VALIDATION REPORT

IBIRAMA SMALL HYDROPOWER PLANT - A BRENNAND CDM PROJECT ACTIVITY IN BRAZIL

REPORT NO. 2009-9238

REVISION NO. 01

VALIDATION REPORT

Date of first issue: 1 March 2010	Project No.: PRJC-177869-2009-CCS-BRA
Approved by: Ole A. Flagstad	Organisational unit: DNV Climate Change and Environmental Services
Client: Ibirama Energética S.A.	Client ref.: Ricardo Rêgo

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Project Name: Ibirama Small Hydropower Plant - a Brennand CDM Project Activity
Country: Brazil
Methodology: ACM0002
Version: 12.1.0
GHG reducing Measure/Technology: Hydro Power
ER estimate: 28 363 tCO_2e per year (average)

Size

☒ Large Scale ☐ Small Scale

Validation Phases:

☐ Desk Review ☐ Follow up interviews
☒ Resolution of outstanding issues

Validation Status

☐ Corrective Actions Requested ☐ Clarifications Requested
☒ Full Approval and submission for registration ☐ Rejected

In summary, it is DNV's opinion that the "Ibirama Small Hydropower Plant - a Brennand CDM Project Activity" in Brazil, as described in the PDD of 19 September 2011 (version 07), meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0002, version 12.1.0. Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.

Report No.: 2009-9238	Subject Group: Environment
Report title: "Ibirama Small Hydropower Plant - a Brennand CDM Project Activity" in Brazil	
Work carried out by: Fabiana Philipi, David Freire da Costa, Němeček Lumír, Felipe Lacerda Antunes	
Work verified by: Andrea Leiroz	
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Indexing terms

Key words: Climate Change, Kyoto Protocol, Validation, Clean Development Mechanism

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Abbreviations

ANEEL	Brazilian Electricity Regulatory Agency
BM	Building Margin
BRL	Brazilian currency (Real – R$)
CAR	Corrective Action Request
CCEE	Electric Power Commercialization Chamber
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification request
CM	Combined Margin
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CONAMA	National Environmental Council
DNA	Designated National Authority
DNV	DNV Climate Change Services AS
DOE	Designated Operational Entity
EIA	Environmental Impact Assessment
ESCELSA	Eletric Centre Espírito Santo / *Espírito Santo Centrais Elétricas*
FATMA	Environmental Foundation for the Santa Catarina State / *Fundação do Meio Ambiente de Santa Catarina*
FSR	Feasibility Study Report
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IBGE	Brazilian Institute of Geography and Statistics / *Instituto Brasileiro de Geografia e Estatística*
INMET	National Meteorology Institute / *Instituto Nacional de Metereologia*
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Return Rate
LoA	Letter of Approval
MP	Monitoring Plan
NCV	Net CaloricValue
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
ONS	Electric System National Operator
PCH	Small Hydropower Plant
PDD	Project Design Document
PPA	Power Purchase Agreement
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Ibirama Small Hydropower Plant - a Brennand CDM Project Activity" in Brazil. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The host Party is Brazil. No participating Annex I Party is yet identified. Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.

The project correctly applies the baseline and monitoring methodology ACM0002, version 12.1.0 "Consolidated methodology for grid-connected electricity generation from renewable sources".

The project involves installation and operation of a small hydropower composed by 3 hydro turbines in the south of Brazil, state of Santa Catarina, municipality of Ibirama, constituting a total generation capacity of 21.00 MW. The project's electricity generation will be delivered to the Brazilian National Interconnected System and greenhouse gas (GHG) emissions are expected to be reduced. In the absence of the project activity all the energy would be supplied by other plants of the interconnected grid. The project is expected to promote renewable energy, thus contributing to the sustainable development objectives of the Brazilian Government. As a result, the project results in reductions of CO_2 emissions that are real, measurable and gives long-term benefits to the mitigation of climate change.

It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be on the average 28 363 tCO_2e per year over the selected 7 year renewable crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan provides for the monitoring of the project's emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design and it is DNV's opinion that the project participants shall be able to implement the monitoring plan, considering underlying assumptions.

In summary, it is DNV's opinion that the project activity "Ibirama Small Hydropower Plant - a Brennand CDM Project Activity" in Brazil, as described in the PDD, version 07 dated 19 September 2011, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0002, version 12.1.0. Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the

confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.

Rio de Janeiro and Oslo, 28 October 2011

Felipe Lacerda Antunes
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DNV Rio de Janeiro, Brazil

Ole A._Flagstad
Approver,
DNV Climate Change Services AS

2 INTRODUCTION

Ibirama Energética S.A. has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the Ibirama Small Hydropower Plant - a Brennand CDM Project Activity located in the city of Ibirama, state of Santa Catarina, Brazil (hereafter called "the project"). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

2.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD) /1/. The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology ACM0002 (version 12.1.0) /18/. The validation was based on the recommendations in the Validation and Verification Manual (version 01.2) /17/.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk review of the project design documentation

The following tables list the documentation that was reviewed during the validation.

3.1.1 Documentation provided by the project participants

/1/ Ecopart Assessoria em Negócios Empresariais Ltda.: Project Design Document for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity, dated 13 August 2009 (version 01), 27 July 2011 (version 06) and 19 September 2011 (version 07).

/2/ Ecopart Assessoria em Negócios Empresariais Ltda.: Financial spreadsheets named "SHPP Ibirama (25 years).xls", "Ke - CAPM.xls", "Ke_CAPM_2006.xlsx", "Ibirama_Cash flow-sens analysis 1_v.3.xls", "Ibirama_Cash flow-sens analysis_v.4.xls", "Ibirama_Cash flow-sens analysis_v.5.xls", "Ibirama_Cash flow-sens analysis_v.6.xls" and "Ibirama_Cash flow-sens analysis_v.6.1.xls".

/3/ Ecopart Assessoria em Negócios Empresariais Ltda.: CERs spreadsheets "Ibirama_Estimated CERs v.1" and "Ibirama_Estimated CERs_v.5_2011.06.20.xls"

/4/ Ibirama Energética S.A.: The construction contract of Ibirama Small Hydropower Plant - a Brennand CDM Project Activity (EPC Contract) signed between the project owner and Bucagrans – Construtora de Obras Ltda. on 1 June 2009.

/5/ Ibirama Energética S.A.: Turbines purchase contract of Ibirama Small Hydropower Plant - a Brennand CDM Project Activity between Ibirama Energética S.A. and Voith Siemens Hydro Power Generation Ltda. dated 31 August 2007.

/6/ Ibirama Energética S.A.: Copies from letters and notification from the Brazilian Post Office that stakeholders received the letters communicating the start of the project.

/7/ Ibirama Energética S.A.: Prior CDM Consideration: Minute of Meeting held by Empreendimentos Energéticos e Participações Ltda. – 10 April 2006.

/8/ Ecopart Assessoria em Negócios Empresariais Ltda.: Evidence of communication between Ecopart and Empreendimentos Energéticos e Participações Ltda. regarding the project activity 6 February and 21 November 2007.

/9/ Ecopart Assessoria em Negócios Empresariais Ltda.: Evidence that on 23 January 2008, Empreendimentos Energéticos e Participações Ltda. sent back the questionnaire to Ecopart.

/10/ Ecopart Assessoria em Negócios Empresariais Ltda.: Evidence that on 17 June 2008 Ecopart sent for the first time letters for stakeholders' comments.

/11/ Ecopart Assessoria em Negócios Empresariais Ltda.: Evidence that on 24 April 2009 Ecopart sent for the second time letters for stakeholders' comments.

/12/ Ibirama Energética S.A.: CDM consultation contract between Ecopart and Ibirama Energética S/A of 28 May 2008.

/13/ Ibirama Energética S.A.: Photograpic report of Ibirama Small Hydro construction of 11/12 September 2009 by Brennand Group.

/14/ Ibirama Energética S.A.: Environmental Impact Assessment:
- Basic Project by Engevix Engenharia Ltda., final report, volume 1 issued in November 2001;
- Simplified Environmental Report by ECSA Engenharia Sócio-Ambiental S/C Ltda. of March 2002;
- Basic Environmetal Project by Soma Soluções em Meio Ambiente of March 2009.

/15/ Empreendimentos Energéticos e Participações Ltda.: "Minutes of Meeting" considering CDM as a decisive factor to proceed with the project implementation issued on 10 April 2006.

3.1.2 Letters of approval

/16/ CIMGC (DNA of Brazil): *Letter of approval* dated DD MMM 2011

3.1.3 Methodologies, tools and other guidance by the CDM Executive Board

/17/ CDM Executive Board: "*Validation and Verification Manual*", version 01.2, adopted at annex 1 of EB55: http://cdm.unfccc.int/Reference/Manuals/accr_man01.pdf.

/18/ CDM Executive Board: ACM0002 (version 12.1.0) Approved methodology, "*Consolidated methodology for grid-connected electricity generation from renewable sources*".

/19/ CDM Executive Board: "*Tool for the demonstration and assessment of additionality"*, version 5.2, annex 10 of EB39.

/20/ CDM Executive Board: "*Tool to calculate the emission factor for an electricity system"*, version 02.2.0, annex 12 of EB61.

/21/ CDM Executive Board: "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*", version 2, annex 11 of EB41.

/22/ CDM Executive Board: *"General Guidelines to SSC CDM methodologies"*, version 16, annex 9 of EB59.

/23/ CDM Executive Board: *"Guidelines on demonstration and assessment of prior consideration of the CDM"*, version 04.0, annex 13 of EB62.

3.1.4 Documentation used by DNV to validate / cross-check the information provided by the project participants

/24/ GE Motors: generator technical specification, July 2009.

/25/ Voith Siemens: turbine technical specification, October 2007.

/26/ FATMA: Environmental Licenses issued by Santa Catarina Environmental Agency:
- Preliminary License granted on 8 August 2002 (LAP N°218/02);
- Installation License granted on 18 February 2009 (LAI N°0013/09);
- Operation License granted on 17 December 2010 (LAO N°086/2010).

/27/ Brazilian National Interconnected System (Grid) available at: http://www.ons.org.br/conheca_sistema/mapas_sin.aspx#
Brazilian DNA defining the Brazilian Grid as unique: Resolution nr. 8 issued on 26 May 2008.

/28/ DNV internal control of commercial proposals: spreadsheet "Controle de Propostas 2008.xls" and "Controle de Propostas 2009.xls".

/29/ ANEEL - Resolution nr. 852, dated 20 March 2007, transferring the Ibirama Hydro power ownership from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda.

/30/ ANEEL - National Agency of Electric Energy - Resolution nr. 652, dated 9 December 2003, that defines the characteristics of a small hydropower.

/31/ ANEEL - Brazilian Electricity Regulatory Agency ,available at: www.aneel.gov.br

/32/ ANEEL - Resolution nr. 24, issued on 27 January 2004, Art 7, stating the installed capacity and that the project concession is valid for 30 years from the issuance date of the resolution.

/33/ ANEEL - Resolution nr. 65 dated 25 May 2004, stating the Ibirama small hydro power assured energy delivered to grid.

/34/ ANEEL - Ordinance nr. 1 368, issued on 27 June 2006, authorizing 13.92 MW to be commercialized in the energy auctions for new projects.

/35/ CCEE (Câmara de Comercialização de Energia Elétrica – Eletric Power Comercialization Chamber, Brazilian entity that controls the electricity market), available at: www.ccee.gov.br

/36/ CCEE – 1st electricity auction of renewable source (Ibirama small hydro power sold energy of 13 MW, 134.98 BRL/MWh) on 18 June 2007: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=3cb3f87495bd1110VgnVCM1000005e01010aRCRD

/37/ ESCELSA (Eletric Centre Espírito Santo / *Espírito Santo Centrais Elétricas*): PPA (CCEAR Nº 5358/2007 - 27614S) signed between ESCELSA and Ibirama Energética S.A., dated 6 December 2007.

/38/ EPE (Empresa de Pesquisa Energética – Energy Research Company, Brazilain entity in charged of planning the Brazilian electric sector).

/39/ ONS - Electric System National Operator, available at: www.ons.org.br .

/40/ MME – Mines and Energy Ministry, available at: www.mme.gov.br .

/41/ Santa Catarina Environmental Agency (FATMA) available at: www.fatma.sc.gov.br.

/42/ Brazilian DNA: Emission factor calculus, available at: http://www.mct.gov.br/index.php/content/view/4016.html.

/43/ Brazilian Federal Law 10 637, that determines companies taxation regarding social contribution, 31 December 2002.

/44/ Brazilian Federal Law 10 833, that determines companies taxation regarding social welfare, health and social assitence, 29 December 2003.

/45/ Brazilian Federal Law 8 981, that determines companies taxation regarding social contribution over net profit, 20 January 1995.

/46/ Brazilian Federal Law 9 430, that determines companies taxation regarding revenue, 27 December 1996.

/47/ INMET (National Meteorology Institute / *Instituto Nacional de Metereologia*), climatology studies available at: http://www.inmet.gov.br.

/48/ IBGE (Brazilian Institute of Geography and Statistics / *Instituto Brasileiro de Geografia e Estatística*): Brazilian States areas, available at: www.ibge.gov.br.

/49/ ANEEL: small hydro power projects with the Construction License issued, available at: http://www.aneel.gov.br/area.cfm?idArea=37&idPerfil=2.

/50/ UNFCCC: Project Activities. Validation. United Nations Framework Convention on Climate Change, available at: http://cdm.unfccc.int/index.html.

/51/ ELETROBRÁS: Programs and setorial funds. Proinfa. Contracted projects, available at: www.eletrobras.com/elb/data/Pages/LUMISABB61D26PTBRIE.htm.

/52/ ESPARTA, A. R. J. (2008). Greenhouse gases emission reductions in the Brazilian power sector: Kyoto Protocol's clean development mechanism experience and a future pathway (in a free translation from the Portuguese *Redução de emissões de gases de efeito estufa no setor elétrico brasileiro: a experiência do Mecanismo de Desenvolvimento Limpo do Protocolo de Quioto e uma visão futura*). PhD thesis – Energy Graduation Program. University of Sao Paulo, March 2008.

/53/ CCEE - Chamber of Electric Energy Commercialization: Official information regarding electric energy auctions is publicly available and can be obtained at the website: <http://www.ccee.org.br/>.

/54/ ANEEL: Public information available in the ANEEL's report "Acompanhamento das Pequenas Centrais Hidrelétricas com Licença de Instalação" (Supervision of Activities from Small Hydro power Plants with Instalation License), dated 17 November 2010. The referred document confirms the contruction starting date as 1 July 2009. Available at: http://webcache.googleusercontent.com/search?hl=pt-BR&rlz=&q=cache:ui0XTxR2wRMJ:http://www.aneel.gov.br/area.cfm?idArea=37+%22Acompanhamento+das+Pequenas+Centrais+Hidrel%C3%A9tricas+com+Licen%C3%A7a+de+Instala%C3%A7%C3%A3o%22&ct=clnk.

/55/ Financing contracts signed between Ibirama Energética S/A and Itaú Bank on 19 October 2009 (BRL 84 MM) and plus its amendment signed on 4 January 2011 (BRL 36 MM), totalizing BRL 120 MM, which is considered the actual investment of the project.

/56/ VOITH SIEMENS: Design Data Sheet of Hydraulic Machine (hydro turbine) for Ibirama project, rev. A, issued on 1 October 2007, by Voith Siemens (turbine manufacturer). The document provides technical details of each hydro turbine, including the rated output capacity (nominal installed capacity) of 7 250 kW or 7.25 MW per turbine.

/57/ ONS (Operador Nacional do Sistema Elétrico / *Electric System National Operator*). Available at: http://www.ons.org.br/home/index.aspx

Grid Procedures (*"Procedimentos de Rede"*): Sub-module 12.3 – Maintenance of the measurement system for billing/invoicing (*"Manutenção do sistema de medição para fatura"*), Annex 1, revision 1.1, issued on 16 September 2010, available at: http://extranet.ons.org.br/operacao/prdocme.nsf/principalPRedeweb?openframeset or http://extranet.ons.org.br/operacao/prdocme.nsf/videntificadorlogico/F415A39592589C78832577A6004F6099/$file/Submodulo%2012.3_Rev_1.1.pdf?openelement

/58/ R. W. Bacon and J. E. Besant Jones (1998). Estimating construction costs and schedules – Experience with power generation projects in developing countries. Energy Policy, vol. 26, no 4, pp 317-333.

/59/ ANEEL: Resolution nr. 1924, dated 25 May 2009, transferring the Ibirama hydropower ownership from José Jaime Monteiro Brennand and Ricardo C. de Almeida Brennand Filho to Brennand Energia S. A.
Webpage assessed on 25 January 2011, available at:
http://www3.aneel.gov.br/netacgi/cobaia.exe?s4=1924&s5=&l=100&SECT1=IMAGE&SECT4=e&SECT6=HITOFF&SECT3=PLURON&SECT2=THESON&SECT5=BIBL01&d=BIBL&p=1&u=http://www3.aneel.gov.br/biblioteca\pesquisafa.htm&r=5&f=G

/60/ ANEEL: Generation Database, confirming that Ibirama hydro power plant belongs to Ibirama Energética S.A. Webpage assessed on 25 January 2011, available at:
http://www.aneel.gov.br/area.cfm?idArea=248.

/61/ ANEEL: Result of the energy auction published by ANEEL (Leilão N° 03/2007) issued on 7 August 2007, confirming the total purchased of 13MW-ave of Ibirama project.

/62/ Central Bank of Brazil: "IAS 38 Intangible Assets", issued in December 2006. The referred document confirms the maximum amortization period of 10 years. Webpage assessed on 26 January 2011, available at:
http://www.bcb.gov.br/nor/convergencia/IAS_38_Ativos_Intangiveis.pdf

/63/ Brazilian National Official Newspaper (Diário Oficial da União – D.O.U.): Balance sheet of Antonio Brennand small hydro power plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005.

/64/ ELETROBRÁS and Mines and Energy Ministry: "Diretrizes para estudos e projetos de Pequenas Centrais Hidrelétricas" (Guidelines for studies and projects for Small Hydro Power plants) published in January 2000 by Eletrobrás and the Mines and Energy Ministry. The report presents an estimated value of 5% of the total investment for annual O&M costs as reference for the feasibility/financial analysis of these types of projects in Brazil.

/65/ BNDES (Brazilian Development Bank): Annual Report 2005. Main operations approved - generation segment, page 59: *"In 2005, BNDES approved BRL 2.1 billion in financings to 29 projects for small hydroelectric power stations, in the ambit of Proinfa. Total investment is BRL 3 billion, and the generating installed capacity reaches additional 763 MW, distributed to 11 states of Brazil"*. As per the referred report, these numbers result in an investment per installed capacity of BRL 3 931 847.97 / MW for small hydro power plants (BRL 3bi / 763 MW). This information is available at:
http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/empresa/RelAnual/ra2005/ing/Rel-Anual.pdf

/66/ KPMG: "Investment in Brazil", 10th edition, issued in September 2008 by KPMG Tax Advisors - Assessores Tributários Ltda., a Brazilian member firm of the KPMG network of independent member firms affiliated with KPMG International, a Swiss cooperative. Document assessed by DNV on 8 June 2011 through the following link:
http://www.kpmg.com.br/publicacoes/livros_tecnicos/Investment_in_Brazil10_out08.pdf.

/67/ GEVISA S/A: Identification nameplate containing the generators' technical

specification, 17 July 2009.

/68/ Federal Revenue Service: The minimum period for amortization is 5 years. Available at: http://www.planalto.gov.br/ccivil_03/Leis/L4506.htm.

/69/ BNDES (Brazilian Development Bank): Long Term Bond Rate ("Taxa de Juros de Longo Prazo – TJLP"). Information available at: BNDES' website: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Ferramentas_e_Normas/Custos_Financeiros/Taxa_de_Juros_de_Longo_Prazo_TJLP/index.html.

/70/ Central Bank of Brazil (Banco Central do Brasil – BACEN): Information related to inflation targeting available at: http://www.bcb.gov.br/Pec/metas/TabelaMetaseResultados.pdf

/71/ BNDES (Brazilian Development Bank): History of the operational politics for hydroelectric generation (publication named "O papel do BNDES na expansão do setor elétrico nacional e o mecanismo de project finance"). Available at: http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/conhecimento/bnset/Set2901.pdf.

/72/ BNDES (Brazilian Development Bank): Financing rules for electric energy generation. Available at: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energia_eletrica_geracao.html.

/73/ ANEEL: Decree 6048 dated 27/02/2007 with the first energy auction for renewable alternative sources

3.2 Follow-up interviews with project stakeholders

On 3 November 2009, DNV performed a visit at Ibirama Energética S.A. office and interviewed project stakeholders in order to confirm selected information and to resolve issues identified in the document review. Fabiana Philipi and David Freire da Costa conducted the site visit. The major topics of the interviews and the project stakeholders are summarized in the table below.

