by the Guidelines on Investment Analysis Annex A. The benchmark referenced from the World Bank Study and the Project Specific Benchmark which considers the increased leverage offered by the BNDES to renewable energies

was kept in the PDD as an additional complementary reference, but is not relevant for the additionality discussion under the chosen baseline scenario. This CAR has been closed out.

**8. References to resulting changes in the PDD or supporting annexes:**

The PP has adapted to CAPM calculation to define a Standard Benchmark with 50% debt and 50% equity finance structure and added to the PDD a second benchmark reference (from the guidelines on assessment of investment analysis). Sensitivity calculations have been adapted accordingly.

<b>1. Grade / Ref:</b>	CAR 09	<b>2. Date:</b>	04 August 2012	<b>3. Status:</b>	Closed (06 August 2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 120.e				
<b>5. Nature of the Issue Raised:</b>	The Sensitivity Analysis presented only covers O&M, which is a minor operational cost, while sector fees and the more significant transmission fee are not covered. Please clarify the analysis on the effects of variations of the transmission fee.				
<b>6. Nature of responses provided by the project participants:</b>	All Operational Costs have now been summarized as a basis for the calculation and discussion of the sensitivity Analysis.				
<b>7. Assessment of such responses:</b>	The amendment was made to the investment analysis worksheet and the PDD. The CAR was closed.				
<b>8. References to resulting changes in the PDD or supporting annexes:</b>					
<b>Updated Document:</b>	Investment Analysis, file "Jirau HPP Investment Analysis Spreadsheet v4"				

<b>1. Grade / Ref:</b>	CL 01	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (28 June 2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 120.a				
<b>5. Nature of the Issue Raised:</b>	Provide reference for the value of the minimum Debt Service Coverage Rate adopted in the financial analysis for the determination of the investment leverage.				
<b>6. Nature of responses provided by the project participants:</b>	The minimum Debt Service Coverage Rate of 1.2 is referenced by the Term Sheet published by BNDES for the Jirau HPP as already referenced by the PDD. In addition a more detailed term sheet was made available in the data room. The reference shows that a maximum DSCR of 1.2 is accepted. In addition the reference shows that the BNDES requires that a Debt Service Reserve Account is established to make sure that an amount equivalent to at least three month of debt service and operational expenses is made available as security to the Bank. This has now been included in the financial model as further explained below.				
<b>References used for this response:</b>					

Reference 1: “BNDES divulga condições de apoio para usina Jirau, no rio Madeira”, issued on 28 April 2008, file “2008\_04\_28 www.bndes.gov.br - BNDES divulga condições de apoio para usina Jirau no rio Madeira”.

Reference 2: “Condições do Apoio do Sistema BNDES para a Implantação da Usina Hidrelétrica Jirau”, file “Detalhes Condições do Apoio BNDES\_Jirau”.

#### 7. Assessment of such responses:

The PP provided valid references for the value of the minimum Debt Service Coverage Rate adopted in the financial analysis. Additionally, the Debt Service Reserve account required by BNDES, to make sure that an amount equivalent to at least three months of debt service and operational expenses is made available as security to the Bank, was included in the investment model.

The CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

##### Updated Documents:

Investment Analysis, file “Jirau HPP CDM Model2012-07-02 v2.1”

Jirau HPP PDD, file “20120711\_Jirau\_PDD\_v2.1\_wtc”

1. Grade / Ref:	CL 02	2. Date:	18 June 2012	3. Status:	Closed (28 June 2012)
4. Requirement:	VVS v02.0 paragraph 120.a				
5. Nature of the Issue Raised:	Provide reference for the value adopted in the financial analysis (1.75%) for the Risk spread charged by the private banks.				
6. Nature of responses provided by the project participants:	<p>All loan cost assumptions had been projected on the basis of the Term Sheet published by the BNDES [Reference 1 and 2 below], as well as on the basis of general assumptions and pertinent sector experiences and references as cited below. All elements of the loan cost, such as TJLP, the Financial Cost and a Basic Spread of 0.5% are clearly defined on the basis of that document. In addition to that, the “Risk Spread” is a variable decided by the BNDES and the Intermediary Private Banks on a case by case basis and only after due analysis of the project on the basis of the FSR and further negotiations.</p> <p>In the case of the BNDES, the Risk Spread is defined to be in a range between 0.46% and 2.54% and the assumption was that the average of both values, i.e. 1.5% can be negotiated. The fact that this assumption was reasonable can be referenced by the final loan agreement which was signed on 29 June 2009 [Reference 3]. On page 4 of the agreement it is defined that the interest added to the TJLP is 2.08%, which implies a Risk Spread of 1.58% and a Basic Spread of 0.5%. Thus, the realized figure is 8 base points above the original projection.</p> <p>On the same ground, an increased Risk Spread of 1.75% was assumed for the private banks as they were expected to request a slightly higher percentage than the BNDES. The incremental 0.25% therefore represents a best estimate without specific reference. In effect, the final number was 1.65% and thus 10 base points below the original estimate.</p> <p>On aggregate the values finally agreed when the financing contract was signed on 29 June 2009 were well in line with those estimated before, with the Risk Spread due to the BNDES being slightly above and for the intermediating banks slightly below the original estimate.</p> <p>The total difference of 2 base points is minimal and readily covered by the sensitivity analysis which has been included as a response to CL 10.</p>				

#### References used for this response:

Reference 1: “BNDES divulga condições de apoio para usina Jirau, no rio Madeira”, issued on 28 April 2008, file “2008\_04\_28 www.bndes.gov.br - BNDES divulga condições de apoio para usina Jirau no rio Madeira”.

Reference 2: “Condições do Apoio do Sistema BNDES para a Implantação da Usina Hidrelétrica”, available in the dataroom in folder Shared Documents\Findings 1\CI 1, file “Detalhes Condições do Apoio BNDES\_Jirau”

Reference 3: “JIRAU - CONTRATO DE FINANCIAMENTO DIRETO”, , file “2009\_06\_29 JIRAU - CONTRATO DE FINANCIAMENTO DIRETO” and “JIRAU - CONTRATO DE REPASSE”, file “2009\_06\_29 JIRAU - CONTRATO DE REPASSE 29 06 2009”.

#### 7. Assessment of such responses:

The PP provided reference for the value adopted in the financial analysis (1.75%) for the Risk spread charged by the private banks. The effect of variations in the cost of debt on the conclusion of the investment analysis were considered in the sensitivity analysis.  
The CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

##### Updated Documents:

Investment Analysis, file “Jirau HPP CDM Model2012-07-11 v2.1”

Jirau HPP PDD, file “20120711\_Jirau\_PDD\_v2.1\_wtc”

<b>1. Grade / Ref:</b>	CL 03	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (28 June 2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 120.a				
<b>5. Nature of the Issue Raised:</b>	The PP mentioned in the cash flow worksheet “Valuation”, cell D18, the federal tax incentives available for projects in Amazon region (ADA). Please provide reference and details on this incentive and explain how it has been considered in the cash flow.				
<b>6. Nature of responses provided by the project participants:</b>	<b>What is the benefit?</b> <ul style="list-style-type: none"> <li>The applicable Corporate Income Tax (“CIT”) rate in Brazil has two components: (i) Corporate Income Tax (“IRPJ”): 25.0% and (ii) Social Contribution (“CSLL”): 9.0%.</li> <li>Jirau HPP is located in a Federal tax incentive area which (according to federal law number 11.196 from 22 November 2005 – [see Reference 1 below]) entitles a 75% reduction on IRPJ for 10 operating years. This benefit is granted by the Amazon Development Superintendence, known as SUDAM (former “ADA - Amazon Development Agency”) and instead of the 25% normal rate, projects located at the SUDAM region have a 6.25% IRPJ, totaling 15.25% income tax rate</li> </ul>				

(IRPJ + CSLL).