Previously to the audit visit, a photograpic report of Ibirama Small Hydro construction of September 2009 was sent to DNV stating that the construction was still in the land excavation and planning phase. Therefore, since the project activity was not implemented in existing facilities or utilizing existing equipments (Validation and Verification Manual /17/ item 62) it is DNV's opinion that it is not necessary to visit the site where the project will be implemented.

	Date	Name	Organization	Topic
/74/	3 November 2009	Roberto Ferreira de Melo	Ibirama Energética S.A.	➢ The development of small hydro power project ➢ The approval status (incl. EIA approval, CDM project approval) ➢ Emission reduction monitoring plan ➢ Consulting process for stakeholder's comments ➢ Information of project construction ➢ Project management ➢ Investment risks
/75/	3 November 2009	Karen Nagai	Ecopart Assessoria em Negócios Empresariais Ltda.	➢ Baseline determination of the project ➢ Applicability of selected methodology ACM0002 ➢ Issues related to the additionality ➢ Common practice analysis ➢ Emission reductions calculation ➢ Emission reduction monitoring plan and project management

3.3 Resolution of outstanding issues

The objective of this phase of the validation was to resolve any outstanding issues which needed be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol is customised for the project. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of four tables. The different columns in these tables are described in the figure below. The completed validation protocol for the Ibirama Small Hydropower Plant - a Brennand CDM Project Activity in Brazil is enclosed in Appendix A to

this report, and relate to the project design as documented and described in the PDD, version 07 dated 19 September 2011.

The validation protocol enclosed in Appendix B to this report corresponds to earlier versions of the PDD.

A corrective action request (CAR) is raised if one of the following occurs:

(a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

(b) The CDM requirements have not been met;

(c) There is a risk that emission reductions cannot be monitored or calculated.

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

A forward action request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities		
Requirement	***Reference***	***Conclusion***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	*This is either acceptable based on evidence provided (**OK**) or a **corrective action request (CAR)** if a requirement is not met.*

Validation Protocol Table 2: Requirement Checklist				
Checklist question	***Reference***	***Means of verification (MoV)***	***Assessment by DNV***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD	*Gives reference to documents where the answer to the checklist question or item is found.*	*Means of verification (MoV) are **document review (DR)**, **interview (I)** or any other follow-up actions (e.g., on site visit and telephone or email interviews) and **cross-checking (CC)** with available information relating to projects or technologies similar to the proposed CDM project activity under validation.*	*The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.*	*OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A c**orrective action request (CAR)** is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. A **clarification request (CL)** is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A **forward action request (FAR)** during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.*

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Corrective action and/ or clarification requests	***Ref. to checklist question in table 2***	***Response by project participants***	***Validation conclusion***
*The **CARs** and/ or **CLs** raised in Table 2 are repeated here.*	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants to address the CARs and/or CLs.*	*The validation team's assessment and final conclusions of the CARs and/or CLs.*

Validation Protocol Table 4: Forward Action Requests		
Forward action request	***Ref. to checklist question in table 2***	***Response by project participants***
The FARs raised in Table 2 are repeated here.	*Reference to the checklist question number in Table 2 where the FAR is explained.*	*Response by project participants on how forward action request will be addressed prior to first verification.*

Figure 1: Validation protocol tables

3.4 Internal Quality Control

The validation report underwent a technical review performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation Team

				Type of involvement						
Role	***Last Name***	***First Name***	***Country***	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 1.2 competence	
Team leader (Validator)	Antunes	Felipe	Brazil	✓		✓	✓		✓	
Validator	Costa	David	Brazil	✓	✓	✓			✓	
Assessor under training	Philipi	Fabiana	Brazil	✓	✓	✓				
Sector Expert	Němeček	Lumír	Czech Republic	✓					✓	
Technical reviewer	Leiroz	Andrea	Brazil					✓	✓	

The qualification of each individual validation team member is detailed in Appendix C to this report.

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The validation findings relate to the project design as documented and described in the project design documentation of 19 September 2011 (version 07) /1/.

4.1 Participation requirements

The project participants are Ibirama Energética S.A. of Brazil and Ecopart Assessoria em Negócios Empresariais Ltda. of Brazil. The host Party Brazil meets all relevant participation requirements. There is no Annex I Party defined yet.

Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.

The project is expected to bring social (employment), and economic benefits, thus contributing to the sustainable development objectives of the Brazilian Government. The project's contribution to the sustainable development of the country shall be confirmed through the written Letter of Approval to be issued by the Brazilian DNA.

The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards Brazil.

4.2 Project design

The project involves installation and operation of a small hydro power composed by 3 hydro turbines in the south of Brazil, state of Santa Catarina, municipality of Ibirama, river Itajaí do Norte. The installed capacity of each turbine unit is 7.25 MW, constituting a total generation capacity of 21.75 MW /24/ /25/. However, according to the revised "General Guidelines to SSC CDM methodologies" (EB59, Annex 9) /22/, "the rated/installed capacity for renewable energy generating units that involve turbine-generator systems shall be based on the installed/rated capacity of the generator". Therefore, the installed capacity of the project activity was readjusted from 21.75 MW as per the sum of the turbines' nameplate capacities to 21 MW, as per the sum of the 3 generators of 7 MW each (7.780 MVA x 0.9 of power factor = 21 MW). Hence, it was confirmed by DNV that the total nominal installed capacity of 21 MW for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is based on the information available in the identification nameplate containing the generators' technical specification, dated 17 July 2009 /67/.

The turbines will be manufactured by Voith Siemens Hydro Power Generation Ltda., from Brazil/5/ /25/ /56/, and the technology is deemed to reflect current good practice in Brazil since the project activity uses Francis turbine, the most common type of hydro turbine.

The reservoir is 0.13 km^2 /26/ and the power density is 161.6 W/m^2. The project is named as a small hydropower, since according the Brazilian National Agency of Electric Energy (ANEEL) Resolution 652 /30/, a small hydro consists of a utility with an installed capacity

between 1 MW and 30 MW, and have a reservoir area smaller than 3 km². Due the short period of pondage in the reservoir (0.3 day at maximum volume of reservoir and 0.18 day at average volume of the dam), the Ibirama hydropower can be considered a run-of-river power plant.

The project's electricity generation will be delivered to the Brazilian National Interconnected System and greenhouse gas (GHG) emissions are expected to be reduced. In the absence of the project activity all the energy would be supplied by other plants of the interconnected grid. The project's system boundaries are clearly defined as the project power plant and the Brazilian National Interconnected Grid System, defined by ONS (Electric System National Operator) /39/.

The expected operational lifetime of the project activity is 23 years /32/ and the expected net electricity to be supplied to the grid is 121 939 MWh annually at the load factor of 66.29% /33/ /34/.

The project activity starting date is 31 August 2007 /5/, which is the date when turbines purchase contract of Ibirama Small Hydropower Plant - a Brennand CDM Project Activity between Ibirama Energética S.A. and Voith Siemens Hydro Power Generation Ltda. was signed /5/. The starte date is in accordance with the EB 41 meeting report, that determines the start date of a CDM project activity as the earliest date at which either the implementation or construction or real action of a project activity begins. A renewable crediting period of 7 years has been chosen for the project, starting on 1 July 2012 or on the date of registration of the CDM project activity, whichever is later, which is deemed to be reasonable. The emission reductions are estimated to be 198 541 tCO_2e over the first seven-year crediting period, 28 363 tCO_2e per year /3/.

DNV considers the project description of the project contained in the PDD to be complete and accurate. The PDD /1/ complies with the relevant forms and guidance for completing the PDD.

4.3 Application of selected baseline and monitoring methodology

The methodology ACM0002 (version 12.1.0) /18/ is applicable to this project activity since it is the implementation of a grid-connected renewable power generation project activity that installed a new 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 new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section of ACM0002 (version 12.1.0) /18/, is greater than 4 W/m^2 (total nominal installed capacity of 21 MW /56/ and reservoir of 0.13 km^2 /26/ resulting in a power density calculated as 161.6 W/m^2).

The project correctly applies the approved baseline methodology ACM0002 (version 12.1.0) /18/. The applied baseline methodology is justified as:

- It is confirmed that the project activity consists of a greenfield hydro power plant that displace electricity from the Brazilian National Interconnected Grid System /4/ /13/ /14/;
- The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section of ACM0002 (version 12.1.0), is greater than 4 W/m^2 (total nominal installed capacity of 21.0 MW and

reservoir area of 0.13 km^2 resulting in a power density calculated as 161.6 W/m^2) /26/ /56/.

- As confirmed during the site visit, there were no fossil fuel energy sources at the project site /74/ /75/.
- The project activity is not a biomass power plant /4/ /13/ /14/;
- The project boundary is defined as the site of the project activity and all power plants connected physically to the Brazilian National Interconnected Grid System to which the project is connected /27/.

The assessment of the project's compliance with the applicability criteria of ACM0002 (version 12.1.0) /18/ are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

4.4 Project boundary

The project boundary is clearly defined as the site of project activity and the system boundary is defined as the Brazilian National Interconnected System, to which the project is connected /27/. There are no significant transmission constraints between the power plants of the Brazilian National Interconnected System, nor with the proposed project.

Emission sources and gases included in the project boundary are:

	GHGs involved	***Description***
Baseline emissions	CO_2	Brazilian National Interconnected System.
Project emissions	N/A	Project emission is regarded as zero since power density of the power plant is greater than 10 W/m^2 (161.6 W/m^2) /26/ /56/.
Leakage	N/A	There are no leakages that need to be considered in applying this methodology.

The identified boundary and selected sources and gases are justified for the project activity. The validation of the project activity did not reveal other greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed project activity which are expected to contribute more than 1% of the overall expected average annual emission reduction, which are not addressed by ACM0002 (version 12.1.0) /18/.

4.5 Baseline identification

A) Baseline determination

Since the project is demonstrated to be additional, cf. Section 4.6, the baseline is in accordance with the approved methodology ACM0002 (version 12.1.0) /18/ that 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" /20/.

The combined margin (CM), consisting of the combination of operating margin (OM) and

build margin (BM) is calculated as per the procedures prescribed in the "*Tool to calculate the emission factor for an electricity system*" (version 02.2.0) /20/. The *ex-post* method was selected on OM and BM calculation based on the available data provided by the Brazilian DNA that will be updated yearly /27/.

The approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios /18/, and the identified baseline scenario most reasonably represents what would occur in the absence of the proposed CDM project activity.

All the assumption and data used by the project participants are listed in the PDD /1/ and/or supporting documents. All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD /1/. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable /4/ /13/ /14/ /27/. Relevant national and/or sectoral policies and circumstances are considered /30/ and listed in the PDD /1/.

4.6 Additionality

The additionality of the project has been established using the "*Tool for the demonstration and assessment of additionality"*, (version 5.2) /19/, approved by the CDM EB.

4.6.1 Evidence for prior CDM consideration and continuous actions to secure CDM status

Project start date

The project activity starting date is 31 August 2007 /5/, which is the date when turbines and generators purchase contract of Ibirama Small Hydropower Plant - a Brennand CDM Project Activity between Ibirama Energética S.A. and Voith Siemens Hydro Power Generation Ltda. was signed /5/. DNV confirms that this was the first financial commitment on the project activity, since the civil works contract was only issued on 1 June 2009 /4/. The starting date is in accordance with the EB 41 meeting report, that determines the start date of a CDM project activity as the earliest date at which either the implementation or construction or real action of a project activity begins.

Prior CDM consideration

The document that states the first CDM consideration is a Minute of Meeting held by Empreendimentos Energéticos e Participações Ltda., the major shareholder of Ibirama Energética S.A. on 10 April 2006 /7/. According the document, the meeting took place in order to discuss the the feasibility of Ibirama Small Hydro power. The conclusion was that the implementation of Ibirama small hydro power was feasible since the project would genarate electricity as an indepent producer of electricity and also that the project would perfectly fits the CDM Program requirements, generating carbon credits. The revenue from carbon creditis would help the project to mitigate the risks related to the energy price variation in the Brazilian market. Based on this the project proponent took the decision to invest in the project activity implementation on 10 April 2006 /15/.

DNV assessed that in May 2005 the PDD from Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project (ref.: 0530, that belongs to Brennand Group) was published for comments and that the validation report was issued in June 2006. Therefore, it is DNV opinion that by the time that the mentioned Board Meeting took place,

Brennand Group has suficient knowledge from the CDM mechanism to support the information stated in the Minutes of Meeting /15/, which is the first CDM consideration.

Efforts to secure CDM status

On the begining of 2007, the Brennand Group/Empreendimentos Energéticos e Participações Ltda. got in contact with Ecopart (the carbon consultancy firm) and on 6 February 2007 Ecopart asked Empreendimentos Energéticos e Participações Ltda. about preliminary information in order to prepare a commercial proposal /8/. The transfer of Ibirama Energética S/A (PCH Ibirama owner) from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda happened on 20 March 2007, according ANEEL - Brazilian Electricity Regulatory Agency - Resolution 852 /29/. The main equipment (three Francis turbines from Voith Siemens Hydro Power Generation Ltda.) was ordered on 31 August 2007 (earliest commitment with implementation or construction or real action of the project activity) /5/. On 21 November 2007, Ecopart sent to Empreendimentos Energéticos e Participações Ltda. a questionnaire in order to obtain information to the PDD production /8/, and the questionnaire was sent back answered on 23 January 2008 /9/. The PPA was signed on 6 December 2007 /37/. On February 2008, DNV sent Ecopart a proposal regarding Ibirama Small Hydro validation /28/. On 28 May 2008, the contract between Ecopart and Ibirama Energética S/A was signed /12/ and on 17 June 2008 Ecopart sent for the first time letters for stakeholders' comments /10/. Despite the fact the stakeholders consultancy started, by that time a DOE was not yet defined and on March 2009 DNV sent to Ecopart an updated validation proposal /28/. The installation license was granted on 18 February 2009 /26/. On 24 April 2009 Ecopart sent for the second time letters for stakeholders' comments /11/. The EPC contract was signed on 1 June 2009 /4/. On 17 September 2009 the PDD was made public for stakeholders consultation.

It is DNV's opinion that the proposed CDM project activity complies with the requirements of the latest version of the guidance on prior consideration of CDM /23/.

4.6.2 Identification of alternatives to the project activity:

Two alternatives to the project activity have been identified and discussed:

a) Scenario 1: Equivalent electricity service provided by the Brazilian National Interconnected System (Grid);

b) Scenario 2: The proposed project itself, but not undertaken as a CDM project activity.

It has been adequately demonstrated that alternative a) and b) are potential alternatives consistent with current laws and regulations established by the main entities related to the project activity, ONS (Chamber of Electric Energy Commercialization) /27/ /39/ /57/, ANEEL (Brazilian Electricity Regulatory Agency) /29/ - /34/ /49/, MME (Mines and Energy Ministry) /40/ and Santa Catarina Environmental Agency (FATMA) /26/ /41/ and thus the alternatives will be discussed at the next steps.
DNV considers the listed alternatives to be credible and complete.

4.6.3 Investment analysis

Choice of approach

As the proposed project generates financial and economic benefits other than CDM related income through the sales of electricity and also since the alternative to the project activity is

not a similar investment project, DNV considers that a benchmark analysis selected for conducting the investment analysis is appropriate.

Benchmark selection

The most suitable financial indicator for the project type identified is the IRR (Internal Rate of Return) and the benchmark considered in the PDD /1/ is the cost of equity (Ke) based on the Capital Asset Pricing Model (CAPM).

Regarding the benchmark applied, the SELIC rate was firstly considered as a suitable benchmark for this project. However, after some discussions (also based on requests for reviews from other projects listed at UNFCCC's website) and by applying our sectoral competence, it is DNV opinion that SELIC rate should not be used as benchmark for this project since SELIC is an appropriate benchmark for project IRR, but not for equity IRR, which is applied to the project activity. The IRR presented /2/ is compared to the Cost of Equity (Ke) calculated based on the Capital Asset Pricing Model (CAPM), which is considered an appropriate benchmark of the electric sector.

The rate which is charged for the equity component of a project was calculated through the following formula:

$$Ke = Rf + \beta \times Rm + Rc$$

Where:

- Ke: represents the rate of return for equity investments;
- Rf: represents for the risk free rate;
- B: represents the average sensitivity of comparable companies in that industry to movements in the underlying market;
- Rm: represents the market premium;
- Rc: represents the country risk premium.

The Capital Asset Pricing Model (CAPM) was calculated based on data and information from January 2006, year in which the decision to implement the project by the Boards happened. The table below provides the summary of the input paramenters used by the project participants to calculate the CAPM, which have been assessed and cross-checked by DNV /2/, as indicated in the "Source" column in the table below.

DESCRIPTION	VALUE	PARAMETER	SOURCE
Risk-Free Rate (Rf)	4.29%	10-year US Treasury Yield	Federal Reserve: http://www.federalreserve.gov/releases/h15/data/Business_day/H15_TCMNOM_Y10.txt
US expected inflation (π)	2.46%	10-year T.Notes minus 10-year TIPS	Federal Reserve: http://www.federalreserve.gov/econresdata/researchdata.htm
Risk-Free Rate real (Rfr)	1.78%	Rfr = [(1+Rf)/(1+π)-1]	Calculated
Equity Risk Premium (Rm)	6.47%	S&P500 vs 10-year T.Bond Yield	Damodaran website: http://pages.stern.nyu.edu/~adamodar/
Estimated Country Risk Premium (Rc)	8.07%	EMBI+Brazil	JP Morgan: http://www.cbonds.info/all/eng

			/index/index_detail/group_id/1/
Adjusted Industry Beta (β)	1.49	Average Beta US Power Companies re-levered to Brazilian leverage	Damodaran website: http://pages.stern.nyu.edu/~adamodar/
Cost of Equity – nominal USD (Ke)	22.03%	Ke = Rf + β x Rm + Rc	Calculated
Cost of Equity – real (Ke')	19.53%	Ke' = Rfr + β x Rm + Rc	Calculated

DNV confirmed that the assumptions taken and the values considered for the benchmark calculation are reasonable and acceptable.

Input parameters

The equity-IRR calculations were provided in a spreadsheet /2/ and verified by DNV. The financial analysis considered input values by the time when the decision to invest in the project activity was taken, in April 2006 /5/.

Cash flow:

The cash flow presented in the financial analysis spreadsheet /2/ includes loan repayment and loan interest and thus it calculates the equity IRR. The investment analysis has been performed for 29 years (from which 25 of operation). DNV considers this period adequate, since according to ANEEL resolution 24 /32/, the project concession is valid for 30 years from the issuance of the resolution on January 2004. Therefore, the period of 29 years also includes the project design/study and construction, from 2006 (investment decision) to 2034. Since the project started operations in the end of December 2010, the estimated project lifetime is 23 years and 1 month. When the decision for implementing the project was taken in 2006, the idea was starting operating in 2009, so the operation in the investment analysis is considered from 2009 to 2034.

The following financial analysis evidences related to the inputs parameters considered in the cash flow of the financial analysis spreadsheet were assessed and confirmed by DNV:

- Total investment: The costs related to the project investments were based on the project sponsor experience with the other three small hydropower plants in operation: Antonio Brennand, Indiavaí and Ombreiras (Registered CDM project activity "Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project", Ref.: 0530) /1/ and it was confirmed through the assessment of the Balance sheet of Antonio Brennand small hydropower plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005 /63/. The Balance sheet of Antonio Brennand small hydro power plant "Araputanga Centrais Elétricas S.A." presents the project investments as a sum of the static assets of BRL 64 945 082 plus the pre-operationl assets of BRL 13 358 368, resulting in a total of BRL 78 303 450, which refers to the referred small hydro power plant with an installed capacity of 21.96 MW, giving a relation of BRL 3 565 731/MW. In this regard, the investment per installed capacity for small hydro power plants was defined as BRL 3 931 848/MW according to the BNDES (Brazilian Development Bank) Annual Report 2005 /65/, while as per the project sponsor experience based on the balance sheet of Antonio Brennand small hydro power plant /63/, this investment per installed capacity has been set as BRL 3 565 731/MW, which is therefore considered

conservative and appropriate by DNV. Hence, by multiplying the investment per installed capacity as BRL 3 565 731/MW by the 21 MW, which was the installed capacity of the proposed project activity at the time of the investment decision taken by the project participant, this will result in the total investment of BRL 74 880 348, as described in the revised cash flow of the financial analysis spreadsheet /2/. The real costs for investing in the project activity are verified to be BRL 120 MM. This information has been confirmed and cross-checked by DNV through the assessment of the financing contracts signed between Ibirama Energética S/A and Itaú Bank on 19 October 2009 (BRL 84 MM) and plus its amendment signed on 4 January 2011 (BRL 36 MM), totalizing BRL 120 MM, which is considered the actual investment of the project /55/. Therefore, the total investment of BRL 74 880 348, as described in the revised cash flow of the financial analysis spreadsheet /2/ is more conservative than the real costs for investing in the project activity, which corresponds to BRL 120 MM /55/. From the total investment of BRL 120 MM, approximately 72.5% has been financied by Itaú Bank and approximately 27.5% of the total investment was sponsored by Ibirama Energética S.A. /55/. Hence, this approach is considered reasonable and acceptable by DNV;

- The cash flow of the financial analysis spreadsheet /2/ demonstrates the source for the use of the percentages (53.20% for civil works, 21.51% for national equipments, 1.19% for management, 6.69% for transmission system, 0.35% for land and 17.06% for pre-operational costs). Pre-operational costs consists of detailed design, implementation costs, expenses for hiring staff, expenses of financial operations, among other minor ones. The costs of financial transactions refer to the loan that the project owner needs to start the project without the financing agreement. These percentages were based on the balance sheet of Antonio Brennand small hydropower plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005 /63/ and used for estimating the construction costs based on the total investment of BRL 74 880 348 for Ibirama small hydropower plant, which were assessed by DNV and considered appropriate;
- Operational and Maintenance costs (O&M): The O&M costs contained in the revised cash flow of the financial analysis spreadsheet /2/ corresponds to 4.38% of total investment based on the project sponsor experience with other small hydro power plant. The evidence used for supporting the 4.38% is the balance sheet of Antonio Brennand small hydro power plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005 /63/, which was assessed by DNV and considered appropriate. In addition, the O&M value was compared to the estimative value of 5% suggested by the publication of the study named "Diretrizes para estudos e projetos de Pequenas Centrais Hidrelétricas" (Guidelines for studies and projects for Small Hydro Powerplants) published by Eletrobrás and the Brazilian Mines and Energy Ministry /64/. The referred publication presents an estimated value of 5% of the total investment for annual O&M costs as reference for the feasibility/financial analysis of these types of projects in Brazil. Therefore, as the adjusted O&M value of 4.38% used by the project participants in the cash flow of the financial analysis spreadsheet /2/ is lower than the 5% suggested by the study

published by Eletrobrás and the Brazilian Mines and Energy Ministry /64/, this approach is therefore considered conservative and appropriate by DNV;

- Energy tariff: The energy tariff that was considered for the investment analysis corresponds to BRL 114.07/MWh, which is based on the energy auction held on 16 December 2005 for new hydro power plant projects adjusted to the General Market Price Index (Índice Geral de Preços de Mercado - IGP-M) /53/. DNV confirms that this is the data that was available at the time of the investment decision on 10 April 2006 /15/. The energy tariff applied at the time of the project activity starting date, in the Energy Auction for Alternative Sources was 128.47 BRL/MWh,/61/ corrected by the inflation, but even with this tariff the IRR gets lower than the benchmark, as discussed in the sensitivity analysis. Besides, the Energy Auction for Alternative Sources is an initiative from the Brazilian government for the promotion of renewable energy projects. Only renewable energy projects can participate in the auction - small hydropower plants, cogeneration and wind projects /61/. Thus, non-fossil fuel projects participate in this auction and renewable energy projects can compete with each other (and not with modular fossil-fuel-fired power plants which generally are close to load centers and transmission lines and can be easily transferred to a new region where a better tariff is offered). As per the "Clarifications on the Consideration of National and/or Sectoral Policies and Circumstances in Baseline Scenarios (version 02)", this kind of auction can be considered as a type E- policy, where favourable conditions are given to promote sustainable energy after 2001 and it gives comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (in the case, a higher tariff for renewable energy projects). Besides, the first energy auction for alternative sources was regulated by Decree 6048 dated 27/02/2007 /73/ and, therefore, after 11 November 2001. Considering this, the type E- policy shall not be taken into account in developing the baseline scenario, i.e. the energy price influencing the economic situation of the project.
- Depreciation: The "depreciation" was applyed only for the project equipments (major costs). The basis for "depreciation" has been correctly calculated by considering the expenses related to "civil works", "national equipment", "environment" and "transmission system", accounting for BRL 60 948 353, which represents 81.39% of the total investments (BRL 74 880 348). The operation starting date was considered as 1 May 2009 /29/, the depreciation term of 30 years /32/ as well as the annual depreciation set as 3.33% /32/ have been confirmed by DNV. The remaining assets values were correctly discounted as fair values in the last year of operation;
- Amortization: The amortization was applyed only for the remaining non-project equipments in the "Inputs" workbook in the financial spreadsheet /2/, accounting for BRL 13 666 936, which represents 18.25% of the total investments (BRL 74 880 348). The amortization starting date was also considered as 1 May 2009 /29/, the amortization term of 5 years /68/ as well as the annual rate set as 20.0% /68/ have been confirmed by DNV. DNV considers this approach as correct. In addition, the document titled "IAS 38 Intangible Assets", issued in December 2006 by the Central Bank of Brazil, confirms the maximum amortization period of 10 years /62/;
- Financing: The loan value accounts for BRL 52 416 244, which represents 70% of the total investments (BRL 74 880 348). This percentage was based on the typical

BNDES level of participation in electric generation projects in Brazil /65/. The annual financial cost was calculated based on the TJLP (long term bond rate) of 10.25% based on the average of the latest 5 years (between 2001 and 2005) /69/, the spread of 2.80% based on the BNDES remuneration plus credit risk and the inflation targeting of 4.50% /70/, the term of 14 years /71/, the grace period of 0.5 year /72/ and the expected date of 1 May 2009 by project sponsor for disbursement;

- Project revenues: The installed capacity of 21 MW was confirmed and cross-checked through the assessment of documental evidences /26/ /32/ /67/. The assured capacity of 13.92 MW-ave and the annual output of 121 939 MWh were also confirmed by DNV /33/ /34/ and the energy price of BRL 114.00 based on the weighted average of the energy prices negotiated in the Brazilian energy auction destined to new hydro power plant projects in 2005 /53/;
- Taxes: Taxes are divided between taxes applied in the net income and in the energy sales. For the taxes applied in the net income, DNV was able to confirm the revenue base for social taxes (CSLL) of 12% and the social taxes of 9% [1.08% = 9% (social taxes) x 12% (revenue base for social taxes – CSLL)] /45/, the revenue base for income taxes of 8% and the income taxes of 25% /46/. The taxes applied in the energy sales of 3.65% was calculated based on the "Employees' Profit Participation Program" ("Programa de Integração Social – PIS") of 0.65% /43/ and the tax for social security financing ("Contribuição para o Financiamento da Seguridade Social – COFINS") of 3% /44/.

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Calculation and conclusion

The equity IRR calculations were provided in a spreadsheet /2/ and were assessed by DNV. The calculations were verified and found to be correct by DNV. The assumptions used in the calculations were deemed to be correct by DNV. The equity-IRR over 29 years /32/ without CDM revenues is 14.25% /2/, which confirms that the project in the absence of CDM benefits and compared to the benchmark of 19.53% /2/ is not financially attractive.

The inclusion of the CERs revenues resulted in an IRR of 15.76%, which is still lower than the benchmark of 19.53% (cost of equity) /2/

Sensitivity analysis

A sensitivity analysis was carried out varying the parameters contributing more than 20% to revenues or costs in order to check the robustness of the financial analysis. reasonable variations of the energy price, project load factor/energy assured, project costs and project investment were checked by calculating the variation necessary to reach the benchmark reach the benchmark and then discussing the likelihood for that to happen. None of the parameters in the sensitivity analysis are considered to have any significant positive correlation.

- Increase of the energy price: The price at which the IRR reaches the benchmark of 19.53% is at BRL 134.45/MWh, but the most likely price is BRL 114.07/MWh, which is based on the energy auction held on 16 December 2005 for new hydro power plant projects adjusted to the General Market Price Index (Índice Geral de Preços de Mercado - IGP-M) and it results in an IRR of 14.25%. The electricity sale price of

134.45 BRL/MWh is not a likely value to be achieved and this was justified through the following documental evidences:

  - As per the results of the energy auctions promoted by the government for the electricity supply for the period from 2008 to 2012 demonstrates that the highest energy price from hydro power projects was BRL 129.14/MWh for 2012 /52/ /53/; In addition, as per the energy auction for alternative energy sources only (for small-hydro as Ibirama project, wind and biomass), the average of electricity price was BRL 137.62/MWh; if only hydro power plants were considered, the result is approximately BRL 135/MWh. Therefore, DNV considers that the enegy tariff adopted in the feasibility study is adequated and conservative. The energy tariff applied at the time of the project activity starting date was 128.47 BRL/MWh, corrected by the inflation, but even with this tariff the IRR gets to 17.98%, therefore lower than the benchmark of 19.53%.

- Increase in the project plant load factor (PLF) / energy assured: Considering the total installed capacity of the project as 21 MW /24/ /25/, with a predicted power supply to the grid of 121 939 MWh/year /33/ and an expected load factor of 66.29% /34/, the IRR of the project is 14.25%. In order to achieve the benchmark of 19.53%, the electricity output should be increased from approximately 122 GWh per year (corresponding to a energy assured of 13.92 MW-ave /34/) to approximately 143.8 GWh per year, which represents an increase of approximately 18% in the energy assured. That would represent a PLF of 78.18% based on the total nominal installed capacity of 21 MW. However, this is not likely to occur since the installed capacity and energy assured of a power plant are not freely determined by project sponsors, but determined by ANEEL by considering at least 30 years of historical data regarding the project's river and other rivers, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned). For Ibirama project, the energy assured is established through ANEEL Ordinance # 1 368 /34/;
- Reduction in project costs (O&M): As the operation and maintenance costs were set by the project participants as corresponding to 4.38% of total investment, which is based on the project sponsor experience with the other three small hydropower plants in operation: Antonio Brennand, Indiavaí and Ombreiras (Registered CDM project activity "Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project", Ref.: 0530), the sensitivity analysis for O&M shows that in order to achieve the benchmark of 19.53%, the O&M costs would be necessary to be reduced from 4.38 to 1.28% of total investment, which represents a decrease of 71% of the estimated O&M costs. In addition, the O&M value was estimatived as 5% as suggested by the publication of the study named "Diretrizes para estudos e projetos de Pequenas Centrais Hidrelétricas" (Guidelines for studies and projects for Small Hydro Power plants) published by Eletrobrás and the Brazilian Mines and Energy Ministry /64/. Therefore DNV considers an O&M costs corresponding to 1.28% of the total investment as unrealistic and unlikely to occur;
- Reduction in project investments: To achieve the benchmark of 19.53%, the capital expenditure would have to be reduced from approximately 74.9 million BRL to around 62.1 million BRL, representing a reduction of 17% of the capital expenditure.

This is unrealistic and unlikely to occur, as the capital expenditure of 70 million BRL was based on turnkey EPC contracts for Ibirama project, in which costs are fixed and will not vary even if project's investments increase for an unexpected reason. In addition, the total investment of BRL 74 880 348, as described in the revised cash flow of the financial analysis spreadsheet /2/ is more conservative than the real costs for investing in the project activity, which corresponds to BRL 120 MM /55/. Therefore, a reduction in project investments is not possible.

The sensitivity analysis above shows that even with substantial variation of the key indicators, the IRR of the proposed project (14.25%) is lower than the benchmark (19.53%).

In conclusion, the investment analysis and sensitivity assessment have shown that the project activity is not financially attractive.

4.6.4 Common practice analysis:

The common practice analysis presented in PDD considers only small hydropower plants located in the same region of Ibirama project – Santa Catarina state. DNV has assessed that due its huge dimension, Brazil has different zones with considerably distinct climate conditions. Considering the rain regime, that has direct influence in a small hydro implementation, it is DNV's opinion that the Brazilian South Region has totally different characteristics compared with other Brazilian regions. Also, considering the Santa Catarina state extension (95 346.181 square kilometers /48/), it is DNV's opinion that it is reasonable to define the state as the common practice boundary, since there are considerably physical and climatological differences between Santa Catarina and the others Brazilian South Region states (Rio grande do Sul e Paraná) that can influence the implementation of small hydro power plants.

According to the Brazilian regulations /30/, small scale hydro power plants are defined as plants with an installed capacity within 1 MW and 30 MW. Therefore, no large scale hydro power plants (e.g. installed capacity over 30 MW) were considered. Furthermore, only plants with installed capacity 50% lower and 50% higher than Ibirama project were analyzed (i.e. between 10.5 and 31.5 MW). It is DNV's opinion that the range considered - plants with installed capacity 50% lower and higher than the project activity - is an adequate range to be adopted.

On 2003, the Brazilian Government decided to review the electricity market institutional framework. On 2004, two main institutions were set up: Energy Research Company (EPE) /38/ and Eletric Energy Commercialization Chamber (CCEE) /35/. Those changes organized the electrical market, creating rules to regulate it and changing completely the environment comparing with the scenario before 2004. Therefore it is DNV's opinion that the period considered in the PDD - projects that started operations from April 2004 to June 2009 (the most recent data available until the elaboration the PDD /1/) – is adequate.

There are nine small hydro powers that are located in Santa Catarina state, have installed capacity in between 10.5 and 31.5 MW and started operation after 2004 until 2009 (when PDD was published). From this group, four are CDM projects, and five received Proinfa's incentives – program established by the Brazilian government to incentive the generation of

energy from renewable sources /49/ /50/ /51/. Therefore the project activity is not common practice in Brazil.

4.7 Monitoring

The project applies the approved monitoring methodology ACM0002 (version 12.1.0), "*Consolidated methodology for grid-connected electricity generation from renewable sources*" /18/.

The project monitoring plan is in compliance with the monitoring methodology ACM0002 (version 12.1.0) /18/. The monitoring plan will give opportunity for real measurements of achieved emission reductions.

It is DNV's opinion, that the project participants are able to implement the monitoring plan.

4.7.1 Parameters determined ex-ante

The parameters are listed in the following table:

Data and Parameters	*Unit*	*Value applied*	*Source of data used*
Installed capacity of the hydro power plant before the implementation of the project activity (Cap_{BL})	W	0	ACM0002 (version 12.1.0)
Area of the reservoir measured in the surface of the water, before the implementation of the project activity (A_{BL})	m^2	0	ACM0002 (version 12.1.0)

4.7.2 Parameters monitored ex-post

The parameters monitored *ex-post* are the net electricity generation from the proposed project activity, the installed capacity of the hydro power plant after the implementation of the project activity, the area of the reservoir measured in the surface of the water after the implementation of the project activity, the operating margin, build margin and combined margin emission factors.

According to the "*Tool to calculate the emission factor for an electricity system*" /20/, the dispatch data analysis OM method was considered for the determination of the operating margin (OM). Thus, the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) will be monitored *ex-post*. The Brazilian grid emission factor has been recently published by the DNA of Brazil /42/. The calculations are based on electricity generation data provided by the National Operator System (ONS) for the electricity generated in the grid, as described in section 4.8.

The net electricity dispatched will be measured through electricity meters. There will be six energy meters involved in the project activity: 3 meters located in each generator, 1 meter (which writes up the total sum of generator meters) and 2 meters at the substation (principal and backup).

The net electricity generation will be monitored continuously and recorded on monthly basis. In addition, the electricity sales receipts will be provided for data quality control and cross check. In addition, this data will be verified against data provided in the Electric Energy Commercialization Chamber (*Câmara de Comercialização de Energia Elétrica – CCEE*) databank.

The meters are bi-directional and their accuracy is 0.2S, as determined in the standards of the ABNT - Brazilian Association of Technical Standards.

All meters will be calibrated every two years by a qualified third party.

Data will be archived for 2 years following the end of the last crediting period or 2 years after the last issuance of CER for this project activity, whichever occurs later. The project owner will be responsible for the overall monitoring and reporting and will keep all the data and material.

4.7.3 Management system and quality assurance

For the monitoring plan contained in the PDD /1/:

- The authority and responsibility of overall project management have been described.
- Procedures to deal with erroneous measurements have been established.
- Procedures for the registration, monitoring, measurement and reporting of the parameters in the monitoring plan have been identified.
- Procedures for maintenance of the monitoring equipments and installations and the calibration frequency have been established.
- Procedures for day-to-day record handling, collection and archiving have been identified.
- The measurements accuracy was addressed for the various parameters.
- Procedures for identification of training for the monitoring personnel have been addressed.
- Procedures for emergencies regarding data storage, back-up, replacement of monitoring equipments, record handling, collection and archiving have been identified.
- Procedures for review of reported results/data and for corrective actions in order to provide more accurate future monitoring and reporting have been established.

The monitoring of sustainable indicators is not required by the methodology ACM0002 (version 12.1.0) /18/ or by the DNA of Brazil.

Responsibilities and authorities for project management, monitoring and reporting activities, measurement, training and reporting techniques and QA/QC procedures are being defined and will be implemented until the date of commencement of the project activity/first verification.

In addition, the monitoring of parameters will be carried out electronically on a fully automated system, and all the monitoring data will be backed up on a daily basis to 2 different sites and be kept for the full crediting period, plus two years.

Operational procedures will be implemented in order to assure adequate operation and monitoring.

Brennand Group (the company witch Empreendimentos Energéticos e Participações Ltda. and Ibirama Energética S.A. are part) has three other small hydropowers plants registered as CDM projects (Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project, CDM 0530). Thus, they have experience regarding implementation and monitoring of hidroelectric projects.

The application of the monitoring methodology is transparent and DNV considers the project participants able to implement the monitoring plan.

4.8 Algorithms and/or formulae used to determine emission reductions

The emission reductions ER_y by the project activity during the crediting period are the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

1) Baseline emissions: baseline emissions (BE_y in tCO_2) are the product of the grid emission factor (EF_y in tCO_2/MWh) times the net electricity supplied by the project activity to the grid ($EG_{facility,y}$ in MWh).

2) Project emissions: There are no emissions from the project as the proposed project is a renewable hydro energy project with power density (PD = 161.5 W/m^2) /26/ /56/ greater than 10 W/m².

3) Leakage: No leakage has to be considered for the proposed project activity.

Baseline Emissions

The baseline emission factor for the project will be determined *ex-post* as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM) according to the "*Tool to calculate the emission factor for an electricity system*" (version 02.2.0) /20/.

The Brazilian grid emission factor has been recently published by the DNA of Brazil /42/. For estimation purposes, the calculations are based on electricity generation data provided by the National Operator System (ONS) for the electricity generated in the grid in the years of 2006 – 2008. This is the most recent information available at the start of the validation i.e. 17 September 2009.

The system boundary for the grid electricity system affected by the project is defined as the system of the Brazilian grid (SIN).

It has been calculated as the weighted average (w_{OM} = 0.5; w_{BM} = 0.5) of the operating margin and the build margin emission factors.

Dispatch data analysis OM was chosen by the Brazilian DNA. The average OM for the period 2006 – 2008 is calculated to be 0.3636 tCO_2/MWh.

The average BM for the period 2006 – 2008 is calculated as 0.1016 tCO_2e/MWh, resulting in a combined margin emission factor of 0.2326 tCO_2e/MWh.

The quantity of net electricity generation supplied by the project plant/unit to the grid is estimated to be $EG_{facility,y}$ = 121 939 MWh (estimated energy dispatched to the grid based on the ANEEL Resolution /33/).

Thus, Baseline Emissions (BE_y) = 121 939 * 0.2326 = 28 363 tCO_2e.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-post* estimation of emission reduction conservatively calculated to be 28 363 tCO_2e per year for the selected crediting period.

All assumptions and data used by the project participants are listed in the PDD /1/ and/or supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD /1/. All values used in the PDD /1/ are considered reasonable in the context of the proposed CDM project activity. The baseline methodology ACM0002 (version 12.1.0) /18/ has been applied correctly to calculate project emissions, baseline emissions,

leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD /1/.

4.9 Environmental Impacts

An Environmental Impact Assessment (EIA) /14/ has been conducted in order to obtain the Preliminary License and Installation License issued by the state environmental entity FATMA, Preliminary License LAP N°218/02 of 8 August 2002 and Installation License LAI N°0013/09 of 18 February 2009 /26/. The potential environmental impacts have been sufficiently identified. No significant environmental impacts are expected from the project activity.

Therefore, it was confirmed by DNV that the implementation of the project activity is in accordance to the requirements of the environmental legislation in the host country.

4.10 Comments by Local Stakeholders

Project developer has conducted a stakeholder consultation locally, following the Brazilian DNA Resolution # 7. The following entities were directly invited for comments by letter:

- City Hall of Ibirama;
- Municipal Assembly of Ibirama;
- Environmental Agency of Ibirama;
- Communitarian Association;
- Environmental Agency of Santa Catarina;
- State Attorney for the Public Interest of Santa Catarina State;
- Federal Attorney;
- Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento e Meio Ambiente (Brazilian Forum of NGOs and Social Movements for the Development and Environment).