#### **How to obtain it?**

- The benefit can be granted to new projects or to projects that have received a significant improvement/modernization.
- To be entitled to the benefit the project needs to be located in SUDAM region (involves the states of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima, Tocantins and part of Maranhão State) and must be under an economic sector considered as a priority to the Government – such as the electricity generation sector.
- When the project reaches 20% of its capacity (in our case 20% of the assured energy) the company can require the benefit.
- Agency Approval: after complying with the capacity required (assured energy) the company must file a formal tax incentive application within the SUDAM along with the statutory documents and proof of investment in the region. The agency will perform a pre-analysis of the application documents and, upon acceptance, it will schedule an inspection to confirm in loco the substance of the facts raised by the forms, issuing a decision that will either accept or reject the application.
- If approved, the project can start using the benefit as from the year after the requirement was made to SUDAM.

#### **What are the time limits?**

- The current legislation (Decree 11.196/2005) concedes the benefit for 10 years to projects approved until Dec 2013 (deadline to apply under current legislation). Therefore we face a certain risk for losing eligibility for the incentive if we have further delays with the project commissioning.
- To assess this risk we have commissioned a study from Earnest and Young which is being provided as Reference 2. Accordingly, the government has been signalling that the tax benefit will be postponed for approvals until Dec 2018 (and valid for 10 years as from 2019). Considering the long history of this legislation (and its extension or renewal), and considering that the North region of Brazil still needs strong incentives to foster development, our understanding is that there are high indications that the benefit will be extended to projects approved until 2018.

#### **What happens to the avoided CIT payment and how is it treated in the Investment Analysis.**

- The avoided CIT will constitute a special capital reserve which cannot be distributed to the shareholders (through dividends) and if it is used to increase paid-in capital, such capital cannot be reduced. If capital is reduced or reserve is distributed, the company is obliged to pay all taxes not paid due to the incentive.
- Accordingly the key benefit of the incentive is to increase the projects cash flow and thus facilitate the payment of interest and debt amortization. As this also improves the Debt Service Coverage Ratio, the regulation allows to obtain better financing conditions.
- In the Investment Analysis it is considered as a full reduction of the Tax. The fact that it cannot be distributed to the Shareholders is not contemplated in this model, which is conservative according to the principles of the CDM.

#### **Summary**

- As the ADA represents a general investment incentive not related to the GHG emission intensity of any project it was considered in the projects investment analysis according to the regulation in place at that time and as required by the CDM rules. At stage there is a certain risk that this premise will not consolidate if the Jirau HPP faces further delays in its commissioning timeline and if the regulation is not extended as expected. However, given the long history of the benefit, the need of further development of the Amazon region and the interest demonstrated by the government in postponing it, we believe the extension to at least

December 2018 should occur and that the text exemption for 10 years will be obtained as expected at the Project Starting Date.

#### References used for this response:

Reference 1: “LEI Nº 11.196, DE 21 DE NOVEMBRO DE 2005”, available under:

[http://www.planalto.gov.br/ccivil\\_03/ato2004-2006/2005/lei/111196.htm](http://www.planalto.gov.br/ccivil_03/ato2004-2006/2005/lei/111196.htm), file “Lei No 11196 de 21 de Novembro de 2005”.

Reference 2: Earnest and Young: SUDAM and SUDENE: Analysis of Possible Extension of Current Regional Tax Incentives, 02 February 2012, available in the dataroom under Shared Documents\Findings 1\CI 3, file “2012\_02\_02 ADA\_Earnest and Young Expertise”.

#### 7. Assessment of such responses:

The PP provided reference and details on the federal tax incentives available for projects in Amazon region and explained how it was considered in the cash flow. The CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

No change has been made.

<b>1. Grade / Ref:</b>	CL 04	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (03/07/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 120.a				
<b>5. Nature of the Issue Raised:</b>	It is said in the PDD table 10, page 40, that the Additional Firm Energy projected for sales to the Free Market (ACL) comes from the 2 additional turbines planned by the PP. Please confirm if this energy is also due to the anticipation of energy generation, planned by the PP, in relation to the implementation timeline proposed by EPE as a reference for the auction.				
<b>6. Nature of responses provided by the project participants:</b>	<p>In fact the financial model considers the additional Firm Energy that was expected from anticipation of the commissioning of the turbines, as well as from the additional turbines in the same line (line 22 of the “Valuation” sheet). The quantification of this additional Firm Energy is achieved by comparing ESBRs project implementation and turbine commissioning timeline as assumed in June 2008, with the timeline and configuration that was defined by EPE. The positive difference between both projections then represents the additional Firm Energy which was projected to be obtained from the projections that were made by ESBR as the time of the Project Starting Date as referenced by the Project Feasibility Report. The detailed calculation are available on the sheet “E-Gener” and the results are visible in line 16, which is directly linked to line 22 in the sheet “Valuation” [Reference 1].</p> <p>As the projection was based on the most ambitious construction timeline possible, as well as on the premise that the additional Firm Energy for the turbines 45 and 46 would be readily approved by the regulator. Thus from the perspective of the CDM the assumption was considered in the most conservative way possible.</p> <p>PDD was updated to improve clarity in this respect.</p>				

**References used for this response:**

Reference 1: Revised Investment Analysis, file "Jirau HPP CDM Model2012-06-26 v2.1\_draft".

**7. Assessment of such responses:**

The PP confirmed that the Additional Firm Energy projected for sales to the Free Market (ACL) is also due to the anticipation of the commissioning of the turbines planned by the PP, in relation to the implementation timeline proposed by EPE as a reference for the auction. Additional explanation was included in the PDD. The CL was closed.