DNV has verified that all entities are in accordance with the Brazilian DNA determination. Copies from letters and notification from the Brazilian Post Office that stakeholders received the letters communicating the start of the project were made available to DNV /6/.

DNV considers the local stakeholder consultation carried out adequately.

4.11 Comments by Parties, Stakeholders and NGOs

The PDD, version 01 dated 13 August 2009 /1/ was made publicly available on the CDM website website (http://cdm.unfccc.int/Projects/Validation/DB/W0UC12CWVHPX1C7L62L28CJQUM110V/view.html) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from the 17 September 2009 to the 16 October 2009.

No comments were received.

APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory requirements for Clean Development Mechanism (CDM) project activities

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	No participating Annex I Party is yet identified.
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	Prior to the submission of the validation report to the CDM Executive

Requirement	Reference	Conclusion
		Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	The DNA of Brazil is the Inter-ministerial Commission on Global Climate Change (CIMGC – Comissão Interministerial de Mudança Global do Clima).
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	Brazil has ratified the United Nations Framework

Requirement	Reference	Conclusion
		Convention on Climate Change (UNFCCC) on February 28th, 1994, and the Kyoto Protocol on August 23rd, 2002.
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	No participating Annex I Party is yet identified.
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	No participating Annex I Party is yet identified.
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
About small-scale project activities		
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK
13. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK

Requirement	Reference	Conclusion
14. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK
About stakeholder involvement		
15. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK
Other		
17. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
18. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
19. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
20. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

Table 2 Requirements checklist

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity					
A.1 Title of the project activity (VVM para 55-57)					
A.1.1 Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included.		OK
A.1.2 Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☒ Yes		OK
A.2 Description of the project activity (VVM para 58-64)					
A.2.1 How was the design of the project assessed?	/1/	DR	*What type is the project?* ☐ Project in existing facility or utilizing existing equipment(s) ☐ Project is either a large scale project or a small scale project with emission reductions exceeding 15 000 tCO_2e per year. In this case, a site visit must be performed. ☐ Project is a bundled small scale project, with each project in the bundle with emission reductions not exceeding 15,000 tCO_2e per year. In such case the number of physical site visits may be based on sampling, if the sampling size is appropriately justified through statistical analysis. ☐ The project is an individual small scale project activity with emission reductions not exceeding 15 000 tCO_2e per year. In		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			this case, DOE may not conduct a physical site visit as appropriate. ☒ Greenfield project *How was the design of the project assessed?* ☐ Physical site inspection ☒ Reviewing available designs and feasibility studies		
A.2.2 If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/	DR	Previously to the audit visit, a photograpic report of Ibirama Small Hydro construction of September 2009 was sent to DNV stating that the construction was still in the land excavation and planning phase.		OK
A.2.3 If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year), justify the sampling through a statistical analysis:	/1/	DR	Not applicable.		OK
A.2.4 Is 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?	/1/ /24/ /25/ /26/ /30/ /67/	DR	Yes. The project involves installation and operation of a small hydropower composed by 3 hydro turbines in the south of Brazil, state of Santa Catarina, municipality of Ibirama, river Itajaí do Norte. The installed capacity of each turbine unit is 7.25 MW, constituting a total generation capacity of 21.75 MW. However, according to the revised "General Guidelines to SSC CDM methodologies" (EB59, Annex 9), "the rated/installed capacity for renewable energy generating units that involve turbine-generator systems shall be based on the installed/rated capacity of the generator". Therefore, the installed capacity of the project activity was readjusted from 21.75 MW as per the sum of the turbines' nameplate capacities to 21 MW, as per		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			the sum of the 3 generators of 7 MW each (7.780 MVA x 0.9 of Power Factor = 21 MW). Hence, it was confirmed by DNV that the total nominal installed capacity of 21.0 MW for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is based on the information available in the identification nameplate containing the generators' technical specification, 17 July 2009. The reservoir is 0.13 km^2 and the power density 161.6 W/m^2. The project is named as a small hydropower, since according the Brazilian National Agency of Electric Energy (ANEEL) Resolution, a small hydro consists of a utility with an installed capacity between 1 MW and 30 MW, and have a reservoir area smaller than 3 km^2. Due the short period of pondage in the reservoir (0.3 day at maximum volume of reservoir and 0.18 day at average volume of the dam), the Ibirama hydropower can be considered a run-of-river power plant.		
A.2.5 Does the project activity involve alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR	No, the project activity is a Greenfield project.		OK
A.2.6 Does the project design engineering reflect current good practices?	/1/ /5/ /25/ /56/	DR	Yes. The turbines will be manufactured by Voith Siemens Hydro Power Generation Ltda., from Brazil, and the technology is deemed to reflect current good practice in Brazil since the project activity uses Francis turbine, the most common type of hydro turbine.		OK
A.2.7 Would the technology result in a significantly better performance than any commonly used technologies in the host country? Is any transfer of technology from any Annex-	/1/	DR	The project activity uses Francis turbine, the most common type of hydro turbine, that are produced in Brazil.		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
I Party involved?					
A.3 Participation requirements (VVM para 51-54, 125-127)					
A.3.1 Do all participating Parties fulfil the participation requirements as follows:	/1/	DR			OK
	Brazil (host)				
a) Party has ratified the Kyoto Protocol	☒ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
b) Party has designated a Designated National Authority	☒ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
c) The assigned amount has been determined	☒ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
A.3.2 Do the letters of approval meet the following requirements?	/1/	DR	Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.		
	Brazil (host)				
a) LoA confirms that Party has ratified the Kyoto Protocol	☐ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
b) LoA confirms that participation is voluntary	☐ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
c) The LoA confirms that the project contributes to the sustainable development of the host country?	☐ Yes ☐ No		NA NA		
d) The LoA refers to the precise project activity title in the PDD	☐ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
e) The LoA is unconditional with respect to (a) to (d) above	☐ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
f) The LoA is issued by the respective Party's DNA	☐ Yes ☐ No		☐ Yes ☐ No ☐ Yes ☐ No		
g) The LoA was received directly by the DNA or the PP	☐ DNA ☐ PP		☐ DNA ☐ PP ☐ DNA ☐ PP		
h) In case of doubt regarding the authenticity of the letter of approval, describe how it was verified that the letter of approval is authentic					

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A.3.3 Have all private/public project participants been authorized by an involved Party?	/1/	DR	Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.		
A.4 Technical description of the project activity (VVM para 58-64)					
A.4.1 Is the project's location clearly defined?	/1/	DR	The Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is located in the city of Ibirama, state of Santa Catarina, Brazil The geographical coordinates are: 27° 02' South and 49° 33' West.		OK
A.5 Public funding of the project activity					
A.5.1 In case public funding from Parties included in Annex I is used for the project activity, have these Parties provided an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?	/1/	DR	The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards Brazil.		OK
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVM para 65-76)					
B.1.1 Does the project apply an approved methodology and the correct and valid version thereof?	/1/	DR	The proposed project activity applies the approved consolidated baseline methodology ACM0002 Version 12.1.0 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.1.2 If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/1/	DR	The "Tool to calculate the emission factor for an electricity system" version 02.2.0 for the grid emission factor calculations		OK
B.2 Applicability of methodology (and tools) (VVM para 65-76)					
B.2.1 How was it validated that project complies with the following applicability criteria: "The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro 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"?	/1/	DR	It is confirmed that the project activity consists of a hydro power plant that displace electricity from the Brazilian National Interconnected Grid System.		OK
B.2.2 How was it validated that project complies with the following applicability criteria: "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"?	/1/	DR	The project activity is a greenfield power plant.		OK
B.2.3 How was it validated that project complies with the following applicability criteria: "In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and	/1/ /26/ /56/	DR	The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section of ACM0002 (version 12.1.0), is greater than 4 W/m^2 (total nominal installed capacity of 21.0 MW and reservoir of 0.13 km^2 resulting in a power density calculated as 161.6 W/m^2).		OK

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	the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2"?					
B.2.4	How was it validated that project complies with the following applicability criteria: "The methodology is not applicable to the following: • 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 fuels at the site; • Biomass fired power plants; • Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2"?	/1/ /26/ /56/	DR	As confirmed during the site visit, there was no fossil fuel energy sources at the project site. The project activity is an hydropower plant with a new reservoir with 161.6 W/m^2 power density.		OK
	B.2.5 How was it validated that project complies with the following applicability criteria: "In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance"?	/1/	DR	The project activity is a greenfield power plant.		OK
	B.2.6 Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/	DR	Yes. The selected baseline is in accordance with the approved methodology ACM0002 (version 12.1.0) /18/. Hence, the baseline scenario is that an equivalent amount of electricity would, in the absence of the project activity, would have been		OK

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			generated by the operation of grid-connected thermal power plants and by the addition of new generation sources as the provider for the same electricity generation as the proposed project.		
B.3 Project boundary (VVM para 78-80)					
B.3.1 What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/ /27/	DR	The project boundary is clearly defined as the site of project activity and the system boundary is defined as the Brazilian National Interconnected Grid System, to which the project is connected. There are no significant transmission constraints between the power plants of the Brazilian National Interconnected System, nor with the proposed project.		OK
B.3.2 Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/	DR	Baseline emissions: CO_2 emissions from fossil fuel based electricity generation of SIC grid. No project emissions sources were identified, as per the applied methodology. No leakage sources were identified, as per the applied methodology.		OK
B.3.3 Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR	No, the project activity does not involve other emissions sources.		OK
B.4 Baseline scenario determination (VVM para 81-88, 105-107)					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete?	/1/	DR	The baseline scenarios identified are i) electricity generated by the Brazilian National Interconnected Grid System (current practice) and ii) the project activity implemented without CDM benefits. This is in line with ACM0002.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4.2 How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR	The other baseline scenario was eliminated applying investment analysis.		OK
B.4.3 What is the baseline scenario?	/1/	DR	As the project activity is the installation of a new grid-connected renewable power plant/unit, 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".		OK
B.4.4 Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/	DR	Yes, the baseline scenario is in line with ACM0002 requirements.		OK
B.4.5 Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Yes, baseline scenario corresponds to ACM0002 prescriptions.		OK
B.4.6 Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	Yes.		OK
B.4.7 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Yes, baseline scenario is compatible to all available data and literatures and sources are referenced.		OK
• Is the baseline determination adequately documented in the PDD? • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable	/1/	DR	The baseline determination is adequately documented in the PDD and in line with ACM0002 requirements.		OK

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• Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity					
B.5 Additionality determination (VVM para 94-121)					
B.5.1 What approach/tool does the project use to assess additionality? Is this in line with the methodology?	/1/ /19/	DR	The project proponent applies the "Tool for the demonstration and assessment of additionality".		OK
B.5.2 Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR	Yes.		OK
B.5.3 Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	Yes, see further investment analysis.		OK
B.5.4 What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/	DR	The project additionality is based in investment analysis.		OK
Prior consideration of CDM (VVM para 98-103)					
B.5.5 What is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/1/ /5/ /7/ /8/ /15/	DR	The project activity start date is 31 August 2007, which is the date when turbines purchase contract of Ibirama Small Hydropower Plant - a Brennand CDM Project Activity between Ibirama Energética S.A. and Voith Siemens Hydro Power Generation Ltda. was signed. The document that states the first CDM consideration is a Minute of Meeting held by Empreendimentos Energéticos e Participações Ltda., the major shareholder of Ibirama Energética S.A. on 10 April 2006. According the document, the meeting took place in order to discuss the the feasibility of Ibirama Small Hydropower. The conclusion was that the implementation of Small Hydropower Ibirama		OK

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			was feasible since the project would genarate electricity as a indepent producer of electricity and also that the project would perfectly fits the CDM Program requirements, generating carbon credits. The revenue from carbon creditis would help the project to mitigate the risks related to the energy price variation in the Brazilian market. . In addition, the PDD states that, since Brennand Group (the company witch Empreendimentos Energéticos e Participações Ltda. is part) has three other small hydropowers plants registered as CDM projects (Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project, CDM 0530), project participant has a previous knowledge of CDM mechanism (PDD published for global stakeholder consultation on May 2005) and believed that the project would be registered in the UNFCCC, considering this previous experience to take the decision to invest in Ibirama Small Hydropower. DNV assessed that in May 2005 the PDD from Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project (ref.: 0530, that belongs to Brennand Group) was published for comments and that the validation report was issued in June 2006. Therefore, it is DNV opinion that by the time that the mentioned Board Meeting took place, Brennand Group has suficient knowledge from the CDM mechanism to support the information stated in the Minutes of Meeting, which is the first CDM consideration.		

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			On the begining of 2007, the Brennand Group/Empreendimentos Energéticos e Participações Ltda. got in contact with Ecopart (the carbon consultancy firm) and on 6 February 2007 Ecopart asked Empreendimentos Energéticos e Participações Ltda. about preliminary information in order to prepare a commercial proposal.		
B.5.6 If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status?	/1/	DR	Not applicable.		OK
Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
B.5.7 What initiatives where taken by the project participants from the starting date of the project activity to the start of validation in parallel with the physical implementation of the project activity?	/1/ /8/ /9/ /10/ /11/ /12/ /28/	DR	On 21 November 2007, Ecopart sent Empreendimentos Energéticos e Participações Ltda. a questionnaire in order to obtain information to the PDD production, and the questionnaire was sent back answered on 23 January 2008. On February 2008, DNV sent Ecopart a proposal regarding Ibirama Small Hydro validation. On 28 May 2008, the contract between Ecopart and Ibirama Energética S/A was signed and on 17 June 2008 Ecopart sent for the first time letters for stakeholders' comments. Despite the fact the stakeholders consultancy started, by that time a DOE wasn't yet defined and on March 2009 DNV sent to Ecopart an updated validation proposal. On 24 April 2009 Ecopart sent for the second time letters for stakeholders' comments.		OK

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B.5.8 When did the construction of the project activity start?	/1/ /4/	DR	The EPC contract was signed on 1 June 2009.		OK
B.5.9 When was the project commissioned?	/1/	DR	The project was not commissioned yet.		OK
B.5.10 Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/	DR	It is DNV opinion that continuos actions were taken in order to secure CDM status and that the proposed CDM project activity complies with the requirements of the latest version of the guidance on prior consideration of CDM.		OK
Investment analysis (VVM para 108-114)					
B.5.11 Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/	DR	Yes, the project activity generates revenue apart from CDM, and this is reflected in the PDD.		OK
B.5.12 Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	No, the alternative to the project activity does not involve investment, and this is reflected in the PDD.		OK
B.5.13 Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	The choice of benchmark analysis is correct.		OK
B.5.14 Is the benchmark/discount rate the latest available at the time of decision?	/1/ /2/	DR	<u>Benchmark:</u> Regarding the benchmark applied, the SELIC rate was firstly considered as a suitable benchmark for this project. However, after some discussions (also based on requests for reviews from other projects listed at UNFCCC's website) and by applying our sectoral competence, it is DNV opinion that SELIC rate should not be used as benchmark for this project since SELIC is a Brazilian short-term risk free interest rate and short term interest rates depends on very specific and temporal issues. Therefore, it is not appropriate to be used as benchmark for long term projects. The IRR presented is compared to		OK

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			the Cost of Equity (Ke) calculated based on the Capital Asset Pricing Model (CAPM), which is considered an appropriate benchmark of the electric sector. The rate which is charged for the equity component of a project was calculated through the following formula: Ke = Rf + β x Rm + Rc Where: - Ke: represents the rate of return for equity investments; - Rf: represents for the risk free rate; - B: represents the average sensitivity of comparable companies in that industry to movements in the underlying market; - Rm: represents the market premium; - Rc: represents the country risk premium. The Capital Asset Pricing Model (CAPM) was calculated based on data and information from January 2006, year in which the decision to implement the project by the Boards happened. The table below provides the summary of the input paramenters used by the project participants to calculate the CAPM, which have been assessed and cross-checked by DNV,		
B.5.15 What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/	DR	The financial indicator is IRR on equity basis, after tax.		OK
B.5.16 Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered	/1/	DR	Yes.		OK

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to have zero value?					
B.5.17 Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/ /29/ /32/	DR	Yes. The "depreciation" was applyed only for the project equipments (major costs). The basis for "depreciation" has been correctly calculated by considering the expenses related to "civil works", "national equipment", "environment" and "transmission system", accounting for BRL 60 948 353, which represents 81.39% of the total investments (BRL 74 880 348). The operation starting date was considered as 1 May 2009, the depreciation term of 30 years as well as the annual depreciation set as 3.33% have been confirmed by DNV.		OK
B.5.18 Is the time period of the investment analysis and operating time of the project realistic? Has salvage value been taken into account? Is working capital returned in the last year of operation?	/1/ /32/	DR	Yes. The investment analysis has been performed for 30 years (5 years of investment and 25 of operation). DNV considers this period adequate, since according to ANEEL resolution nr. 24 the project concession is valid for 30 years from the issuance of the resolution on January 2004. Therefore, the period of 30 years also includes the project design/study and construction, from 2004 to 2034.		OK
B.5.19 When a feasibility study report or similar approved by the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?	/1/	DR	NA		OK
B.5.20 How was the amount of output (e.g. sales of electricity) assessed?	/1/ /34/	DR	☐ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity		OK

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			for implementation approval ☐ The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) ☒ Other approach. The installed capacity and energy assured of a power plant are established by ANEEL, considering at least 30 years of historical data regarding the project's river and other rivers, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned). For Ibirama project, the energy assured is established through ANEEL Ordinance # 1 368.		
B.5.21 How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision?	/1/ /52/ /53/	DR	☒ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☒ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The price at which the IRR reaches the benchmark of 19.53% is at BRL 135.45/MWh, but the most likely price is BRL 114.07/MWh, which is based on the energy auction held on 16 December 2005 for new hydropower plant projects adjusted to the General Market Price Index (Índice Geral de Preços de Mercado - IGP-M) and it results in an IRR of 14.25%. The electricity sale price of 135.45 BRL/MWh is not a likely value to be achieved and this was justified through the following documental evidences: As per the results of the energy auctions		OK

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			promoted by the government for the electricity supply for the period from 2008 to 2012 demonstrates that the highest energy price from hydropower projects was BRL 129.14/MWh for 2012. In addition, as per the energy auction for alternative energy sources only (for small-hydro as Ibirama project, wind and biomass), the average of electricity price was BRL 137.62/MWh; if only hydropower plants were considered, the result is approximately BRL 135/MWh.Therefore, DNV considers that the enegy tariff adopted in the feasibility study is adequated and conservative.		
B.5.22 How were the investment costs assessed? Were the data available and valid at the time of decision?	/1/ /2/ /55/ /63/ /65/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☒ Review of feasibility reports, public announcements, contracts and annual financial reports related to the project and the project participants The costs related to the project investments were based on the project sponsor experience with the other three small hydropower plants in operation: Antonio Brennand, Indiavaí and Ombreiras (Registered CDM project activity "Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project", Ref.: 0530) and it was confirmed through the assessment of the Balance sheet of Antonio Brennand small hydropower plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005. The Balance sheet of Antonio Brennand small hydropower plant "Araputanga Centrais Elétricas S.A." presents the		OK

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			project investments as a sum of the static assets of BRL 64 945 082 plus the pre-operationl assets of BRL 13 358 368, resulting in a total of BRL 78 303 450, which refers to the referred small hydropower plant with an installed capacity of 21.96 MW, giving a relation of BRL 3 565 731/MW. In this regard, the investment per installed capacity for small hydropower plants was defined as BRL 3 931 848/MW according to the BNDES (Brazilian Development Bank) Annual Report 2005, while as per the project sponsor experience based on the balance sheet of Antonio Brennand small hydropower plant, this investment per installed capacity has been set as BRL 3 565 731/MW, which is therefore considered conservative and appropriate by DNV. Hence, by multiplying the investment per installed capacity as BRL 3 565 731/MW by the 21 MW, which was the installed capacity of the proposed project activity at the time of the investment decision taken by the project participant, this will result in the total investment of BRL 74 880 348, as described in the revised cash flow of the financial analysis spreadsheet. The real costs for investing in the project activity are estimated in BRL 120 MM. This information has been confirmed and cross-checked by DNV through the assessment of the financing contracts signed between Ibirama Energética S/A and Itaú Bank on 19 October 2009 (BRL 84 MM) and plus its amendment signed on 4 January 2011 (BRL 36 MM), totalizing BRL 120 MM, which is considered the actual investment of the project.		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Therefore, the total investment of BRL 74 880 348, as described in the revised cash flow of the financial analysis spreadsheet is more conservative than the real costs for investing in the project activity, which corresponds to BRL 120 MM. From the total investment of BRL 120 MM, approximately 72.5% has been financied by Itaú Bank and approximately 27.5% of the total investment was sponsored by Ibirama Energética S.A.. Hence, this approach is considered reasonable and acceptable by DNV. The cash flow of the financial analysis spreadsheet demonstrates the source for the use of the percentages (53.20% for civil works, 21.51% for national equipments, 1.19% for management, 6.69% for transmission system, 0.35% for land and 17.06% for pre-operational). These porcentages were based on the balance sheet of Antonio Brennand small hydropower plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005 and used for estimating the construction costs based on the total investment of BRL 74 880 348 for Ibirama small hydropower plant, which were assessed by DNV and considered appropriate		
B.5.23 How were the O&M costs assessed? Were the data available and valid at the time of decision?	/1/ /2/ /63/ /64/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☒ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The O&M costs contained in the revised cash flow of the financial analysis spreadsheet		OK

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			corresponds to 4.38% of total investment based on the project sponsor experience with other small hydropower plant. The evidence used for supporting the 4.38% is the balance sheet of Antonio Brennand small hydropower plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005, which was assessed by DNV and considered appropriate. In addition, the O&M value was compared to the estimative value of 5% suggested by the publication of the study named "Diretrizes para estudos e projetos de Pequenas Centrais Hidrelétricas" (Guidelines for studies and projects for Small Hydro Powerplants) published by Eletrobrás and the Brazilian Mines and Energy Ministry. The referred publication presents an estimated value of 5% of the total investment for annual O&M costs as reference for the feasibility/financial analysis of these types of projects in Brazil. Therefore, as the adjusted O&M value of 4.38% used by the project participants in the cash flow of the financial analysis spreadsheet is lower than the 5% suggested by the study published by Eletrobrás and the Brazilian Mines and Energy Ministry, this approach is therefore considered conservative and appropriate by DNV.		
B.5.24 Describe the assessment of the other input parameters. Were the data available and valid at the time of decision?	/1/ /2/ /29/ /43/ /44/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☒ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants Amortization: The amortization was applyed only		OK

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	/45/ /46/ /62/ /65/ /68/ /69/ /70/ /71/ /72/		for the remaining non-project equipments in the "Inputs" workbook in the financial spreadsheet, accounting for BRL 13 666 936, which represents 18.25% of the total investments (BRL 74 880 348). The amortization starting date was also considered as 1 May 2009, the amortization term of 5 years as well as the annual rate set as 20.0% have been confirmed by DNV. DNV considers this approach as correct. In addition, the document titled "IAS 38 Intangible Assets", issued in December 2006 by the Central Bank of Brazil, confirms the maximum amortization period of 10 years; Financing: The financeable items value accounts for BRL 52 416 244, which represents 70% of the total investments (BRL 74 880 348). This porcentage was based on the typical BNDES level of participation in electric generation projects in Brazil. The annual financial cost was calculated based on the TJLP (long term bond rate) of 10.25% based on the average of the latest 5 years (between 2001 and 2005), the spread of 2.80% based on the BNDES remuneration plus credit risk and the inflation targeting of 4.50%, the term of 14 years, the grace period of 0.5 year and the expected date of 1 May 2009 by project sponsor for disbursement; Taxes: Taxes are divided between taxes applied in the net income and in the energy sales. For the taxes applied in the net income, DNV was able to confirm the revenue base for social taxes (CSLL) of 12% and the social taxes of 9% [1.08% = 9% (social taxes) x 12% (revenue base for social		

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			taxes – CSLL)], the revenue base for income taxes of 8% and the income taxes of 25%. The taxes applied in the energy sales of 3.65% was calculated based on the "Employees' Profit Participation Program" ("Programa de Integração Social – PIS") of 0.65% and the tax for social security financing ("Contribuição para o Financiamento da Seguridade Social – COFINS") of 3%.		
B.5.25 Was the financial calculation spreadsheet verified and found to be correct?	/1/ /2/ /32/	DR	Yes. The IRR calculations were provided in a spreadsheet and were assessed by DNV. The calculations were verified and found to be correct by DNV. The assumptions used in the calculations were deemed to be correct by DNV. The equity-IRR over 30 years without CDM revenues is 14.25%, which confirms that the project in the absence of CDM benefits and compared to the benchmark of 19.53% is not financially attractive.		OK
B.5.26 Sensitivity analysis: Have the key parameters contributing to more than 20% of the revenue/costs during operating or implementation been identified? Has possible correlation between the parameters been considered?	/1/	DR	Yes. A sensitivity analysis was carried out varying the parameters contributing more than 20% to revenues (energy price) or costs (operation costs and investments) in order to check the robustness of the financial analysis: energy price, project load factor/energy assured, project costs and project investment.		OK
B.5.27 Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/	DR	Yes. The described parameters were varied in two different steps, first a fixed 10% variation was applied, and then parameters were varied until they reach the benchmark for the parameters related to: increasement of the energy price, increasement in the project plant load factor		OK

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			(PLF) / energy assured, reduction in project costs (O&M) and reduction in project investments.		
B.5.28 Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/ /2/ /24/ /25/ /33/ /34/ /52/ /53/ /55/	DR	Increasement of the energy price: The price at which the IRR reaches the benchmark of 19.53% is at BRL 134.45/MWh, but the most likely price is BRL 114.07/MWh, which is based on the energy auction held on 16 December 2005 for new hydropower plant projects adjusted to the General Market Price Index (Índice Geral de Preços de Mercado - IGP-M) and it results in an IRR of 14.25%. The electricity sale price of 134.45 BRL/MWh is not a likely value to be achieved and this was justified through the following documental evidences: - As per the results of the energy auctions promoted by the government for the electricity supply for the period from 2008 to 2012 demonstrates that the highest energy price from hydropower projects was BRL 129.14/MWh for 2012; Increasement in the project plant load factor (PLF) / energy assured: Considering a total installed capacity of the project as 21.0 MW, with a predicted power supply to the grid of 121 939 MWh/year and an expected load factor of 66.29%, the IRR of the project is 14.25%. In order to achieve the benchmark of 19.53%, the electricity output should be increased from approximately 122 GWh per year (corresponding to a energy assured of 13.92 MW-ave) to approximately 143.8 GWh per year		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			(corresponding to a energy assured of 16.42 MW-ave), which represents an increase of approximately 18% in the energy assured. The energy assured of 16.42 MW-ave would represent a PLF of 78.18% based on the total nominal installed capacity of 21.0 MW. However, this is not likely to occur since the installed capacity and energy assured of a power plant are not freely determined by project sponsors, but established by ANEEL, considering at least 30 years of historical data regarding the project's river and other rivers, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned). For Ibirama project, the energy assured is established through ANEEL Ordinance # 1 368; Reduction in project costs (O&M): As the operation and maintenance costs were set by the project participants as corresponding to 4.38% of total investment, which is based on the project sponsor experience with the other three small hydropower plants in operation: Antonio Brennand, Indiavaí and Ombreiras (Registered CDM project activity "Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project", Ref.: 0530), the sensitivity analysis for O&M shows that in order to achieve the benchmark of 19.53%, the O&M costs would be necessary to be reduced from 4.38 to 1.28% of total investment, which represents a decrease of 71% of the estimated O&M costs. DNV considers this possibility as unrealistic and unlikely to occur;		

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Reduction in project investments: To achieve the benchmark of 19.53%, the capital expenditure would have to be reduced from approximately 74.9 million BRL to around 62.1 million BRL, representing a reduction of 17% of the capital expenditure. This is unrealistic and unlikely to occur, as the capital expenditure of 70 million BRL was based on turnkey EPC contracts for Ibirama project, in which costs are fixed and will not vary even if project's investments increase for an unexpected reason. In addition, the total investment of BRL 74 880 348, as described in the revised cash flow of the financial analysis spreadsheet is more conservative than the real costs for investing in the project activity, which corresponds to BRL 120 MM. Therefore, a reduction in project investments is not possible. The sensitivity analysis shows that even with substantial variation of the key indicators, the IRR of the proposed project (14.25%) is lower than the benchmark (19.53%).		
Barrier analysis (VVM para 115-118)					
B.5.29 Are the barriers identified complimentary to a potential investment analysis? Does the barrier have a clear impact on the financial returns so that it can be assessed in an investment analysis? Each barrier is discussed separately.	/1/	DR	Not applicable		OK
B.5.30 How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	Not applicable		OK
B.5.31 How does CDM alleviate the investment barriers?	/1/	DR	Not applicable		OK
B.5.32 Is the project activity prevented by the	/1/	DR	Not applicable		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?					
B.5.33 How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR	Not applicable		OK
B.5.34 How does CDM alleviate the technological barriers?	/1/	DR	Not applicable		OK
B.5.35 Is the project activity prevented by the technological barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Not applicable		OK
B.5.36 How were the barriers due to prevailing practise assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants?	/1/	DR	Not applicable		OK
B.5.37 How does CDM alleviate the barriers due to prevailing practise?	/1/	DR	Not applicable		OK
B.5.38 Is the project activity prevented by the barriers due to prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Not applicable		OK
B.5.39 How were the other barriers assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/	DR	Not applicable		OK
B.5.40 How does CDM alleviate the other barriers?	/1/	DR	Not applicable		OK
B.5.41 Is the project activity prevented by the other barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Not applicable		OK
Common practice analysis (VVM para 119-121)					
B.5.42 What is the geographical scope of the common	/1/	DR	The common practice analysis presented in PDD		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
practice analysis? Is this justified?	/48/		considers only small hydropower plants located in the same region of Ibirama project – Santa Catarina state. DNV has assessed that due its huge dimension, Brazil has different zones with considerably distinct climate conditions. Considering the rain regime, that has direct influence in a small hydro implementation, it is DNV opinion that the Brazilian South Region has totally different characteristics compared with other Brazilian regions. Also, considering the Santa Catarina state extension (95 346.181 square kilometers), it is DNV opinion that is reasonable to define the state as the common practice boundary, since there are considerably physical and climatological differences between Santa Catarina and the others Brazilian South Region states (Rio grande do Sul e Paraná) that can influence the implementation of small hydropower plants.		
B.5.43 What is the scope of technology and size (e.g. capacity of power plant) for the common practice analysis and how has this been justified?	/1/ /30/	DR	According to the Brazilian regulations, small scale hydropower plants are defined as plants with an installed capacity within 1 MW and 30 MW. Therefore, no large scale hydropower plants (e.g. installed capacity over 30 MW) were considered. Furthermore, only plants with installed capacity 50% lower and 50% higher than Ibirama project were analyzed (i.e. between 10.5 and 31.5 MW). It is DNV opinion that the range considered - plants with installed capacity 50% lower and higher than the project activity - is an adequate range to be adopted.		OK
B.5.44 What is the data source(s) used for the common practice analysis?	/1/	DR	ANEEL webpage.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.45 How many similar non-CDM-projects exist in the region within the scope?	/1/ /49/ /50/ /51/	DR	The small hydropowers that are located in Santa Catarina state, have installed capacity in between 10.5 and 31.5 MW and started operation after 2004 until 2009 (when PDD was published) have all some kind of incentive (CDM or Proinfa - program established by the Brazilian government to incentive the generation of energy from renewable sources).		OK
B.5.46 How were possible essential distinctions between the project activity and similar activities assessed?	/1/ /49/ /50/ /51/	DR	See B.5.46		OK
B.5.47 What is the conclusion of the common practice analysis?	/1/	DR	Therefore the project activity is not common practice in Brazil.		OK
Conclusion					
B.5.48 What is the conclusion with regard to the additionality of the project activity?	/1/	DR	In conclusion, the assessment of the arguments presented above is deemed to sufficiently demonstrate that the project is not a likely alternative, and that emission reductions resulting from the project are additional.		OK
B.6 Calculations of GHG emission reductions					
Data and parameters that are available at validation and that are not monitored (VVM para 199-203)					
B.6.1 How was the installed capacity of the hydropower plant before the implementation of the project activity verified?	/1/	DR	During the site visit it was confirmed that there was no hydropower plant at the site before the implementation of the project activity.		OK
B.6.2 How was the area of the reservoir before the implementation of the project activity verified?	/1/	DR	During the site visit it was confirmed that there was no reservoir at the site before the implementation of the project activity.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Baseline emissions (VVM para 89-93)					
B.6.3 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /3/ /20/ /27/ /33/ /42/	DR	The baseline emission factor for the project will be determined *ex-post* as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM) according to the "*Tool to calculate the emission factor for an electricity system*" of version 02.2.0. The PDD was published on 17 September 2009 and in order to estimate the emissions reductions, the baseline emission factor was determined based on available data from 2006, 2007 and 2008. The calculation is in accordance with the calculation of the combined margin emission factor published by the DNA of Brazil. Step 1 - According the Brazilian DNA, the Brazilian Interconnected Grid System is defined as a single system that covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest). Step 2 - The Brazilian DNA made available the operating margin emission factor calculated following the "Tool to calculate the emission factor for an electricity system", approved by the CDM Executive Board. The calculation uses option C – Dispatch data analysis OM. This option does not permit the vintage of *ex-ante* calculation of the emission factor. Therefore, the chosen option was *ex-post* calculation. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA. For estimation purpose, data from 2006, 2007 and 2008 was used.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Step 3 - The dispatch data analysis OM emission factor ($EF_{grid,OM\text{-}DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM\text{-}DD,y}$. As mentioned above, the host country's DNA will provide $EF_{EL,DD,h}$ in order for PPs to calculate the operating margin emission factor. Hence, this data will be updated annually applying the number published by the Brazilian DNA. Step 4/5 – The Brazilian DNA also identifies the cohort of power units to be included in the build margin (BM) and calculates it trough the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available. This parameter will be annually updated applying the numbers provided by the Brazilian DNA. For estimation purpose, data from 2006, 2007 and 2008 was used. Step 6 - Combined margin (CM) emissions factor EF_y: $EF = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}$ $w_{OM} = 0.5$, $w_{BM} = 0.5$ According Brazilian DNA data of 2006, 2007 and 2008: - $EF_{BM,2006} = 0.0814\ tCO_2/MWh$; - $EF_{BM,2007} = 0.0775\ tCO_2/MWh$;		

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			- $EF_{BM,2008}$ = 0.1458 tCO_2/MWh; - $EF_{BM,2006-2008}$ = 0.1016 tCO_2/MWh. - $EF_{OM,2006}$ = 0.3232 tCO_2/MWh; - $EF_{OM,2007}$ = 0.2909 tCO_2/MWh; - $EF_{OM,2008}$ = 0.4766 tCO_2/MWh; - $EF_{OM,2006-2008}$ = 0.3636 tCO_2/MWh $EF_{2006-2008}$ = 0.5 * 0.1016 + 0.5 * 0.3636 = 0.2326 tCO_2e/MWh Those values were applied in order to calculate an estimative of the combined emission factor, which will be monitored according data available every year. DNV has verified that all the emission factor calculus by the Brazilian DNA follows the "*Tool to calculate the emission factor for an electricity system*". Quantity of net electricity generation supplied by the project plant/unit to the grid: $EG_{facility,y}$ = 121 939 MWh (estimated energy dispatched to the grid based on the ANEEL Resolution). Thus, Baseline Emissions (BE_y) = 121 939 * 0.2326 = 28 363 tCO_2e		
B.6.4 Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Yes, see B.6.3.		OK
B.6.5 Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Yes, see B.6.3.		OK
Project emissions (VVM para 89-93)					
B.6.6 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	PE_y = zero, since there is no fossil fuel combustion in the proposed project activity, there are no emissions of non-condensable gases from		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			the operation of geothermal power plants and power density is greater than 10 W/m^2 (161.6 W/m^2).		
B.6.7 Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Not applicable		OK
B.6.8 Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Not applicable		OK
Leakage (VVM para 89-93)					
B.6.9 Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	LE_y = zero, since no leakage has to be considered for the proposed project activity.		OK
B.6.10 Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	Not applicable.		OK
B.6.11 Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	Not applicable.		OK
Emission Reductions (VVM para 89-93)					
B.6.12 Algorithms and/or formulae used to determine emission reductions: • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.	/1/ /18/	DR	Yes. Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-post* estimation of emission reduction conservatively calculated to be 28 363 tCO_2e per year for the selected crediting period. All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources. All documentation used by the 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 baseline		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			methodology ACM0002 (version 12.1.0) has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.		
B.7 Monitoring plan (VVM para 122-124)					
Data and parameters monitored					
B.7.1 Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/ /18/	DR	Yes. The project's monitoring plan contained in the PDD is in accordance with the monitoring methodology ACM0002 (version 12.1.0). The monitoring plan will give opportunity for real measurements of achieved emission reductions.		OK
B.7.2 Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	Yes, all parameters are clearly described.		OK
B.7.3 In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	Yes. Electricity meters will be used.		OK
B.7.4 In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	Yes. Electronic meters will have a 0.2 class.		OK
B.7.5 In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR	Yes. Electronic meters will be calibrated each 2 years.		OK
B.7.6 Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Electricity generation will be measured continuously.		OK
B.7.7 Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Electricity generation will be recorded monthly.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Ability of project participants to implement monitoring plan					
B.7.8 How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR	Based in the site visit and interviews, DNV considers the project participants able to implement the monitoring plan.		OK
B.7.9 Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/1/	DR	Yes. Procedures for day-to-day record handling, collection and archiving have been identified		OK
B.7.10 Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR	Yes. The monitoring of parameters will be carried out electronically on a fully automated system, and all the monitoring data will be backed up on a daily basis to 2 different sites and be kept for the full crediting period, plus two years.		OK
B.7.11 Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	Yes.		OK
Monitoring of sustainable development indicators/ environmental impacts					
B.7.12 Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	It has been confirmed that the host country laws do not require for the monitoring of sustainable development indicators / environmental impacts for the project activity.		OK
B.7.13 Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	Not applicable.		OK
B.7.14 Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	Not applicable.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
C Duration of the project activity / crediting period					
C.1.1 Start date of project activity (VVM para 99-100, 104)					
C.1.2 How has the starting date of the project activity been determined? What are the dates of the first contracts for the project activity? When was the first construction activity?	/1/ /5/	DR	The project activity start date is 31 August 2007, which is the date when turbines purchase contract of Ibirama Small Hydropower Plant - a Brennand CDM Project Activity between Ibirama Energética S.A. and Voith Siemens Hydro Power Generation Ltda. was signed. The start date is in accordance with the EB 41 meeting report, that determines the start date of a CDM project activity as the earliest date at which either the implementation or construction or real action of a project activity begins.		OK
C.1.3 Is the stated expected operational lifetime of the project activity reasonable?	/1/ /32/	DR	The expected operational lifetime of the project activity is 23 years.		OK
C.1.4 Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR	A renewable crediting period of 7 years has been chosen for the project, starting on 1 July 2012 or on the date of registration of the CDM project activity, whichever is later, which is deemed to be reasonable.		OK
D Environmental Impacts (VVM para 131-133)					
D.1.1 Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring?	/1/ /26/	DR	An Environmental Impact Assessment (EIA) has been conducted in order to obtain the Preliminary License (LP) and Installation License (LI) issued by the state environmental entity FATMA, Preliminary License LAP N°218/02 of 8 August 2002 and Installation License LAI N°0013/09 of		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			18 February 2009, following the federal regulation by CONAMA (National Environmental Council).		
D.1.2 Does the project comply with environmental legislation in the host country?	/1/	DR	Yes. It was confirmed by DNV that the implementation of the project activity is in accordance to the requirements of the environmental legislation in the host country.		OK
D.1.3 Will the project create any adverse environmental effects?	/1/	DR	No significant environmental impacts are expected from the project activity.		OK
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/	DR	Yes. The potential environmental impacts have been sufficiently identified.		OK
E Stakeholder Comments (VVM para 128-130)					
E.1.1 Have relevant stakeholders been consulted?	/1/	DR	Project developer has conducted a stakeholder consultation locally, following the Brazilian DNA Resolution # 7. The following entities were directly invited for comments by letter: - City Hall of Ibirama; - Municipal Assembly of Ibirama; - Environmental Agency of Ibirama; - Communitarian Association; - Environmental Agency of Santa Catarina; - State Attorney for the Public Interest of Santa Catarina State; - Federal Attorney; - Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento e Meio Ambiente (Brazilian Forum of NGOs and Social Movements for the Development and Environment). DNV has verified that all entities are in		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			accordance with the Brazilian DNA determination. Copies from letters and notification from the Brazilian Post Office that stakeholders received the letters communicating the start of the project were made available to DNV. DNV considers the local stakeholder consultation carried out adequately.		
E.1.2 Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	See E.1.1		OK
E.1.3 If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR	See E.1.1		OK
E.1.4 Is a summary of the stakeholder comments received provided?	/1/	DR	No comments were received.		OK
E.1.5 Has due account been taken of any stakeholder comments received?	/1/	DR	No comments were received.		OK

Table 3 Resolution of corrective action requests and clarification requests

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Not applicable			

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
No FAR was raised.		