**8. References to resulting changes in the PDD or supporting annexes:**
**Updated Document:**

Jirau HPP PDD, file "20120711\_Jirau\_PDD\_v2.1\_wtc"

<b>1. Grade / Ref:</b>	CL 05	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (03/07/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 120.a				
<b>5. Nature of the Issue Raised:</b>	Please detail the reasoning followed in the estimation of the energy transmission losses, estimated at 2.5% (file "Jirau HPP CDM Model2012-04-24-v1.1.xls", worksheet "Valuation", line 33).				
<b>6. Nature of responses provided by the project participants:</b>	<p>The 2.5% transmission loss is clearly contemplated in the table of page 49 of the FSR which was submitted to the Development Bank. This is in line with the Brazilian regulation [Reference 1] which determines that the transmission losses that occur in the basic transmission system are shared by consumers and generators, which have to provide the firm energy to compensate for the loss as calculated by the Commercial Chamber for Energy Exchange CCEE. Loss varies monthly according to the specific dispatch and is determined and compensated accordingly. This is a general feature of the Brazilian system and regulation and all generation projects and consumers have to participate and are due to the same compensation. An analysis of the average historical data shows that the estimate of 2.5% is reasonable [Reference 1].</p> <p>Now as the energy sale to the ACR is firm, i.e. all energy has to be delivered at the contracted price, the compensation for transmission loss has to be discounted from the remaining Firm Energy and thus is not available for sale to the free market.</p> <p><b>References used for this response:</b> Reference 1: Presentation CCEE about Losses in the Basic Transmission System, file "CCEE Perdas na rede básica"</p>				
<b>7. Assessment of such responses:</b>	The reasoning followed in the estimation of the energy transmission losses was satisfactorily explained by the PP. The CL was closed.				
<b>8. References to resulting changes in the PDD or supporting annexes:</b>	The PDD has been amended for clarification.				
<b>1. Grade / Ref:</b>	CL 06	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed

				(05/07/2012)
<b>4. Requirement:</b>		VVS v02.0 paragraph 120.a		
<b>5. Nature of the Issue Raised:</b>				
Please detail the reasoning followed in the estimation of the energy price in the spot market (PDD page 41)				
<b>6. Nature of responses provided by the project participants:</b>				
A specific Memo has been developed to explain the nature and pricing of Secondary Energy in order to demonstrate that the total revenue considered for this variable is adequate and conservative under the principles of the CDM.				
The Memo shows that the revenues from selling secondary energy derive from a volatile spot price and a volatile occurrence of the secondary energy and that the revenue might be negative under some circumstances. Based on historic data it is shown that the volume and price for secondary energy reflect the expected long term average for this specific revenue.				
<b>References used for this response:</b>				
Reference 1: “Jirau Secondary Energy”, file “2012_06_25 Jirau Secondary Energy”.				
<b>7. Assessment of such responses:</b>				
The nature of the spot market price and the reasoning followed for its estimation were satisfactorily explained by the PP in the memo produced. The CL was closed.				
<b>8. References to resulting changes in the PDD or supporting annexes:</b>				
No changes have been made				

1. Grade / Ref:	CL 07	2. Date:	18 June 2012	3. Status:	Closed (05/07/2012)
4. Requirement:	VVS v02.0 paragraph 120.a				
5. Nature of the Issue Raised:					
Provide reference for the value of TUST (the files available in the ANEEL link <a href="http://www.aneel.gov.br/cedoc/reh2008630.pdfm">http://www.aneel.gov.br/cedoc/reh2008630.pdfm</a> , mentioned in the PDD footnote116 could not be opened.					
6. Nature of responses provided by the project participants:					
As the original reference was no longer available a new source for the same values has been identified on the regulator ANEEL's website [Reference 1]: In order to avoid this kind of error or inconsistency to happen again, project participants printed the referred link which contains the information related to the value of TUST applicable for Jirau project. As clearly mentioned by the reference these values were defined by the regulator in real terms of June 2007 and are adjusted annually by the regulator according to a sector specific procedure which takes into account the IGPM [Reference 2] As a consequence the IGPM has been used to conduct adjustment of the values as evidenced by Reference 3.					
References used for this response:					
Reference 1: Reference values of TUST, available in the dataroom in folder Shared Documents\Findings 1\CL 7, file "2007_06_05 JIRAU - ANEEL - Leilão 052008 - ANEXOXII – TUST.pdf", also available from <a href="http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-ANEXO%2012%20-%20Conjunto%20de%20TUST.pdf">http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-ANEXO%2012%20-%20Conjunto%20de%20TUST.pdf</a> .					

Reference 2: “Aneel aprova reajuste da Receita Anual de transmissoras e atualiza tarifas de transmissão do Sistema Interligado - 26/06/2009”, file “Atualização TUST e IGPM”, also available under [http://www.aneel.gov.br/aplicacoes/noticias\\_boletim/?fuseaction=boletim.detalharNoticia&idNoticia=12](http://www.aneel.gov.br/aplicacoes/noticias_boletim/?fuseaction=boletim.detalharNoticia&idNoticia=12).

Reference 3: Cálculo Exato IGPM June 2007 to April 2008, also available under <http://www.calculoexato.com.br/result.aspx?codMenu=FinanVariacaoIndice>.

#### 7. Assessment of such responses:

The references used in the determination of the TUST in real terms were provided by the PP in the response above. The PDD was amended accordingly. The CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

#### Updated Documents:

Investment Analysis, file “Jirau HPP CDM Model2012-07-11 v2.1”

Jirau HPP PDD, file “20120711\_Jirau\_PDD\_v2.1\_wtc”

1. Grade / Ref:	CL 08	2. Date:	18 June 2012	3. Status:	Closed (12/07/2012)
4. Requirement:	VVS v02.0 paragraph 120.a				
5. Nature of the Issue Raised:	Provide reference for the value of the concession fee (UBP)				
6. Nature of responses provided by the project participants:	Reference: Edital Leilão Jirau, document “2008_05_12 Edital Leilão Jirau”, also available from: <a href="http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Edital%2010-4%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf">http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Edital%2010-4%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf</a>				
7. Assessment of such responses:	The PP has provided the reference for the value of the concession fee (UBP) adopted in the investment analysis model. This CL was closed. A miscalculation of UBP value was also found, and the CAR 06 was opened. Please refer to CAR 06 above.				
8. References to resulting changes in the PDD or supporting annexes:	No change has been made				

1. Grade / Ref:	CL 09	2. Date:	18 June 2012	3. Status:	Closed (05/07/2012)
4. Requirement:	VVS v02.0 paragraph 120.a				
5. Nature of the Issue Raised:	With respect to royalties, according to ANEEL ( <a href="http://www.aneel.gov.br/area.cfm?idArea=42">http://www.aneel.gov.br/area.cfm?idArea=42</a> ), concessionaires pay a financial compensation (CF) which is calculated using a standard formula: CF = 6.75% times the Energy generated in the month times the Updated Reference Tariff (TAR). The TAR is set annually by ANEEL. Please give the reference for the value of TAR and the calculation of the royalties due.				

#### 6. Nature of responses provided by the project participants:

As referenced by the FSR, "Royalties" or the Financial Compensation for the use of hydro resources "CFURH" are calculated to be equal to 6.75% of the energy generated per month multiplies by the "Actualized Reference Tariff – TAR, which is regularly informed by the regulator and annually adjusted for inflation. A detailed explanation of the calculation and adjustment of the TAR is offered by the Publication "Encargos Setoriais" issued by ABRACE [Reference 1]. The document explains that the TAR historically developed above the IGPM, showing that this is the most adequate, but still conservative index for the TAR. The TAR value of BRL 60.04 / MWh was defined by Aneel on the basis of "Resolução Homologatoria 586" [Reference 2] and has been adjusted to the inflation rate according to the IGPM from 31 December 2007 to 30 April 2008 [Reference 3].

#### References used for this response:

Reference 1: Cartilha ABRACE Encargos Setoriais, available in the data room, folder Shared Documents\Findings 1\CL 9.

Reference 2: "Aneel Resolução Homologatoria 586 de 11 de Dezembro 2007", document "2007\_12\_11 ANEEL Resolução 586 para definir TAR em 60.04 RS" or from <http://www.aneel.gov.br/cedoc/reh2007586.pdf>.

Reference 3: The adjustment factor for IGPM between 31 Dec 2007 and 30 April 2008 has been determined with the web service "Cálculo Exato" and the result is available in the document "Calculo Exato IGPM 31 Dec 2007 to April 30 2008".

#### 7. Assessment of such responses:

The references used in the determination of TAR and the calculation of the royalties due were provided by the PP. The CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

#### Updated Document:

Investment Analysis, file "Jirau HPP CDM Model2012-07-11 v2.1"

Jirau HPP PDD, file "20120711\_Jirau\_PDD\_v2.1\_wtc"

1. Grade / Ref:	CL 10	2. Date:	18 June 2012	3. Status:	Closed (05/07/2012)
4. Requirement:	VVS v02.0 paragraph 120.e				
5. Nature of the Issue Raised:	Please provide the sensitivity analysis of the parameters considered at the breakeven points (IRR = Benchmark). Provide the sensitivity analysis for changes in the debt cost.				
6. Nature of responses provided by the project participants:	The Investment Analysis has been revised to include sensitivity for changes in the financing cost. In addition, for each of the key variables, the minimum and maximum values which allow achieving the benchmark have been calculated.				
7. Assessment of such responses:	The PP provided in the investment analysis worksheet the sensitivity calculations considering variations of the debt costs, as well as the calculations for the breakeven points of the four key parameters considered (OPEX, CAPEX, Energy price in the Spot or ACL market and Debt interest). The PDD was amended accordingly. The CL was closed.				
8. References to resulting changes in the PDD or supporting annexes:					

**Updated Document:**

Investment Analysis, file "Jirau HPP CDM Model2012-07-02 v2.1"  
Jirau HPP PDD, Document file "20120711\_Jirau\_PDD\_v2.1\_wtc"

<b>1. Grade / Ref:</b>	CL 11	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (05/07/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 96				
<b>5. Nature of the Issue Raised:</b>	Please provide the worksheet with the calculation of the emission reductions.				
<b>6. Nature of responses provided by the project participants:</b>	The emission reductions calculation spreadsheet has been provided to the DOE now. <b>References used for this response</b> Reference 1: Emission reductions calculation spreadsheet, available in the dataroom in folder Shared Documents\Findings 1\CL 11, file "20120418_Jirau_CERs estimates_v.1_DC".				
<b>7. Assessment of such responses:</b>	The emission reductions calculation worksheet was provided by the PP. The CL was closed.				
<b>8. References to resulting changes in the PDD or supporting annexes:</b>	No change has been made				

<b>1. Grade / Ref:</b>	CL 12	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (07/07/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 132.a.ii				
<b>5. Nature of the Issue Raised:</b>	The adopted methodology ACM0002 in the item III. "Monitoring Methodology", "Data and parameters monitored", determines that, for the parameter $EG_{facility,y}$ , the measurement results must be cross-checked with records for sold energy. Nevertheless, the PDD in the item B.7.1 "Data and parameters to be monitored", explains that "Sales receipts for sold electricity cannot be used for cross-checking purposes as the sales receipts will only indicate the monetary amount to be paid and not the amount of electricity sold to the grid". In order to satisfy the implied intent of the methodology's requirement, provide an alternative cross-check with other invoice related data or explain why this cross-check could be waived without any loss of data quality assurance.				
<b>6. Nature of responses provided by the project participants:</b>	As already explained by the project participants in the PDD: "The quantity of net electricity generation supplied by the project plant/unit to the grid needs to be checked by comparison with the CCEE (Electric Power Commercialization Chamber) database, which is the official and the most credible source of information for this purpose". This means that the amount of net electricity dispatched by the project activity to the national grid (SIN) will be 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, as for example: electricity suppliers, electricity consumers, utilities, transmission companies, governmental entities, regulators, etc.

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 by Jirau HPP specifically, which will be available in CCEE internal database, can be accessed (read only) by ESBRE through a web based dedicated interface by using a specific access code (named "crypto card"). 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 to be supplied by the project activity to the grid.

In addition, by accessing the CCEE database, it is possible to obtain different kind of electricity generation reports. However, as these reports will be derived from the same and unique source (CCEE database), the cross-checking practice becomes redundant and useless being, therefore, 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 will not reflect the accurate amount of electricity dispatched to the grid by the project activity.

Nevertheless, this will 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, 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.

#### 7. Assessment of such responses:

The PP has satisfactorily explained how the reliability of the measurement results will be assured even in the absence of a cross-check with records for sold energy. The validation team agrees that the methodology's implied intent is achieved, (as explained in the PDD section B.7.1), as the quantity of net electricity generation supplied by the project activity to the grid needs to be checked through the CCEE's database, which is the official and the most credible source of information for this purpose.

The CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

##### Updated Documents:

Jirau HPP PDD, Document file "20120711\_Jirau\_PDD\_v2.1\_wtc"

<b>1. Grade / Ref:</b>	CL 13	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (07/07/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 134 and 138				
<b>5. Nature of the Issue Raised:</b>	As demonstrated during the visit to the plant, the planning and implementation of actions to mitigate the socio-economic and environmental issues are coordinated by the Sustainability Committee, subdivided into working groups. Please provide the latest semi-annual reports of the Basic Environmental Program (PBA) sent to IBAMA.				
<b>6. Nature of responses provided by the project participants:</b>					

The latest semi-annual report of the Basic Environmental Program (PBA) sent to IBAMA has been made available in the dataroom.	
<b>7. Assessment of such responses:</b>	
The latest semi-annual reports of the Basic Environmental Program (PBA) were provided by the PP. The CL was closed.	
<b>8. References to resulting changes in the PDD or supporting annexes:</b>	
<b>Updated Documents:</b>	
Jirau HPP PDD, file "20120711_Jirau_PDD_v2.1_wtc"	