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APPENDIX B

INITIAL CDM VALIDATION PROTOCOL

Table 2 Requirements Checklist

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity *The project design is assessed.*					
A.1 Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	The Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is located in the city of Ibirama, state of Santa Catarina, Brazil The geographical coordinates are: 27° 02' South and 49° 33' West.		OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR	The project's system boundaries are clearly defined as the project power plant and the Brazilian National Interconnected System, defined by ONS (Electric System National Operator) /39/.		OK
A.2. Participation Requirements *Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.*					
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR	The project participants are Ibirama Energética S.A. and Ecopart Assessoria em Negócios Empresariais Ltda. both of Brazil. The host country Brazil is a Non-Annex I		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			country and it meets all relevant participation requirements.		
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR	Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.		--
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR	Brazil has ratified the United Nations Framework Convention on Climate Change (UNFCCC) on the 28 February 1994, and the Kyoto Protocol on the 23 August 2002. The DNA of Brazil is the Inter-ministerial Commission on Global Climate Change (CIMGC - Comissão Interministerial de Mudança Global do Clima). Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.		--
A.2.4 Potential public funding for the project from Parties in Annex I shall not be a diversion of official development	/1/	DR	The validation did not reveal any information that indicates that the project can be seen as a		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
assistance.			diversion of official development assistance (ODA) funding towards Brazil.		
A.3. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR	Yes. The project design engineering reflects current good practices.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR I	The project activity uses Francis turbine, the most common type of hydro turbine, that are produced in Brazil.		OK
A.3.3 Does the project make provisions for meeting training and maintenance needs?	/1/	DR I	The monitoring plan described in PDD foresees training of technicians. Project participant is requested to explain why it is writting in red that calibration will occur every 2 years.	~~CL 14~~	OK
A.4. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1/	DR	Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of		--

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.		
A.4.2 Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR I	Yes. The implementation of small hydroelectric power plants ensures renewable energy generation, reduces the national electric system demand, avoids negative social and environmental impact caused by the construction of large hydros with large reservoirs and fossil fuel thermo power plants, and drives regional economies, increasing quality of life in local communities.		OK
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR	Yes, the project applies the methodology ACM0002 version 12.1.0 approved by the EB.		OK
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/	DR	Yes. The project is a capacity addition from a renewable energy source and does not		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			involve on-site fuel switch from fossil fuels to a renewable source. The geographic and system boundaries for the relevant electricity grid (Brazilian National Interconnected System) can be clearly identified.		
B.2. Baseline Scenario Determination *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
B.2.1. What is the baseline scenario?	/1/	DR	Provision of equivalent amount of annual power output by the grid (Brazilian National Interconnected System) where the proposed project is connected into is the baseline scenario.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/	DR	According methodology ACM0002 version 12.1.0, if the project activity is the installation of a new grid-connected renewable power plant/unit, 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)		OK

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			calculations described in the "Tool to calculate the emission factor for an electricity system". Therefore, no other scenarios than the amount of annual power output by the grid (Brazilian National Interconnected System) has been considered.		
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/	DR	Yes, see B.2.2.		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Yes. According to the deduction from the available information, the assumptions are conservative.		OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	Yes. All relevant national and sectoral policies, regulations and department rules and disciplines are considered.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Yes. The baseline determination is compatible with the available data. The Brazilian DNA data is considered to baseline calculation.		OK
B.2.7. Have the major risks to the baseline been identified?	/1/	DR	No major risks to the baseline were identified.		OK
B.3. Additionality Determination *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.*					
B.3.1. Is the project additionality assessed according to the	/1/	DR	Yes. The additionality of the Ibirama Small		OK

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methodology?			Hydropower Plant - a Brennand CDM Project Activity, as required by ACM0002, is demonstrated by applying the "*Tool for the demonstration and assessment of additionality*", version 05.2.		
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/	DR	No. Project participants are requested to provide financial analysis evidence (from all inputs considered, sales taxes 3.65%, O&M: 6% of revenue; Managerial: 4% of revenue; taxes: 6% of revenue, social tax: 1.08% of revenue; IRPJ: 2% of revenue).	~~CL 7~~	OK
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR I	The "*Tool for the demonstration and assessment of additionality*" version 05.2 is applied. Step 1 – Identification of alternatives to the project activity consistent with current laws and regulations: Two alternatives to the project activity have been identified and discussed: a) Scenario 1: Equivalent electricity service provided by the Brazilian National Interconnected System (Grid); b) Scenario 2: The proposed project itself, but not undertaken as a CDM project activity.		OK

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			It has been adequately demonstrated that alternative a) and b) are potential alternatives consistent with current laws and regulations established by the main entities related to the project activity, ONS (Chamber of Electric Energy Commercialization), Aneel (National Agency of Electric Energy), MME (Mines and Energy Ministry) and Santa Catarina Environmental Agency (FATMA) and thus the alternatives will be discussed at the next steps. Step 2 – Investment analysis: As the proposed project generates financial and economic benefits other than CDM related income through the sales of electricity and the alternative for the baseline scenario of the proposed project is not a similar investment project, a benchmark analysis (option III) is justified for conducting the investment analysis. Benchmark: The most suitable financial indicator for the project type identified is the IRR (Internal Rate of Return) and there are two benchmarks considered appropriated: - the Brazilian Government bond Rate		

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			(SELIC, tax which the government uses to borrow money and therefore is considered risk free); - and the cost of equity (Ke) based on Capital Asset Pricing Model (CAPM). The project-IRR calculations were provided in a spreadsheet and verified by DNV. The financial analysis considered input values by the time when the decision to invest in the project activity was token, April 2006. Project participants are requested to provide financial analysis evidence (from all inputs considered, sales taxes 3.65%, O&M: 6% of revenue; Managerial: 4% of revenue; Taxes: 6% of revenue, Social Tax: 1.08% of revenue; IRPJ: 2% of revenue). <u>Cash flow</u> The cash flow presented in the financial spreadsheet includes loan repayment and loan interest and thus it calculates the equity IRR. The investment analysis has been performed for 30 years: the fist five years just considers investment and loans, from the sixth on it is considered revenues, tax and loan repayments.	~~CL 7~~	

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			Energy tariff: • Regulated market: The tariff of 134.98 BRL/MWh that was expected to be the regulated market energy tariff on 2009. • Free Market: An energy tariff of 148.5 BRL/MWh to the energy sold in the free market. According the financial analysis spreadsheet, the main part of the energy produced will be sold in the regulated market (113 880 MWh) and just a small part of the energy produced will be sold in the free market (8 067 MWh). Project participant is requested to explain why it was estimated that 113 880 MWh of energy produced will be sold in the regulated market and 8 067MWh of the energy produced will be sold in the free market? DNV verified the following energy prices in the regulated market auctions realized on 2006: - Second auction of energy from new producers: hydro energy average price 126.77 BRL/MWh (varying from 124 to 134.42 BRL); - Third auction of energy from new	~~CL 14~~	

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			producers: average of hydro energy price 125.43 BRL/MWh (varying from 112.68 to 135.98 BRL). This information was disclosured in the CCEE (Câmara de Comercialização de Energia Elétrica – Eletric Energy Comercialization Chamber, Brazilian entity that controls the electricity market). The most recent auctions of energy in Brazil are: - Seventh auction of energy from new producers (held on 2008): just one Hydropower sold energy for 99 BRL/MWh. - First auction of alternative sources (held on 2007): average price of hydro energy 134.99 BRL/MWh. In this auction, the Ibirama Small Hydropower sold energy equivalent to an average installed capacity of 13 MW for 134.98 BRL/MWh. Considering the installed capacity 21 MW and the load factor 66.29%, the main part of the 13.92 MW available was sold in this auction. Project participants are requested to provide evidence of PPA signed on 6 December 2007 and sold energy equivalent to an average installed capacity of 13 MW.	~~CL 7~~	

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			Therefore, DNV considers that the enegy tariff adopted in the feasibility study is adequated and conservative. Investment: 106.257 million BRL; Loans: 77.143 million BRL; Sales taxes: 3.65% of revenue; Expenses: • O&M: 6% of revenue; • Managerial: 4% of revenue; • Taxes: 6% of revenue. Depreciation: According the tab Depreciation in the financial spreadsheet "SHPP Ibirama (25 years).xls". Amortization (BNDES Interes and Principal): According BNDES documentation; Taxes: • Social Tax: 1.08% of revenue; • IRPJ: 2% of revenue. <u>Benchmark</u> The most suitable financial indicator for the project type identified is the IRR (Internal Rate of Return) and there are two benchmarks considered in the PDD:		

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			- the Brazilian Government bond Rate (SELIC, rate which the government uses to borrow money and therefore is considered risk free); - and the cost of equity (Ke) based on Capital Asset Pricing Model (CAPM). The Selic rate adopted as benchmark was 16.74%, the average from the first semester before the decision to implement the project. DNV considers it conservative, since the Selic rate resulting from the Selic rates average one year before the date of decision to implement the project is 18.64%. Since no evidence from the financial analysis has been provided, by the time DNV could not assess if the equity IRR for the proposed project activity is lower than the presented benchmark and therefore could not conclude if the project activity is not considered financially attractive. Moreover, a sensitivity analysis was carried out varying 10% the parameters contributing more than 20% to revenues (energy price) or costs (operation costs and investments) in order to check the robustness of the financial analysis.		

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			The sensitivity analysis should not be executed with fixed variations of 10%. It is the expected variations that are interesting. For parameters with historical values, such as energy price for example, earlier variations should influence on the sensitivity range. The variation of "electricity output" and "load factor" should be included in the sensitivity analysis. In addition, it needs to be extended in order to consider the situations when benchmark is reached. Clarification on the variation for each parameter until the IRR reaches the benchmark and the probability of the occurrence of this scenario is needed. Project participants should make an assessment of the impact in each chosen parameter when benchmark is reached for the scenario without considering the future income of the CERs. Then, the project participants are requested to justify why the parameters cannot change so much, preferably using documental evidences or other references whenever possible. Step 3 –Barrier analysis: Not applicable (only step 2 is selected)	~~CAR 1~~	

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			Step 4 – Common practice analysis: The common practice analysis presented in PDD considers only small hydropower plants located in the same region of Ibirama project – Santa Catarina state. According to the Brazilian regulations, small scale hydropower plants are defined as plants with an installed capacity within 1 and 30MW. Therefore, no large scale hydropower plants (e.g. installed capacity over 30MW) were considered. Furthermore, only plants with installed capacity 50% lower and 50% higher than Ibirama project were analyzed (i.e. between 10.5 and 31.5 MW). It is DNV opinion that the range considered - plants with installed capacity 50% lower and higher than the project activity - is an adequate range to be adopted. On 2003, the Brazilian Government decided to review the electricity market institutional framework. On 2004, two main institutions were set up: Energy Research Company (EPE) and Eletric Energy Comercialization Chamber (CCEE). Those changes organized the electrical market, creating rules to regulate it and		

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			changing completely the environment comparing with the scenario before 2004. Therefore it is DNV opinion that the period considered in the PDD - projects that started operations from April 2004 to June 2009 (the most recent data available until the elaboration the PDD) – is adequate. Also, according PDD it was researched generating units of small hydro power plants in Brazil that stays in Santa Catarina state. Project participant is requested to further explain the following: - Project participants are requested to include in the PDD additional information in order to justify the selection of the range of plants with installed capacity 50% lower and 50% higher than Ibirama project - between 10.5 and 31.5 MW used in the common practice analysis. - Why just plants located in Santa Catarina state were considered to have similar environment with respect to investment climate, access to technology and financing compared to the project activity.	~~CL 1~~	OK

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B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/	DR I	The starting date of the project is 20 March 2007, when the Ibirama Plant was transferred from from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda. (project participant). According the EB 41 meeting report, the start date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins and thus no other date must be adopted. Project participants are requested to include and update, if necessary, the document that makes reference to the starting date of the project activity presented in section C.1.2 of the PDD. The document that states the first CDM consideration is a Minute of Meeting held by Empreendimentos Energéticos e Participações Ltda., the major shareholder of Ibirama Energética S.A. on 10 April 2006. According the document, the meeting took place in order to discuss the the feasibility of Ibirama Small Hydropower. The conclusion	~~CAR 2~~ ~~CL 11~~	OK OK

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			was that the implementation of Small Hydropower Ibirama was feasible since the project would genarate electricity as a indepent producer of electricity and also that the project would perfectly fits the CDM Program requirements, generating carbon credits. The revenue from carbon creditis would help the project to mitigate the risks related to the energy price variation in the Brazilian market. Project participants are requested to provide the feasibility study made for Ibirama small hydroelectric project. Project participant are requested to provide evidence of book/register of meetings reports and evidence that supports the conclusion of the meeting report of 10 April 2006 (that states that the project participant had a previous knowledge of carbon credit and its value to conclude that the credits revenue would mitigate the risks related to energy prices variation in the Brazilian market). The PDD states that, since Brennand Group (the company witch Empreendimentos Energéticos e Participações Ltda. is part) has three other small hydropowers plants registered as CDM projects (Araputanga Centrais Elétricas S. A. - ARAPUCEL -	~~CL 8~~ ~~CL 7~~	OK

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			Small Hydroelectric Power Plants Project, CDM 0530), they believed that the project would be registered in the UNFCCC and considered this previous experience to take the decision to invest in Ibirama Small Hydropower. On the begining of 2007, the Brennand Group/Empreendimentos Energéticos e Participações Ltda. got in contact with Ecopart (the carbon consultancy firm) and on 6 February 2007 Ecopart asked Empreendimentos Energéticos e Participações Ltda. about preliminary information in order to prepare a commercial proposal. Project participant is requested to provide evidence that on on 6 February 2007 Ecopart asked Empreendimentos Energéticos e Participações Ltda. about preliminary information in order to prepare a commercial proposal. On 21 November 2007, Ecopart sent Empreendimentos Energéticos e Participações Ltda. a questionnaire in order to obtain information to the PDD production, and the questionnaire was sent back answered on 23 January 2008. On February 2008, DNV sent Ecopart a proposal regarding Ibirama Small Hydro validation. On 28 May	~~CL 7~~	

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			2008, the contract between Ecopart and Ibirama Energética S/A was signed and on 17 June 2008 Ecopart sent for the first time letters for stakeholders' comments. Despite the fact the stakeholders consultancy started, by that time a DOE wasn't yet defined and on March 2009 DNV sent to Ecopart an up dated validation proposal. On 24 April 2009 Ecopart sent for the second time letters for stakeholders' comments. The implementation chronology is described bellow: The transfer of Ibirama Energética S/A (PCH Ibirama owner) from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda happened on 20 March 2007, according ANEEL - National Agency of Electric Energy - Resolution nr. 852. The main equipment (three Francis turbines from Voith Siemens Hydro Power Generation Ltda.) was ordered on 31 October 2007 (earliest commitment with implementation or construction or real action of the project activity). The PPA was signed on 6 December 2007 and the installation license was granted on 18 February 2009. The EPC contract was signed on 1 June 2009. Project	~~CL 7~~	

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			participant is requested to provide evidence of the financing contract and PPA signed on 6 December 2007. Project participant is requested to provide evidence that the Ibirama Hydropower belongs to Ibirama Energética S.A., relation among Ibirama Energética, Empreendimentos Energéticos e Participações e Brennand Group.		
B.4. Calculation of GHG Emission Reductions – Project emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Yes. Project emission is regarded as zero since there is no fossil fuel combustion in the proposed project activity, there are no emissions of non-condensable gases from the operation of geothermal power plants and power density is greater than 10 W/m^2 (72.4 MW/km2). Project participant is requested to amend PDD regarding the reservoir area presented in the last environmental license.	~~CL 7~~	OK
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1/	DR	See B.4.1.	~~CL 7~~	OK

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B.4.3 Are uncertainties in the project emission estimates properly addressed?	/1/	DR	See B.4.1.	~~CL 7~~	OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions *It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Yes. The baseline emission factor for the project will be determined *ex-post* as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM) according to "*Tool to calculate the emission factor for an electricity system*" of version 1.1. The PDD was published on 17 September 2009 and in order to estimate the emissions reductions, the baseline emission factor was determined *ex-ante*, based on available data of 2006, 2007, 2008. The calculation is in accordance with the calculation of the combined margin emission factor published by the DNA of Brazil. Step 1 - According the Brazilian DNA, the Brazilian Interconnected Grid is defined as a single system that covers all the five macro-		OK

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			geographical regions of the country (North, Northeast, South, Southeast and Midwest). Step 2 - The Brazilian DNA made available the operating margin emission factor calculated following the "Tool to calculate the emission factor for an electricity system", approved by the CDM Executive Board. The calculation uses option C – Dispatch data analysis OM. This option does not permit the vintage of *ex-ante* calculation of the emission factor. Therefore, the chosen option was ***ex-post*** calculation. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA. For estimation purpose, data from 2006, 2007 and 2008 was used. Step 3 - The dispatch data analysis OM emission factor ($EF_{grid,OM\text{-}DD,y}$) is determined based on the power units that are actually dispatched at the margin during each hour *h* where the project is displacing electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM\text{-}DD,y}$. As mentioned above, the host country's DNA will provide $EF_{EL,DD,h}$ in		

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			order for PPs to calculate the operating margin emission factor. Hence, this data will be updated annually applying the number published by the Brazilian DNA. Step 4/5 – The Brazilian DNA also identifies the cohort of power units to be included in the build margin (BM) and calculates it trough the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available. This parameter will be annually up-dated applying the numbers provided by the Brazilian DNA. For estimation purpose, data from 2006, 2007 and 2008 was used. Step 6 - Combined margin (CM) emissions factor EF_y $EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$, $w_{OM} = 0.5$, $w_{BM} = 0.5$ According Brazilian DNA data of 2006, 2007 and 2008: $EF_{BM,2006} = 0.0814$ tCO_2/MWh, $EF_{BM,2007} = 0.0775$ tCO_2/MWh, $EF_{BM,2008} = 0.1458$ tCO_2/MWh $EF_{OM,2006} = 0.3232$ tCO_2/MWh,		

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			$EF_{OM,2007}$ = 0.2909 tCO_2/MWh, $EF_{OM,2008}$ = 0.4766 tCO_2/MWh EF_{2008} = 0.5 * 0.3636 + 0.5 * 0.1016= 0.2326 tCO_2e/MWh Those values were applied in order to calculate an estimative of the combined emission factor, that will be monitored according data available every year. DNV has verified that all the emission factor calculus by the Brazilian DNA follows the "*Tool to calculate the emission factor for an electricity system*". Quantity of net electricity generation supplied by the project plant/unit to the grid: $EG_{facility,y}$ = 121 713 MWh Project participants are requested to provide documental evidences and/or references in order to justify the expected annual electricity delivery to the grid by the project activity presented as 121 713 MWh/year. Thus, Baseline Emissions (BE_y) = 121 713 *	~~CL 9~~	

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			0.1016 = 28 310 tCO_2e		
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Yes, see B.5.1.	~~CL 9~~	OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Yes, see B.5.1.	~~CL 9~~	OK
B.6. Calculation of GHG Emission Reductions – Leakage *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	According to ACM0002, there are no leakages that need to be considered.		OK
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	Yes, see B.6.1.		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	Yes, see B.6.1.		OK
B.7. Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation*					

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of climate change.					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/	DR	Yes. The emission reductions are real, measurable and give long-term benefits related to the mitigation of climate change. The project is expected to reduce CO_2 emissions to the extent of 198 173 tCO_2e (28 310 tCO_2e per year) during the first renewable 7 years crediting period.		OK
B.8. Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Yes. The monitoring plan is documented according to the approved monitoring methodology ACM0002. Project participant is requested to add to PDD the source of values applied regarding the following parameters: - Electricity generation of the Project delivered to grid (EGy); - Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (APJ); - The parameter "Total electricity produced by the project activity, including the electricity supplied to the grid and the	~~CL 2~~	OK

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			electricity supplied to internal loads – TEGy" is just applicable to hydro power project activities with a power density of the project activity (PD) greater than 4 W/m^2 and less than or equal to 10 W/m^2.		
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	Yes. The PDD states that data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.		OK
B.9. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/	DR	No. Project participants are requested to update the PDD in order to include the monitoring of project emissions from fossil fuel consumption (PEFF,y) due to the future installation of a diesel fuelled back-up generator for emergencies stoppages. PEFF,y shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".	~~CAR 4~~	OK
B.10. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for*					

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reliable and complete baseline emission data over time.					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR I	The project uses the ex-post determination of emission factor for grid electricity. The monitoring plan includes all parameters necessary to the monitoring and determination of emission factor. The electricity supplied to the grid will be monitored and since there will be two meters (principal and backup), data will be compared between the meters, so that any problems can be detected. The emission factor is calculated based on the Brazilian DNA data and will be up dated annually. For estimation purpose, DNV has assessed the emission factor calculated annually by the Brazilian DNA until 2008 and has verified that, regarding Operating Margin (that follows the option C – Dispatch data analysis OM) and Build Margin (calculated trough the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available), the Brazilian DNA follows the "Tool to calculate the emission factor for an electricity system" of version 1.1.		OK