<b>1. Grade / Ref:</b>	CL 14	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (12/07/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 138				
<b>5. Nature of the Issue Raised:</b>					
Local stakeholders consultation: In Brazil, besides the requirements of the Brazilian DNA, the environmental licensing process regulated and controlled by IBAMA also includes the obligation of a thorough and comprehensive consultation, through public hearings, to the local stakeholders. According to the PDD version 1 item E.2 “Summary of comments received”, “No comments have been received during the local Stakeholders consultation process, as implemented according to the requirements of the Brazilian DNA”. Please give a summary of the consultation process under the IBAMA licensing process and clarify if comments have been received. If so, explain how due consideration was given.					
<b>6. Nature of responses provided by the project participants:</b>					
As described in the PDD, the environmental licensing process of the Jirau Hydro Power Plant Project is being developed in strict accordance with the Brazilian Law, specially the CONAMA Resolutions N° 001/1986 and N° 237/1997, which requires the participation of all involved parties (i.e.: FUNAI, IPHAN, ANA, communities, associations, governments, municipalities, etc) and a broad consultation process at the EIA/RIMA approval stage. Right after the submission of the EIA/RIMA to the federal environmental agency (IBAMA) to request the preliminary license (LP), a formal consultation process was defined, resulting in 04 (four) public hearings which involved more than 2,000 stakeholders directly and indirectly affected by the project activity. As a preparation to these four public hearings, EIA/RIMA were made available for public consultation on 25 September 2006 and the invitations to the public hearings to discuss EIA/RIMA for the Santo Antonio and Jirau HPPs were published by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) in its homepage and through a public notice published on 24 October 2006 and later in the Official Gazette (DOU) on 24 October 2006 and 14 November 2006. In addition to these formal disclosure mechanisms, an extensive publicity campaign was conducted prior to the hearings which included public disclosure through posters, banners, brochures, radio announcements, car audio announcements, etc. The four public hearings were held after 36 preparatory meetings, involving civil society, government agencies and various organizations in the districts of Abunã, Mutum-Paraná, Jaci-Paraná and the City of Porto Velho, as described below:					
District of Abunã – held on 29 November 2006 at the Marechal Rondon Municipal Primary Education School, the Abunã Public Hearing was attended by 404 people. District of Mutum-Paraná – held on 30 November 2006 at the Nossa Senhora de Nazaré Municipal Primary Education School, the Public Hearing was attended by 669 people. District of Jaci-Paraná – held on 10 November 2006 at the Maria Nazaré dos Santos Municipal Primary and Secondary Education School, the Public Hearing was attended by 800 people. City of Porto Velho – held on 11 November 2006 at the Aquarius Hotel, Nautilus room, the Public Hearing was attended by 1,100 people.					

All comments and questions made during meetings and public hearings were incorporated into the licensing process of the Santo Antônio and Jirau Hydro Power Plants, including the Preliminary License (LP) No 251/2007, which attested the environmental viability of these projects. According to the technical opinion nº 14/2007 – COHID/CGENE/DILIC/IBAMA (pág. 1) issued by IBAMA (PT):

“This technical opinion aims to present the results of the environmental impact assessment of the Santo Antonio and Jirau Hydro Power Plants, as performed by the technical team of IBAMA, based in the analysis of the Environmental Impact Assessment (EIA), Environmental Impact Report (RIMA), Public hearings, technical surveys, technical meetings and other documentation annexed to the process in accordance with the applicable legislation” (Free translation from Portuguese). As a conclusive opinion, the IBAMA stated that “(...) we can affirm that there was an improvement of the project’s overall understanding and addressing of identified problems, and, as a conclusion, there is no remaining issue at this Preliminary Licensing stage”.

Subsequently, on 15 October 2008, a public meeting was held in Porto Velho to present and discuss the proposal to amend project's original engineering design and construct the plant at the Ilha do Padre instead of the original location at the Jirau Waterfall. This meeting was announced in the Official Gazette (DOU) on 9 October 2008 and attended by approximately 800 participants. The presentation as well as comments, questions and answers provided during the meeting have been summarised in a meeting document and the overall meeting has been recorded and filmed.

According to the meeting document, all questions raised were dully responded by the participants, including: employment generation, compensation packages, training of professionals, health and malaria, riparian communities, impacts on fishing activity, among others.

#### 7. Assessment of such responses:

The PDD has been amended by the PP in the sections D.2 and D.3, with the inclusion of a detailed description of the comments received and the considerations made with respect to the comments received during the IBAMA licensing process. The CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

##### Updated Documents:

Jirau HPP PDD, file “20120711\_Jirau\_PDD\_v2.1\_wtc”

1. Grade / Ref:	CL 15	2. Date:	18 June 2012	3. Status:	Closed (12/07/2012)
4. Requirement:					
5. Nature of the Issue Raised:					
Please clarify if the PP intends to adopt the recently issued version of the methodology ACM0002 (version 13.0.0).					
6. Nature of responses provided by the project participants:					
Project participants revised the PDD by updating the approved methodology ACM0002 from version 12.3.0 to 13.0.0. In this regard, the table of the parameter “EG <sub>facility,y</sub> ” in section B.7.1 of the PDD has been revised in order to be in accordance to version 13.0.0 of the methodology ACM0002 and additional information  has been included in the referred table as well.					
7. Assessment of such responses:					

The validation team confirmed the use of the latest version of ACM0002 (13.0.0) in the PDD version 2. The CL was closed.	
<b>8. References to resulting changes in the PDD or supporting annexes:</b>	
the PDD has been revised in order to be in accordance to version 13.0.0 of the methodology ACM0002	

<b>1. Grade / Ref:</b>	CL 16	<b>2. Date:</b>	18 June 2012	<b>3. Status:</b>	Closed (12/07/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 120.a				
<b>5. Nature of the Issue Raised:</b>	<p>a. Regarding the TFSEE (Inspection Fee of Electric Energy Services) the value according to the Law N° 9427/1996 is calculated by multiplying the installed capacity times 0.5% times a variable factor. The PP has adopted the value of 316.48 BRL/kW for this factor. Please give reference for the value adopted.</p> <p>b. The validator was not able to identify the depreciation regime determined by the regulation in the reference given by the PP (11 Law 11.196-2005 from 11 November 2005).</p>				
<b>6. Nature of responses provided by the project participants:</b>	<p>According to the FSR, the “Taxa de Fiscalização do Setor Elétrico” – TFSEE was considered in line with the applicable regulation as detailed by Reference 1. The TFSEE shall remunerate the activities of the ANEEL and is charged monthly according to variables which are continuously updated. The value is calculated as 0,5% of the installed capacity and multiplies with a value of BRL 303.78 as defined by Aneel, “Despacho 3.731” from 27 December 2007 [Reference 2]. According to Reference 1 the value of the TFSEE increases above the IGPM inflation indicator which has been used to adjust the value to reflect the terms of 30 April 3008 [Reference 3].</p> <p><b>References used for this response</b></p> <p>Reference 1: Cartilha ABRACE Encargos Setoriais, available in the data room, folder Shared Documents\Findings 1\CL 9.</p> <p>Reference 2: Aneel Despacho 3.731 de 27 de Dezembro 2007, available in the data room, folder Shared Documents\Findings 1\CL 15, document “2007_12_27 ANEEL DESPACHO N° 3.731 TFSEE” or from <a href="http://www.aneel.gov.br/cedoc/dsp20073731.pdf">http://www.aneel.gov.br/cedoc/dsp20073731.pdf</a>.</p> <p>Reference 3: The adjustment factor for IGPM between 31 Dec 2007 and 30 April 2008 has been determined with the web service Cálculo Exato and the result is available in the data room, folder Shared Documents\Findings 1\CL 8, document “Calculo Exato IGPM 31 Dec 2007 to April 30 2008”.</p> <p>The depreciation regime is available from the official site of Internal Brazilian Revenue Service (Receita Federal), <a href="http://www.receita.fazenda.gov.br/legislacao/ins/ant2001/1998/in16298ane2.htm">http://www.receita.fazenda.gov.br/legislacao/ins/ant2001/1998/in16298ane2.htm</a>.</p>				
<b>7. Assessment of such responses:</b>	<p>a. The PP has provided the references used for the determination of TFSEE value adopted in the investment analysis model.</p> <p>b. The PP has provided the reference for the depreciation regime adopted.</p> <p>The CL was closed.</p>				
<b>8. References to resulting changes in the PDD or supporting annexes:</b>					

No change has been made.

<b>1. Grade / Ref:</b>	CL 17	<b>2. Date:</b>	18/08/2012	<b>3. Status:</b>	Closed 23/08/2012
<b>4. Requirement:</b>	VVS v02.0 paragraph 120.a				
<b>5. Nature of the Issue Raised:</b>	<p>a) Please provide clarification on the difference between loan conditions offered to Wind and Hydro power projects in terms of Basic Spread and Loan Payback period.</p> <p>b) Also provide further references that demonstrate that the support conditions for hydro power have been established with the objective to reduce GHG emission reductions and not for other reasons.</p>				
<b>6. Nature of responses provided by the project participants:</b>	<p>Before we answer this clarification request we would like to recall that the VVS [Reference 1], in line with the provisions of EB 22, Annex 3 [Reference 2] defines that:</p> <p><i>“National and/or <b>sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy</b> or to finance energy efficiency programmes), otherwise known as policies that decrease GHG emissions, are called type E-.</i></p> <p>Therefore, in response to item a) we understand that the definition of E- policies only requires identifying a comparative advantage between <b>less emissions-intensive technologies over more emissions-intensive technologies</b> and does not require analyzing any differences in conditions offered between different kinds of GHG mitigation technologies, such as renewable energies. This interpretation is also in line with the Guidance on the CDM as provided by CMP 5 in Copenhagen which defines that <i>“it is the prerogative of the host country to decide on the design and implementation of policies to promote or give competitive advantage to low greenhouse gas emitting fuels or technologies”</i>. Therefore we understand that the differences in financing conditions between wind and hydro power are not of relevance for the CDM registration process of the project activity in question, i.e. that it is up to the host country to gauge the level of promotion and comparative advantage which each renewable energy technology needs in comparison to GHG intensive alternatives.</p> <p>In spite of this principle we would like to explain that the observed differences are related to the fact that hydro power plants are more sensitive to interest rates due to their long construction time. While wind projects can be operational in 18 months and then pay interests and loan amortization from their operational cash flow, large hydro power plants take up to 5 years or more to be completed. This leads to high cost for interests during construction, which is one of the main barriers for hydro power developments. In consideration of this fact, the World Bank (2000) [Reference 4] recommends <i>“the availability of longer-term finance at low cost”</i> to promote hydro power investments. In line with this recommendation the Brazilian Development Bank (BNDES, 2012) [Reference 3] provided a statement to clarify the background of its policy:</p> <p><i>“On the basis of a differentiation in basic spread, the extension of the financing duration, next to the increased participation in financing, it was possible to reduce the financial cost of hydro power investments to a level which granted them with competitiveness in relation to the financial cost of coal and fuel oil based generation plants” (BNDES, 2012, translation ours).</i></p>				

Now in response to item b) we also understand that the political motives behind the policy are irrelevant for the discussion as an E- policy is solely defined on the basis of the fact that a comparative advantage between **“less emissions-intensive technologies over more emissions-intensive technologies”** exists. Moreover, the definition is explicitly addresses **“public subsidies to promote the diffusion of renewable energy”**. It is therefore irrelevant why the policy has been established or what other objectives than GHG mitigation it has. This makes sense as even in a case where the policy was established for reasons not related to GHG mitigation, the loss of additionality would represent a perverse incentive to abolish or not adopt further equivalent policies, a fact which would be in conflict with EB 22, Annex 3 [Reference 2] and the Guidance on the CDM as provided by CMP 5 in Copenhagen [Reference 5].

Nevertheless, in the PDD and above in the response to item a), we have provided vast reference that illustrate that the promotion of hydro power is part of Brazil's GHG mitigation policy and therefore it is out of question that GHG mitigation is one of the key objectives behind the incentive. For further clarification, some additional references are being provided in the reference list below. Now another objective referenced the Ministry of Energy and Mines (MME PNE 2030, 2007) and reaffirmed by recent publications of the Brazilian Senate (2012) [Reference 6], is to use the development of hydro power projects, such as the project activity, to promote sustainable economic development in underdeveloped regions. According to the mentioned study published by the Brazilian Senate [Reference 6] (page 3):

*“Large hydro power plants offer opportunities to implement policies for social inclusion and sustainable development in underdeveloped and poor regions. The Analysis of the GIP (Gross Internal Product) and HDI (Human Development Index) before and after the implementation of hydro power projects shows significant improvement in the quality of life of the surrounding population”*

Therefore the project activity is in line with the two objectives of the CDM, to promote GHG mitigation and the sustainable development of the Host Country.

#### References used for this response

- Reference 1: CDM Validation and Verification Standard (Version 02.0), Annex 4, EB 65, 2012. Available at: [http://cdm.unfccc.int/Reference/Standards/accr\\_stan02.pdf](http://cdm.unfccc.int/Reference/Standards/accr_stan02.pdf).
- Reference 2: CDM Executive Board Report 22, Annex 3, *“Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios”* (version 02). Available at: [http://cdm.unfccc.int/CDMNews/issues/issues/I\\_H0T1WTXPU59MY8LT0CLCGGHICY1JYKM/viewnewsitem.html](http://cdm.unfccc.int/CDMNews/issues/issues/I_H0T1WTXPU59MY8LT0CLCGGHICY1JYKM/viewnewsitem.html).
- Reference 3: BNDES letter to clarify promotional financing conditions for hydro power and other renewable energies, file “2012\_02\_17 Carta\_BNDES\_AIE\_DEENE\_63\_2012.pdf”.
- Reference 4: World Bank Discussion Paper No. 420, *“Financing of Private Hydro power Projects”*, July 2000; Section 8, Page 65, 2<sup>nd</sup> paragraph. Available at: <http://www.chrishead.co.uk/pdfs/3-Financing-of-Private-HydropowerProjects.pdf>.
- Reference 5: UNFCCC 2009 Decision 2/CMP.5. *“Further Guidance relating to the clean development mechanism”*. Available at: <http://unfccc.int/resource/docs/2009/cmp5/eng/21a01.pdf#page=4>.
- Reference 6: Bulletin No 16, 2012 of the Legislative “Sustainable Energy for all”, available from [http://www.senado.gov.br/senado/conleg/Boletim\\_do\\_Legislativo/16\\_EdundoMontavao\\_IvanDutraFaria-Energia\\_sustentavel\\_para\\_todos.pdf](http://www.senado.gov.br/senado/conleg/Boletim_do_Legislativo/16_EdundoMontavao_IvanDutraFaria-Energia_sustentavel_para_todos.pdf).