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B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR	Yes. The choice of baseline indicators is in line with ACM0002 version 12.1.0.		OK
B.10.3. Is the measurement *method* clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/	DR	Yes. The electricity generated delivered to the grid will be monitored directly trough two meters (principal and backup).		OK
B.10.4. Is the measurement *equipment* described and deemed appropriate?	/1/	DR I	Yes. From follow-up interview and desk review of the PDD, it is found that the electricity delivered to the grid will be measured trough two meters (principal and backup). Project participant is requested to explain the following in the monitoring plan: "Each SHPP will have a meter and there will be two meters (principal and backup) utilized for billing from Centrais Elétricas Matogrossenses S/A. Before the operations start, CCEE demands that these meters are calibrated by an entity with Rede Brasileira de Calibração (RBC) credential. Measurements will be controlled in real time by the Operation and Management Center (COG) in Cuiabá, capital of Mato Grosso state".	~~CL 14~~	OK
B.10.5. Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR I	Procedures to deal with erroneous measurements have been in place. Project participant is requested to explain the following: the calibration will occur every 2	~~CL 14~~	OK

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			years (it is in red)?		
B.10.6. Is the measurement *interval* for baseline data identified and deemed appropriate?	/1/	DR I	Yes. The measurement interval for baseline data is identified as hourly measurement and monthly recording.		OK
B.10.7. Is the *registration*, *monitoring*, *measurement* and *reporting* procedure defined?	/1/	DR I	No. The monitoring plan presented in the PDD does not foresee procedures regarding registration and reporting of data.	~~CL 3~~	OK
B.10.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR I	Yes. The monitoring plan presented in the PDD foresees procedures for maintenance of monitoring equipment and installations. Project participant is requested to explain the following: the calibration will occur every 2 years (it is in red)?	~~CL 14~~	OK
B.10.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	No. The monitoring plan presented in the PDD does not foresee procedures for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation).	~~CL 3~~	OK
B.11. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	According to ACM0002, project proponents do not need to consider leakage.		OK
B.11.2. Are the choices of project leakage indicators reasonable and conservative?	/1/	DR	See B.11.1.		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.11.3. Is the measurement *method* clearly stated for each leakage value to be monitored and deemed appropriate?	/1/	DR	See B.11.1.		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	Neither ACM0002 nor the Brazilian DNA requires collection and archiving of relevant data concerning environmental, social and economic impacts. However Brennand Group has hired a team of environmental experts that will monitor the compliance with the environmental agencies' regulations. Project participants are requested to provide documental evidences and/or references related to the environmental impact monitoring due to the development of Ibirama small hydropower plant.	~~CL 10~~	OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	See B.12.1.	~~CL 10~~	OK
B.12.3. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	See B.12.1.	~~CL 10~~	OK
B.13. Project Management Planning					

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
It is checked that project implementation is properly prepared for and that critical arrangements are addressed.					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/	DR	No. Despite the fact that Brennand Group has been identified as responsible for the calibration and maintenance of the monitoring equipment, for dealing with possible monitoring data adjustments and uncertainties, for review of reported results/data and for internal audits, a more specific authority has to be identified.	~~CL 3~~	OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/	DR I	Yes, Brennand is responsible for training the staff in the appropriate monitoring, measurement and reporting techniques. Technicians will be trained on mounting and start-up.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR I	No emergency situation which can cause unintended emissions is expected from the project.		OK
B.13.4. Are procedures identified for review of reported results/data?	/1/	DR I	Yes. Energy will be metered in two different meters (principal and backup) and measurement data will be compared between the meters, so that any problems can be detected. In case of any problem, plant personnel will be put in action.		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR I	Yes, procedures were identified for corrective actions in order to provide for more accurate future monitoring and reporting.		OK
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/	DR I	The starting date of the project is 20 March 2007, when the Ibirama Plant was transferred from from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda. (project participant). According the EB 41 meeting report, the start date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins and thus no other date must be adopted. The lifetime of the project is expected to be 20 years. Project participant is requested to provide evidence from the expected life time.	~~CAR 2~~ ~~CL 7~~	OK OK
C.2. Is the start of the crediting period clearly defined and reasonable?	/1/	DR	Yes, the crediting period starting date is 1 February 2011 or on the date of registration of the CDM project activity, whichever is later.		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
D. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
D.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	No significant negative environmental impacts are expected from the implementation of the project activity. An Environmental Impact Assessment (EIA) has been conducted in order to obtain the Preliminary License (LP) and Instalation License (LI) issued by the state environmental entity FATMA, Preliminary License LAP N°218/02 of 8 August 2002 and Instalation Licence LAI N°0013/09 of 18 February 2009, following the federal regulation by CONAMA (National Environmental Council). The potential environmental impacts have been sufficiently identified. No significant environmental impacts are expected from the project activity. Project participants are requested to include, in section D.2 of the PDD, the reference numbers and dates of issuance of the Preliminary and Installation Licenses.	~~CL 12~~	OK
D.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/	DR	Yes. Environmental Impact Assessment has been approved by FATMA and the environmental licenses described above were		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			issued since EIA was approved.		
D.3. Will the project creates any adverse environmental effects?	/1/	DR I	No, since project was granted the environmental licenses described above.		OK
D.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR I	There are no transboundary environmental impacts foreseen for the project.		OK
D.5. Have identified environmental impacts been addressed in the project design?	/1/	DR	Yes.		OK
D.6. Does the project comply with environmental legislation in the host country?	/1/	DR	Yes. The project complies with Brazilian environmental regulation as EIA was approved by local authority.		OK
E. Stakeholder Comments *The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					
E.1. Have relevant stakeholders been consulted?	/1/	DR I	Project developer has conducted a stakeholder consultation locally, following the Brazilian DNA Resolution # 1. The following entities were directly invited for comments by letter: - City Hall of Ibirama; - Municipal Assembly of Ibirama; - Environmental Agency of Ibirama; - Communitarian Association;		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			- Environmental Agency of Santa Catarina; - State Attorney for the Public Interest of Santa Catarina State; - Fórum Brasileiro de ONGs e Movimentos Sociais para o Desenvolvimento e Meio Ambiente (Brazilian Forum of NGOs and Social Movements for the Development and Environment). The last resolution from the Brazilian DNA regarding stakeholder consultation is the resolution number 7 of 5 March 2008. In addition, the "Federal Attorney" should be included in section E.1. of the PDD. The PDD must be updated in order to be in line with the referred document. DNV has verified that all entities are in accordance with the Brazilian DNA determination. Copies from letters and notification from the Brazilian Post Office that stakeholders received the letters communicating the start of the project were made available to DNV.	~~CL 4~~	
E.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR I	See E.1.	~~CL 4~~	OK
E.3. If a stakeholder consultation process is required by	/1/	DR	Yes. See E.1.	~~CL 4~~	OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?					
E.4. Is a summary of the stakeholder comments received provided?	/1/	DR	No comments were received.		OK
E.5. Has due account been taken of any stakeholder comments received?	/1/	DR	No comments were received.		OK

Table 2b: Additional requirements checklist for VVM version 1 (EB 44)

A.1. Letter of approval					
A.1.1 Is the LoA received directly from the DNA or through the project participant.	/1/	DR	Prior to the submission of the validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.		--
A.2. Project design					
A.2.1 Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?	/1/		Yes, please see Table 2 A.3.1		OK
A.2.2 Has the CDM project activity at the start of the validation been constructed or does the CDM project activity use existing facilities or equipment?	/1/		The starting date of the project is 20 March 2007, when the Ibirama Plant was transferred	~~CAR 2~~	OK

			from from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda. (project participant). According the EB 41 meeting report, the start date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins and thus no other date must be adopted. Please see Table 2 C.1.1		
A.2.3 Is the project a large scale project, a small scale project with average annual emission reductions above 15 000 tonnes or a bundled small scale project? Has on-site visit been carried out?	/1/		The project is a large scale project, the implementation of a 21MW small hydro power using the ACM0002 version 12.1.0. On 02 November 2009, DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. The project participants of Ibirama Energética S.A. and Ecopart Assessoria em Negócios Empresariais Ltda. were interviewed during the site visit at the Ibirama Energética S.A. office.		OK
A.2.4 Does the project activity involved alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/		No, the entire project will use new equipment. Please see Table 2 A.3.1.		OK
A.3. Project emissions not addressed by the methodology					
A.3.1 Does the methodology describe all project emission source for the project activity that contributes all 1% of the emission	/1/		Yes. Please see Table 2 B.4 and B.5.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

reductions? Sources that the methodology considers not to take into account are not relevant (e.g. cement and iron consumption for building hydropower plants).					
A.4. Documentation of baseline emissions					
A.4.1 Documentation of the baseline determination: a. All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. b. All documentation is relevant as well as correctly quoted and interpreted. c. Assumptions and data can be deemed reasonable d. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. e. The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/		Yes. Please see Table 2- B.1.1, B.2.1, B.2.2 and B.5.		OK
A.5. Documentation of the calculations					
A.5.1 Algorithms and/or formulae used to determine emission reductions • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity	/1/		Yes, Please See Table 2 B.4 and B.5.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

• The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.					
A.6. Implementation of the monitoring plan					
A.6.1 How were the plans for implementation of the monitoring plan, data management, QA/QC procedures assessed? To what extent can the emission reductions achieved by the project by monitored ex-post and verified later by a DOE?	/1/		Yes, please see Table 2 B.8, B.9 and B.10.		OK
A.7. CDM consideration prior to starting date					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46	/1/		Yes, Pease see Table 2 B.3.4.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
CAR 1 - Sensitivity analysis: The sensitivity analysis should not be executed with fixed variations of 10%. It is the expected variations that are interesting. For parameters with historical values, such as energy price for example, earlier variations should influence on the sensitivity range. The variation of "electricity output" and "load factor" should be included in the sensitivity analysis. In addition, it needs to be extended in order to consider the situations when benchmark is reached. Clarification on the variation for each parameter until the IRR reaches the benchmark and the probability of the occurrence of this scenario is needed. Project participants should make an assessment of the impact in each chosen parameter when benchmark is reached for the scenario without considering the future income of the CERs. Then, the project participants are requested to justify why the parameters cannot change so much, preferably using documental evidences or other references whenever possible.	B.3.3	PPs response: 02/02/2010 The sensitivity analysis presented in the PDD (version 1) was conducted following the "Guidance on the Assessment of Investment Analysis" which states that: "*...variations in the sensitivity analysis should at least cover a range of +10% and -10%...*". Therefore, the analysis follows the tool and it was not withdrawal from the PDD. As requested by the DOE, Project Participants (PPs) included variations in the electricity output and plant load factor in the sensitivity analysis. The probability of occurrence of the scenarios presented in the sensitivity analysis is necessary only if the project activity becomes financially attractive. Therefore, it was not included in the PDD (version 1). However, as requested by DOE during the validation visit, the assessment of the impact in each chosen parameter when benchmark is reached was included in the new version of the PDD (version 2) together with explanations why these variations would not occur in the project context. All scenarios were explained in the PDD according to referenced documentation. Considering information above, two types of sensitivity analysis were presented in the new version of the PDD (version 2) based on the variation of the project revenues and investments/costs: (a) variation of +10% and -10% in the scenarios and assessment of the impact in the project IRR and (b) variation in the scenarios until the IRR reaches the benchmark and explanations	A sensitivity analysis was carried out varying the parameters contributing more than 20% to revenues or costs in order to check the robustness of the financial analysis. reasonable variations of the energy price, project load factor/energy assured, project costs and project investment were checked by calculating the variation necessary to reach the benchmark reach the benchmark and then discussing the likelihood for that to happen. None of the parameters in the sensitivity analysis are considered to have any significant positive correlation. - Increase of the energy price: The price at which the IRR reaches the benchmark of 19.53% is at BRL 134.45/MWh, but the most likely price is BRL 114.07/MWh, which is based on the energy auction held on 16 December 2005 for new hydro power plant projects adjusted to the General Market Price Index (Índice Geral de Preços de Mercado - IGP-M) and it results in an IRR of 14.25%. The electricity sale price of 134.45 BRL/MWh is not a likely value to be achieved and this was justified through the following documental evidences: o As per the results of the energy auctions promoted by the government for the electricity supply for the period from 2008 to 2012 demonstrates that the highest energy price from hydro power projects was BRL 129.14/MWh for

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
		why these scenarios would not occur. In addition, PPs withdrawal the Brazilian Prime Rate (SELIC) as the project benchmark as it is not suitable to compare it to the equity IRR of the project since it is a short term market rate. When applying SELIC rate as the project benchmark, PPs based on the following statement of the Additionality Tool: "*...project developers shall demonstrate that this benchmark has been consistently used in the past*". Since other registered CDM project from the same project sponsor used SELIC to demonstrate the investment barriers involved in the small hydropower plants implementation (CDM ref: 0530), PPs believed that the Additionality Tool was followed. However, this statement is applicable only in cases in which a company internal benchmark is used, which is not the case of Ibirama project. Therefore, since SELIC is a short term market rate and is not the appropriate benchmark to be compared to the equity IRR of the project, it was withdrawal from the new version of the PDD (version 2). Reviewed PDD, project cash flow and spreadsheet with the calculation of the benchmark (Cost of Equity) are attached to this response.	2012 /52/ /53/; In addition, as per the energy auction for alternative energy sources only (for small-hydro as Ibirama project, wind and biomass), the average of electricity price was BRL 137.62/MWh; if only hydropower plants were considered, the result is approximately BRL 135/MWh. Therefore, DNV considers that the enegy tariff adopted in the feasibility study is adequated and conservative. The energy tariff applied at the time of the project activity starting date was 128.47 BRL/MWh, corrected by the inflation, but even with this tariff the IRR gets lower than the benchmark. Besides, the Energy Auction for Alternative Sources is an initiative from the Brazilian government for the promotion of renewable energy projects. Only renewable energy projects can participate in the auction - small hydropower plants, cogeneration and wind projects /61/. Thus, non-fossil fuel projects participate in this auction and renewable energy projects can compete with each other (and not with modular fossil-fuel-fired power plants which

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			generally are close to load centers and transmission lines and can be easily transferred to a new region where a better tariff is offered). As per the "Clarifications on the Consideration of National and/or Sectoral Policies and Circumstances in Baseline Scenarios (version 02)", this kind of auction can be considered as a type E- policy, where favourable conditions are given to promote sustainable energy after 2001 and it gives comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (in the case, a higher tariff for renewable energy projects). Besides, the first energy auction for alternative sources was regulated by Decree 6048 dated 27/02/2007 /73/ and, therefore, after 11 November 2001. Considering this, the type E-policy shall not be taken into account in developing the baseline scenario, i.e. the energy price influencing the economic situation of the project. - Increase in the project plant load factor (PLF) / energy assured: Considering the total installed capacity of the project as 21 MW /24/ /25/, with a predicted power

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			supply to the grid of 121 939 MWh/year /33/ and an expected load factor of 66.29% /34/, the IRR of the project is 14.25%. In order to achieve the benchmark of 19.53%, the electricity output should be increased from approximately 122 GWh per year (corresponding to a energy assured of 13.92 MW-ave /34/) to approximately 143.8 GWh per year, which represents an increase of approximately 18% in the energy assured. That would represent a PLF of 78.18% based on the total nominal installed capacity of 21 MW. However, this is not likely to occur since the installed capacity and energy assured of a power plant are not freely determined by project sponsors, but determined by ANEEL by considering at least 30 years of historical data regarding the project's river and other rivers, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned). For Ibirama project, the energy assured is established through ANEEL Ordinance # 1 368 /34/; - Reduction in project costs (O&M): As the operation and maintenance costs were set by the project participants as corresponding to 4.38% of total investment, which is based on the project sponsor experience with the other three small hydropower plants in operation: Antonio Brennand, Indiavaí and Ombreiras (Registered CDM

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			project activity "Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project", Ref.: 0530), the sensitivity analysis for O&M shows that in order to achieve the benchmark of 19.53%, the O&M costs would be necessary to be reduced from 4.38 to 1.28% of total investment, which represents a decrease of 71% of the estimated O&M costs. In addition, the O&M value was estimatived as 5% as suggested by the publication of the study named "Diretrizes para estudos e projetos de Pequenas Centrais Hidrelétricas" (Guidelines for studies and projects for Small Hydro Powerplants) published by Eletrobrás and the Brazilian Mines and Energy Ministry /64/. Therefore DNV considers an O&M costs corresponding to 1.28% of the total investment as unrealistic and unlikely to occur; - Reduction in project investments: To achieve the benchmark of 19.53%, the capital expenditure would have to be reduced from approximately 74.9 million BRL to around 62.1 million BRL, representing a reduction of 17% of the capital expenditure. This is unrealistic and unlikely to occur, as the capital expenditure of 70 million BRL was based on turnkey EPC contracts for Ibirama project, in which costs are fixed and will not vary even if