Additional references about hydro power as GHG mitigation policy:

- 1) The Governmental Research Company EPE declared that the establishment of incentives for investments in hydroelectricity, biomass and other complementary sources will be, if elected, a priority of the second government as proposed by President Lula. Potential Emission Reductions from the Jirau

HPP are clearly referenced. (Ambiente Brasil, 29 August 2006, available at: <http://noticias.ambientebrasil.com.br/clipping/2006/08/29/26519-tolmasquim-descarta-risco-de-crise-energetica-ate-2015.html>).

- 2) The mixed Commission of Brazilian Senate and Parliament, which was founded on 13 March 2007, released a conclusive report which reiterates that swift implementation of run-of-river hydro power plants is important to satisfy electricity demand without establishment of further fossil fuelled generation. According to the report, the GHG mitigation potential of the Jirau HPP was discussed between 28 and 30 of August 2007 as referenced in the final report of the commission. It is interesting to mention that the report also mentions that the development of run-of-river reservoirs are important to avoid possible methane emissions, which shows that GHG mitigation was fully taken into account. ("Mixed Commission of Brazilian Senate and Parliament, Final Report, national Congress", Brasília, June 2008. Available at: <http://www.senado.gov.br/atividade/materia/getPDF.asp?t=56862>).
- 3) Brazil's National Energy Plan 2030 as launched in December 2007 defines the development of Brazil's hydro power potential as fundamental for a clean expansion. The report shows that for each 20% less in hydro power developments, emissions would grow by 86 Mio tCO<sub>2</sub>e p.a. The report also discusses the issue of GHG emissions from reservoirs, but concludes that these can be avoided by building run-of-river hydro power plants with small reservoir surface that do not alter the river flow. Furthermore, the report identifies that such hydro power projects are eligible to the CDM, which provides a financial incentive to their implementation. (Brazilian Ministry of Mines and Energy (Ministério de Minas e Energia) "National Energy Plan 2030 – 3 – Hydroelectric Generation" (Plano Nacional de Energia 2030 – 3 Geração Hidrelétrica), available at: [http://www.epe.gov.br/PNE/20080512\\_3.pdf](http://www.epe.gov.br/PNE/20080512_3.pdf), published in 2007).

#### 7. Assessment of such responses:

- a) The PP has provided full clarification on the difference between loan conditions offered to Wind and Hydro power projects in terms of Basic Spread and Loan Payback period.
- b) The PP has explained and the TL agrees that, according to the definition of E- policies in EB22 Annex 3, the E- policies must give comparative advantage to less emissions-intensive technologies over more emissions-intensive technologies. No reference to the underlying intention is made in the definition.

This CL has been closed out.

#### 8. References to resulting changes in the PDD or supporting annexes:

No change has been made

1. Grade / Ref:	CL 18	2. Date:	18/08/2012	3. Status:	Closed (23/08/2012)
4. Requirement:	Guidelines for Project Design Document (CDM-PDD), version 01.0, EB 66, Annex 8, page 6, section A.3 (a)				
5. Nature of the Issue Raised:	Project participants are requested to provide information about the age and average lifetime of the equipment based on manufacturer's specifications and industry standards.				
6. Nature of responses provided by the project participants:					

Additional information has been included in section A.3 of the revised PDD.

As the project activity comprises the installation of 50 new bulb turbines, the age of equipment could be considered as zero years.

In addition, according to the “Tool to determine the remaining lifetime of equipment” (Version 01), Annex 15, EB 50, the default technical lifetime for water-cooled electric generators is 30 years, while the technical lifetime for turbines is 150.000 operating hours, which is equivalent to an operational lifetime of 30 years at a load factor of 57%, compatible with the maximum load factor of the Jirau HPP of 60.8%. As the bulb turbines are integrated electromechanical units, the overall operational lifetime of 30 years according to the default values defined is applicable. This is in line with the concession and depreciation period.

#### 7. Assessment of such responses:

The revised PDD has been assessed by the validation team. Although the project participants have used the “Tool to determine the remaining lifetime of equipment” (version 01), which is more suitable for already existing equipment, the use of default values as per option (c) of the referred tool to justify the lifetime of the power generation equipment is acceptable. Moreover, the validation team was able to confirm during the site visit that the project participants are installing new power generation equipment (bulb turbines and generators) at the project activity location.

This CL was closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

Section A.3 of the PDD has been revised in order to include additional information about the age and average lifetime of the power generation equipments to be installed at the project activity and the information provided is in line with the “Tool to determine the remaining lifetime of equipment” (version 01).

<b>1. Grade / Ref:</b>	CL 19	<b>2. Date:</b>	04/09/2012	<b>3. Status:</b>	Closed (06/09/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraph 106				
<b>5. Nature of the Issue Raised:</b>	The PP considers the homologation of the rights to concession as the “real action” of the project activity. Please justify why an earlier date, such as the auction, or a later date, such as the effective entering into force of the EPC construction contract would not represent “real action” and therefore adequate project starting dates. Please clarify the main differences between these events which allow defining that the homologation is the adequate project starting date.				
<b>6. Nature of responses provided by the project participants:</b>	The <b>homologation and adjudication</b> which occurred on 22 July 2008 (Reference 1) is the date the PP was effectively declared winner of the auction and this official act was necessary and sufficient to award the PP with the rights and obligations to the concession, which was necessary to start effective steps for implementation of the project activity at the Ilha do Padre. Before the homologation, PP did not have any right and the result of the auction, his proposal to develop the project at the Ilha do Padre, which was revealed after the auction, as well as his formal habilitation, which also took place after the auction on 20 June 2008 (Reference 2), were questioned by third parties. In fact PP had to defend his proposal and actively promote habilitation and homologation. Therefore the <b>homologation and adjudication</b> declared the PP unquestionable winner of the auction and awarded him with the rights and obligations to the concession. On the following day, 23 July 2008, when the homologation and adjudication was published in the Brazilian Gazette (Reference 3), and therefore as early as legally				

possible, PP immediately submitted the request for installation license (Reference 4), which was granted on 14 November 2008. The importance of the homologation to initiate the development of the project activity with the request for installation license was announced by the PP in a press interview of 22 July 2008 (Reference 5), which demonstrates that this date was the basis of his investment decision. Therefore it is clear that real action for the implementation of the project activity could only be taken and has been taken on the basis of the **homologation and adjudication**.

In addition, this step also implies significant obligations for the winner as briefly outlined on the basis of the applicable clauses of the Auction Notice (Reference 6):

- ☐ According to clause 4.2.11.1: The regulator's (ANEEL and CCEE) expenses with the auction process need to be refunded within 5 days after the adjudication.
- ☐ According to clause 12.3, after 30 days following Homologation and Adjudication, the winner needs to deliver a set of documents defined by the clause.
- ☐ According to clause 4.2.15.2: The winner needs to deposit the performance guarantee of a total of 650.0000.000 BRL within 15 days after the delivery of the documents requested by clause 12.3 above. The performance guarantee is only fully released after the plant is operational.
- ☐ According to clause 12.7.2: The official granting of the concession by presidential decree implies the unconditional obligation by the winner to sign the Concession Contract.
- ☐ According to clause 13.2, the winner is obliged to sign the PPAs at the price defined in the homologation.

In conclusion homologation and adjudication shows that the PPs proposition to develop the project activity at Ilha do Padre is in compliance with the regulatory rules and that ANEEL would not have proceeded with the process if this was not the case, as clearly expressed by ANEEL's director (Reference 7). In comparison to that, the auction date itself is still a very preliminary date as it does not imply any entitlement and as the PP did not have time to discuss his proposal to build the project activity at the Ilha do Padre with the regulators, not did the regulator have opportunity to indicate acceptability of the proposition. Press material from 19 June 2008 (Reference 8), the day before ESBR achieved **habilitation (Reference 2)**, also shows that it was possible that the auction would be cancelled or that ESBRs could be disqualified due to the proposition to change the project design. Therefore the homologation and adjudication in fact can be seen as a first and preliminary acceptance of the PPs proposition to develop the project activity at the Ilha do Padre. Immediately after this preliminary acceptance was granted, the installation license was requested (reference 4) and the request was duly processed by IBAMA to issue the Preliminary installation License for the projects construction site (Reference 9).

In addition to that, the homologation and adjudication implies important commitments and responsibilities which imply immediate expenditures, the depositing of a considerable guarantee and the mandatory signature of the concession contract and a 30 year long ACR Power Purchase Agreement according to the terms defined by the homologation.

All these facts show the importance and the relevance of the date of homologation and adjudication as effective project starting date.

Now when it comes to later possibilities to define the project starting date, the installation license and construction start on 14 November 2008 obviously represents "the effective construction start", but given that the installation license was requested immediately after the homologation as well as the strong commitments implied by this legal act, it is appropriate to consider the homologation as starting point of real action and commitments to effectively pursue the implementation of the

project activity. Furthermore it is conservative to consider this “earliest date” as the effective project starting date, while the construction start on 14 November 2008 would rather classify as the “latest possible date”.

#### References:

Reference 1 : ANEEL, 2008\_07\_22 Note on homologation and adjudication (“Aviso de adjudicação e homologação”) available at: [http://www.aneel.gov.br/aplicacoes/editais\\_geracao/documentos/052008-Aviso%20de%20Homologa%C3%A7%C3%A3o%20e%20Adjudica%C3%A7%C3%A3o%20n%20%2005-2008%2018-7.pdf](http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Aviso%20de%20Homologa%C3%A7%C3%A3o%20e%20Adjudica%C3%A7%C3%A3o%20n%20%2005-2008%2018-7.pdf)

Reference 2 : ANEEL, 2008\_06\_20 ANEEL, *Report on Analysis of the Documentation for Inscription and habilitation, File 08\_06\_20 ANEEL Relatorio Habilitação*, available from [http://www.aneel.gov.br/aplicacoes/editais\\_geracao/documentos/Relatorio%20Habilita%C3%A7%C3%A3o-UHE%20Jirau\\_16-6%20\(sem%20gabriel\).pdf](http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/Relatorio%20Habilita%C3%A7%C3%A3o-UHE%20Jirau_16-6%20(sem%20gabriel).pdf)

Reference 3: FOB\_2008\_07\_23 “Federal Official Gazette of Brazil”, page. 405. *Section 3. Of 23/07/2008*, available from <http://www.jusbrasil.com.br/diarios/707633/dou-secao-3-23-07-2008-pg-405>

Reference 4: request for Installation license

Reference 5: Globo, 2008\_07\_22 Globo Interview: ESBR President explains that he was waiting for homologation to request installation license, File “2008\_07\_22 GLOBO ESBR to request license this week”, available from <http://oglobo.globo.com/economia/energia-sustentavel-vai-pedir-licenciamento-de-jirau-ainda-nesta-semana-3608092>

Reference 6: ANEEL, 2008: Auction Notice 05/2008, Process nº. 48500.000175/2008-78, file “2008\_05\_12 Edital Leilão Jirau”, also available from: [http://www.aneel.gov.br/aplicacoes/editais\\_geracao/documentos/052008-Edital%20\\_10-4\\_%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf](http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/052008-Edital%20_10-4_%20PARA%20PUBLICAR%20-%20revisado%20Helvio%2011-04%20as%2012h28.pdf).

Reference 7: Folha, 2008\_07\_22b: *ANEEL confirms SUEZ'victory in the Jirau auction*, available from <http://www1.folha.uol.com.br/folha/dinheiro/ult91u424935.shtml>

Reference 8: Folha, 2008\_06\_19: *Lula interferes in process about Jirau, but dispute might go to justice*, available from <http://www1.folha.uol.com.br/folha/dinheiro/ult91u413939.shtml>

Reference 9: IBAMA Installation License 563, 2008\_11\_14: Environmental installation permit for the construction site as issued by IBAMA on 14 November 2008, file “Ofício IBAMA 361-2011 - aprovação 50 máquinas - 26.04.2011 (original).pdf”.

#### 7. Assessment of such responses:

The PP has satisfactorily explained the reasons for choosing the homologation of the rights to concession as the earliest real action of the project activity. The CL has been closed.

#### 8. References to resulting changes in the PDD or supporting annexes:

No change to the documents has been made.

<b>1. Grade / Ref:</b>	CL 20	<b>2. Date:</b>	17/09/2012	<b>3. Status:</b>	Closed (17/09/2012)
<b>4. Requirement:</b>	VVS v02.0 paragraphs 34 to 36				
<b>5. Nature of the Issue Raised:</b>	Please clarify if it is adequate to state, in the PP's response to the comments received from the global stakeholder consultation, that the project's turbines are "fish-friendly", as the turbines are still likely to result in fish mortalities.				
<b>6. Nature of responses provided by the project participants:</b>	With regards to the Fish Friendliness, there is no contradiction because " <i>mortality associated to the passage through turbines can be relatively low in low head plants with Kaplan or Bulb turbines.</i> ". Therefore the condition for low fish mortality is the conjunction between a low head and the use of Kaplan or Bulb turbines. In fact the Bulb turbine is a special type of Kaplan Turbine with the main difference that the Bulb turbine is installed in horizontal manner, which allows to use lower heads, while Kaplan turbines are used with low and medium heads. As a consequence Bulb turbines always offer lower mortality, while Kaplan only show this benefit in conjunction with low heads. Therefore there is no contradiction, but PPs decided to rephrase the reference to fish friendliness from the response to GSC to avoid further questions and doubts about this technical matter.				
<b>7. Assessment of such responses:</b>	The PP has satisfactorily clarified the issue raised.				
<b>8. References to resulting changes in the PDD or supporting annexes:</b>	The PP response to the GSC has been changed.				