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			project's investments increase for an unexpected reason. In addition, the total investment of BRL 74 880 348, as described in the revised cash flow of the financial analysis spreadsheet /2/ is more conservative than the real costs for investing in the project activity, which corresponds to BRL 120 MM /55/. Therefore, a reduction in project investments is not possible. The sensitivity analysis above shows that even with substantial variation of the key indicators, the IRR of the proposed project (14.25%) is lower than the benchmark (19.53%). Regarding the benchmark applied, the SELIC rate was firstly considered as a suitable benchmark for this project. However, after some discussions (also based on requests for reviews from other projects listed at UNFCCC's website) and by applying our sectoral competence, it is DNV opinion that SELIC rate should not be used as benchmark for this project since SELIC is an appropriate benchmark for project IRR, but not for equity IRR, which is applied to the project activity. The IRR presented /2/ is compared to the Cost of Equity (Ke) calculated based on the Capital Asset Pricing Model (CAPM), which is considered an appropriate benchmark of the electric sector. In conclusion, the investment analysis and sensitivity assessment have shown that the project activity is not financially attractive.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			Therefore this CAR is closed.
CAR 2 According the EB 41 meeting report, the starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins and thus no other date must be adopted.	B.3.4 C.1	PPs response: 02/02/2010 As presented in the PDD (version 1), the starting date considered for the project was the date when Ibirama was transferred from Guascor Geratec Ltda. to Empreendimentos Energéticos e Participações Ltda. for conservativeness reasons, *i.e.*, 20/03/2007. However, considering comments from DOE, the starting date of the project was changed for the date when first order of the main equipments happened, *i.e.*, 31/08/2007.	DNV has assessed the turbines and generators purchase contract between Ibirama Energética S.A. and Voith Siemens Hydro Power Generation Ltda. dated 31 August 2007. DNV confirms that this was the first financial commitment on the project activity, since the civil works contract was only issued on 1 June 2009 /4/, and concluded that it is the earliest date at which either the implementation or construction or real action of a project activity begins. Therefore this CAR is closed.
CAR 3 Project participants are requested to update and to revise, if necessary, the dates of the documents presented in the first table of section B.5 of the PDD.	NA	PPs response: 02/02/2010 First table of the section B.5. was revised in the new version of the PDD (version 2) based on documented evidence attached to this response.	Project participants updated and revised the dates of the documents presented in the first table of section B.5 of the PDD. The referred documents /4/ /26/ /29/ /36/ /37/ /54/ /55/, its relevant content and dates were assessed and confirmed by DNV. Therefore, this CAR is closed.
CAR 4 Project participants are requested to update the PDD in order to include the monitoring of project emissions from fossil fuel consumption (PEFF,y) due to the future installation of a diesel fuelled back-up generator for emergencies stoppages. PEFF,y shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".	B.9.1	PPs response: 02/02/2010 According to ACM0002 methodology (version 10), emissions from backup power generations do not need to be considered. Therefore, Project Participants did not review the PDD.	Although version 9 of ACM0002 requested the inclusion of project emissions for operation of backup power generation of all the renewable energy plants, this is no more applicable for hydropower plant projects as per version 12 of ACM0002. Therefore, this CAR is closed.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
CAR 5 Project participants are requested to update the PDD using the latest version available of the approved consolidated methodology ACM0002 (version 12.1.0).	NA	PPs response: 21/03/2011 PPs reviewed the PDD to include the latest version of ACM0002 (version 12.1.0).	The PDD dated 19 September 2011 (version 07) /1/ has been updated using the latest version available of the approved consolidated methodology ACM0002 (version 12.1.0) /18/. DNV has confirmed that the approved consolidated methodology ACM0002 (version 12.1.0) /18/ was correctly applied in the PDD dated 19 September 2011 (version 07) /1/. Therefore, this CAR is closed.
CAR 6 Project participants are requested to update the PDD in order to apply the latest version 02.2.0 of the "Tool to calculate the emission factor for an electricity system".	NA	Considering DOE comments, the PDD was revised to apply the latest version of the "Tool to calculate the emission factor for an electricity system".	The PDD dated 19 September 2011 (version 07) /1/ has been updated using the latest version available of the "Tool to calculate the emission factor for an electricity system" (version 02.2.0) /20/. DNV has confirmed that the "Tool to calculate the emission factor for an electricity system" (version 02.2.0) /20/ was correctly applied in the PDD dated 19 September 2011 (version 07) /1/. Therefore, this CAR is closed.
CAR 7 The PDD states that the "starting date of the first crediting period" is 1 February 2011, which is already outdated. Therefore, project participants are requested to update/postpone the starting date of the first crediting period by indicating a reasonable date for starting the first crediting period, which shall considers the timeline until the date in which the project could be registered.	NA	Considering DOE comments, PPs revised the starting date of the crediting period to the estimated date of the project registration, *i.e.* 01/07/2012.	The PDD dated 19 September 2011 (version 07) /1/ has been updated in order to revise the "starting date of the first crediting period", which is now defined as 1 July 2012 and considered acceptable by DNV. Therefore, this CAR is closed.
CL 1 Project participant is requested to further explain the following: - Project participants are requested to include in the PDD additional information in order to justify the selection of the	B.3.3	PPs response: 02/02/2010 Regarding common practice analysis, Project Participants would like to clarify that the analysis presented in the PDD (version 1), it is based on the Additionality Tool, which states: "*projects are*	According to the Brazilian regulations /30/, small scale hydro power plants are defined as plants with an installed capacity within 1 MW and 30 MW. Therefore, no large scale hydro power plants (e.g. installed capacity over 30 MW) were considered.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
range of plants with installed capacity 50% lower and 50% higher than Ibirama project - between 10.5 and 31.5 MW used in the common practice analysis. - Why just plants located in Santa Catarina state were considered to have similar environment with respect to investment climate, access to technology and financing compared to the project activity.		*considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc*". Although small hydroelectric projects are considered to be the ones with installed capacity from 1 MW to 30 MW according to ANEEL Resolution #652/2003, it is not reasonable consider that a power plant with 1 MW is comparable with a power plant with 21 MW, as it is the case of Ibirama project. The project scale has influence in many aspects for a small project implementation as costs, investments, financing, environmental studies, and others. Thus, it is evident that a small hydro with 1 or 5.5 MW (the lowest and the highest installed capacity of power plants located in the same region of the project - see attached spreadsheet) cannot be compared with the proposed project activity. As mentioned in the PDD (version 1), Brazil has an extension of 8,514,876.599 square kilometers and 6 distinct climate regions. These differences obviously have influence for small hydropower plants implementation (see comparison of the monthly precipitation where the project is located and other regions of the country in the second version of the PDD, figures 4 and 5). Therefore, Santa Catarina State was considered a conservative approach for the common practice analysis. See explanations presented in the new version of PDD (Version 2) and spreadsheet with the common	Furthermore, only plants with installed capacity 50% lower and 50% higher than Ibirama project were analyzed (i.e. between 10.5 and 31.5 MW). It is DNV's opinion that the range considered - plants with installed capacity 50% lower and higher than the project activity - is an adequate range to be adopted. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
		practice analysis attached to this response.	
CL 2 Project participant is requested to add to PDD the source of values applied regarding the following parameters: - Electricity generation of the project delivered to grid (EG_y); - Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (A_{PJ}); - The parameter "Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads – TEG_y" is just applicable to hydro power project activities with a power density of the project activity (PD) greater than 4 W/m^2 and less than or equal to 10 W/m^2.	B.8.1	PPs response: 02/02/2010 Source of information related to electricity generation and reservoir area was included in the new version of the PDD (version 2): (i) Electricity generation (EG_y): ANEEL Resolution nr. 65, 25/05/2004 and ANEEL Ordinance nr. 1,368, 27/06/2006; (ii) Area of the reservoir (A_{PJ}): Construction License nr. 0013, 18/02/2009. Total electricity produced by the project activity (TEG_y) was withdrawal of the PDD, since it is applicable only for hydropower projects with power densities greater than 4W/m^2 and less or equal to 10W/m^2. See the new version of the PDD (version 2).	The sources of the values applied to the monitored parameters EG_y and A_{PJ} were added to the revised PDD. The parameter TEG_y was removed from the revised PDD. Therefore this CL is closed.
CL 3 The monitoring plan presented in the PDD does not foresees: - Procedures regarding registration and reporting of data; - Procedures for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation); - Despite the fact that Brennand Group has been identified as responsible for the calibration and maintenance of the monitoring equipment, for dealing with possible monitoring data adjustments and uncertainties, for review of reported results/data and for internal audits, a more specific authority has to be identified. Therefore, additional and detailed information should be included in the PDD. - The monitoring of the paramenter "area of the reservoir	B.10.7 B.10.9 B.13.1	PPs response: 12/04/2010 The parameter was included in the section B.7.1 according the methodology. Please refer to the third version of the PDD. In addition, PPs included detailed how parameters mentioned in section B.7.2 will be monitored (reporting, measurement accuracy and intervals) and reviewed data units of parameters presented in the tables of section B.7.1 following the ACM0002 (version 11). The reservoir area of the project will be monitored through topographical data in the location of the project activity made once (at the time of the project design) and the reservoir level will be monitored	Additional information regarding monitoring paramenters and monitoring plan was included in sections B.7.1 and B.7.2, respectively. The PDD dated 19 September 2011 (version 07) /1/ has been updated and the paramenter "area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (A_{PJ})" will be monitored through topographical data in the location of the project activity made once (at the time of the project design) and the reservoir level will be monitored yearly as required by the methodology ACM0002 (version 12.1.0). Therefore, this CL is closed.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (A_{PJ})" is a requirement from the methodology ACM0002 (version 12.1.0) and it needs to be measured using topographical surveys, maps, satellite pictures, etc., on an annual basis by the project participants. Hence, project participants are requested to update the PDD accordantly.		yearly as required by ACM0002. This information is presented in section B.7.1 of the PDD.	
CL 4 The last resolution from the Brazilian DNA regarding stakeholder consultation is the resolution number 7 of 5 March 2008. In addition, the "Federal Attorney" should be included in section E.1. of the PDD. The PDD must be updated in order to be in line with the referred document.	E.1 E.2 E.3	PPs response: 02/02/2010 Information was corrected in the new version of the PDD (version 2).	The revised PDD was amended considering Brazilian DNA resolution number 7 and adding the "Federal Attorney". Therefore this CL is closed.
CL 5 Section A.4 of the PDD states that Itajaí do Norte River's dry season flow rate is 35.2 m^3/s and that the minimum flow rate required by the project turbines (9.3 m^3/s x 3 turbines) is 27.9 m^3/s. In addition, Table 2 also provides reservoir and turbine data of the project activity. Project participants are requested to provide documental evidences or to include respective references in the PDD in order to justify the source of information.	NA	PPs response: 02/02/2010 All information mentioned in the PDD (version 2) presents source of information. Evidences are attached to this response. (i) River's dray season flow rate: corrected in the PDD to 48.8 m^3/s according to historical data from 1935 to 2001 Itajaí do Norte river's dry season corresponds to Summer and Autumn seasons. Information available in the Energetic Research Company (in a free translation from the Portuguese *Empresa de Pesquisa Energética – EPE*) technical data record dated February 2007 attached to this response. Spreadsheet with the days of pondage at maximum volume of reservoir is also attached to this response. Volume of reservoir: corrected in the PDD to 1,250,000 m^3 according to the Project Design prepared by Engevix Engenharia Ltda, volume I,	Technical description information source was added to PDD section A.4 and DNV has verified that data is in accordance with the Project Design prepared by Engevix Engenharia Ltda and Mazzarollo, volume I, dated November 2001 and EPE technical data report, page 2, dated February 2007. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
		dated November 2001, attached to this response.	
CL 6 Section A.4 of the PDD states that "in the absence of the project activity all the energy would be imported from the interconnected grid". Project participants are requested to clarify who or which facility would "import" electricity from the grid in absence of the project activity.	NA	PPs response: 02/02/2010 In section A.4.3 where it is written "*in the absence of the project activity all the energy would be imported from the interconnected grid*", it should be read "*all the energy would be supplied by the power plants of the interconnected grid*". Considering DOE's comments, PPs review PDD (version 2).	The PDD has been amended, including that in the absence of the project activity all the energy would be supplied by other plants of the interconnected grid. Therefore this CL is closed.
CL 7 Project participants are requested to provide: - documental evidences or to include respective references in the PDD in order to justify the source of information presented in Table 3; - evidence that the Ibirama hydropower belongs to Ibirama Energética S.A., relation among Ibirama Energética, Empreendimentos Energéticos e Participações and Brennand Group; - evidence that on 1 February 2007 Ecopart asked Empreendimentos Energéticos e Participações Ltda. about preliminary information in order to prepare a commercial proposal; - evidence of PPA signed on 6 December 2007 and sold energy equivalent to an average installed capacity of 13 MW; - financing contract; - financial analysis evidence (from all inputs considered, sales taxes 3.65%, O&M: 6% of revenue; Managerial: 4% of revenue; taxes: 6% of revenue, social tax: 1.08% of revenue; IRPJ: 2% of revenue); - evidence of estimative of quantity of net electricity generation supplied by the project plant/unit to the grid,	B.3.2 B.3.3 B.3.4 B.4.1 B.4.2 B.4.3 C.1	PPs response: 02/02/2010 The following documents are attached to this response: (i) Technical data record issued by the turbines and generators manufacturers Voith Siemens and Gevisa S/A, confirming the values presented in the PDD. (ii) ANEEL Resolution nr. 852, issued on 20/03/2007: approval for the shareholders change of Ibirama Energética S/A (from Guascor Geratec Ltda. and Genor Jácomo Mazzarollo to Empreendimentos Energéticos e Participações Ltda.) and ANEEL Resolution nr. 1,924, issued on 26/05/2009: authorization for the shareholders change to Brennand Energia S/A. In addition, see <http://www.aneel.gov.br/aplicacoes/AgenteGeracao/UsinasAgente.asp?fase=2&empresa=3423:Ibirama Energética S/A.>, which demonstrates that PCH Ibirama is owned by Ibirama Energética S/A. (iii) In fact, evidence is dated February 6th, 2007.	The technical configuration and details of turbines and generators to be used at Ibirama small hydropower plant, as described in table 3 available in section A.4.3 of the PDD, were assessed /5/ /24/ /25/ /56/ and confirmed as appropriate by DNV. The evidences that the Ibirama hydropower plant belongs to Ibirama Energética S.A. were assessed /29/ /59/ /60/ and confirmed by DNV. DNV has assessed and confirmed the evidence, an e-mail sent on 6 February 2007 by Ecopart to Empreendimentos Energéticos e Participações Ltda., asking for preliminary information in order to prepare a commercial proposal /8/. DNV has assessed and confirmed the result of the energy action published by ANEEL (Leilão N° 03/2007) issued on 7 August 2007, confirming the total purchased of 13 MW-ave of Ibirama project /61/. In addition, the PPA /37/ signed on 6 December 2007 between ESCELSA (Eletric Centre Espírito Santo / *Espírito Santo Centrais Elétricas*) and Ibirama Energética S.A. was also assessed and confirmed by DNV. DNV has assessed and confirmed the financing

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
installed capacity and load factor; - book/Register of meetings reports; - evidence from the expected life time; - evidence that supports the conclusion of the meeting report of 10 April 2006 (that states that the project participant had a previous knowledge of carbon credit and its value to conclude that the credits revenue would mitigate the risks related to energy prices variation in the Brazilian market); - evidence of turbines specifications'; Project participant is requested to amend the PDD regarding the reservoir area presented in the last environmental license - Installation License from 18 February 2009 (LAI N°0013/09).		Attached to this response. (iv) In fact, there are 17 PPAs signed for the total purchased of 13MW-ave of Ibirama project. See result of the energy action published by ANEEL attached to this response. This information is also publicly available at CCEE's website: <http://www.ccee.org.br/>. (v) Financing contract attached. (vi) Financial spreadsheet: a. Sales taxes: 3.65% PIS/PASEP: Law nr. 10,637, December 31st, 2002 COFINS: Law nr. 10,833, December 29th, 2003 b. O&M: 5% Project sponsor experience. Spreadsheet attached. c. Managerial: removed d. Taxes: 6% revenues. Please clarify the source of this number. e. Social tax: 1.08% = 9% (social taxes) x 12% (revenue base for social taxes – CSLL) Law nr. 8,981, January 20th, 1995 f. IRPJ: 2% = 25% (income tax) x 8% (revenue base for income taxes) Law nr. 9,430, December 27th, 1996 (vii) As mentioned in CL2, electricity supplied to the grid is based on the ANEEL Resolutions nr. ANEEL Resolution nr. 65, 25/05/2004	contract signed between Ibirama Energética S/A and Itaú Bank on 19 October 2009 /55/. The following financial analysis evidences related to the inputs parameters considered in the financial spreadsheet were assessed and confirmed by DNV: - The "tributation" and "managerial" costs contained in the project costs together with O&M costs have been excluded in the reviewed cash flow in the financial analysis spreadsheet /2/. Instead, the project costs is only related to the O&M costs contained in the revised cash flow of the financial analysis spreadsheet /2/, which have been adjusted by the project participants to 4.38% of total investment based on the project sponsor experience with other small hydropower plant /63/ and this value is considered conservative and appropriate by DNV /64/; The evidence used for supporting the 4.38% is the balance sheet of Antonio Brennand small hydro power plant "Araputanga Centrais Elétricas S.A.", published in D.O.U. (Diário Oficial da União) on 1 July 2005 /63/, which was assessed by DNV and considered appropriate. In addition, the O&M value was compared to the estimative value of 5% suggested by the publication of the study named "Diretrizes para estudos e projetos de Pequenas Centrais Hidrelétricas" (Guidelines for studies and projects for Small Hydro Powerplants)

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
		and ANEEL Ordinance nr. 1,368, 27/06/2006; (viii) Please clarify. The Minutes of Meeting was already presented during validation visit. (ix) According to ANEEL Resolution nr. 24, issued on 27/01/2004, Art 7, the project concession is valid for 30 years from the issuance of this Resolution. Therefore, the period of 30 years also includes the project design/study and construction, *i.e.*, the project lifetime is from 2004 to 2034. Since the project is expected to start operation in 2011, the estimated project lifetime is 23 years; (x) As mentioned in section B.5 of the PDD, project sponsor had knowledge of the CDM incentives through its project "Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project", registered on 15/12/2006. In addition, Ibirama Energia S/A had signed a contract with Ecopart (formerly called Ecoinvest Carbon) to register Ibirama project under CDM on 06/07/2005. (xi) Evidence of the turbines specifications are attached to this response (as informed in item (i)). Reservoir area of the project was corrected in the new version of the PDD (version 2) according to the Construction License issued.	published by Eletrobrás and the Brazilian Mines and Energy Ministry /64/. The referred publication presents an estimated value of 5% of the total investment for annual O&M costs as reference for the feasibility/financial analysis of these types of projects in Brazil. Therefore, as the adjusted O&M value of 4.38% used by the project participants in the cash flow of the financial analysis spreadsheet /2/ is lower than the 5% suggested by the study published by Eletrobrás and the Brazilian Mines and Energy Ministry /64/, this approach is therefore considered conservative and appropriate by DNV; - Taxes: Taxes are divided between taxes applied in the net income and in the energy sales. For the taxes applied in the net income, DNV was able to confirm the revenue base for social taxes (CSLL) of 12% and the social taxes of 9% [1.08% = 9% (social taxes) x 12% (revenue base for social taxes – CSLL)] /45/, the revenue base for income taxes of 8% and the income taxes of 25% /46/. The taxes applied in the energy sales of 3.65% was calculated based on the "Employees' Profit Participation Program" ("Programa de Integração Social – PIS") of 0.65% /43/ and the tax for social security financing ("Contribuição para o Financiamento da Seguridade Social – COFINS") of 3% /44/.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			DNV has assessed and confirmed that the total installed capacity of the project is 21.75 MW /24/ /25/, with a predicted power supply to the grid of 121 939 MWh/year /33/ and an expected load factor of 64% /34/. A copy of the "Minutes of Meeting" needs to be provided to DNV. The expected operational lifetime of the project activity is 23 years as per ANEEL's Resolution nr. 24, issued on 27 January 2004 /32/, which states that the project concession is valid for 30 years from the issuance date of the resolution. As mentioned in section B.5 of the PDD /1/, project sponsor had previous experience and knowledge of the CDM incentives through the registration of the project "Araputanga Centrais Elétricas S. A. - ARAPUCEL - Small Hydroelectric Power Plants Project", on 15 December 2006. In addition, Ibirama Energia S/A had signed a contract with Ecopart (formerly called Ecoinvest Carbon) to register Ibirama project under CDM on 6 July 2005. It was confirmed by DNV that the total nominal installed capacity of 21.75 MW for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is based on the information available in the design data sheet of hydraulic machine (hydro turbine) for Ibirama project, rev. A, issued on 1 October 2007, by Voith Siemens (turbine manufacturer) /56/. However, according to the revised "General Guidelines to SSC CDM methodologies" (EB59, Annex 9) /22/, "the

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			rated/installed capacity for renewable energy generating units that involve turbine-generator systems shall be based on the installed/rated capacity of the generator". Therefore, the installed capacity of the project activity was readjusted from 21.75 MW as per the sum of the turbines' nameplate capacities to 21 MW, as per the sum of the 3 generators of 7 MW each (7.780 MVA x 0.9 of power factor = 21 MW). Hence, it was confirmed by DNV that the total nominal installed capacity of 21 MW for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is based on the information available in the identification nameplate containing the generators' technical specification, dated 17 July 2009 /67/. The PDD /1/ was revised in order to correct the information regarding the reservoir area of 0.13 km^2 as presented in the Installation License issued on 18 February 2009 (LAI N°0013/09) /26/. Therefore this CL is closed.
CL 8 Project participants are requested to provide the feasibility study made for Ibirama small hydroelectric project.	B.3.4	PPs response: 02/02/2010 Project design prepared by Engevix Engenharia Ltda. and Mazzarollo, volume I, dated November 2001.	Project participants provided the project design prepared by Engevix Engenharia Ltda. and Mazzarollo, dated November 2001 /14/. Therefore this CL is closed.
CL 9 Project participants are requested to provide documental evidences and/or references in order to justify the expected	B.5.1 B.5.2 B.5.3	PPs response: 02/02/2010 The estimated annual electricity delivery to the grid presented in the PDD (version 1) was based on	The documents ANEEL Resolution nr. 65 dated 25 May 25, 2004 /33/ and ANEEL Ordinance nr. 1 368, issued on 27 June 2006 /34/ detemine 121 939

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
annual electricity delivery to the grid by the project activity presented as 121 713 MWh/year.		the energy assured of the project of 121.939 MWh/year (as established by the ANEEL Resolution nr. 65 dated May 25th, 2004) minus the plant use electricity (estimated in 229MWh/year). However, the ANEEL Ordinance nr. 1,368, issued on June 27th, 2006, authorized 13.92 MW-ave to be commercialized in the energy auctions for new projects, which results in 13.92 x 8,760 hours of operation in a year = 121.939 MWh/year, *i.e.*, the same quantity as established the ANEEL Resolution nr. 65/2004. Since 121.939 MWh/year is the quantity to be delivery to the grid, the discount of the plant use is not needed. Therefore, estimated emission reductions calculation was corrected in the new version of the PDD (version 2) and CERs spreadsheet.	MWh/year delivered to the grid and authorized energy of 13.92 MW. Therefore this CL is closed.
CL 10 Project participants are requested to provide documental evidences and/or references related to the environmental impact monitoring due to the development of Ibirama small hydro power plant.	B.12.1 B.12.2 B.12.3	PPs response: 02/02/2010 The project PBA presents 14 environmental programs, which were approved by FATMA and, therefore, the Construction License was issued considering the 14 programs mentioned in the project PBA as conditionings for the validity of the license. This information was included in the new version of the PDD (version 2). PBA is attached to this response	DNV assessed that the installation license by the environmental entity FATMA just would be granted considering the development and implementation of the environmental programs described on the Basic Environmental Project. Therefore this CL is closed.
CL 11 Project participants are requested to include and update, if necessary, the document that makes reference to the starting date of the project activity presented in section C.1.2 of the PDD.	B.3.4	PPs response: 02/02/2010 Considering DOE's comments in CAR 2, PPs reviewed the starting date of the project activity, i.e, the date when the first order of the main equipment happened (31/08/2007). Ibirama Energética S/A's	The project starting date was amended, considering the date when the first order of the main equipment happened, the contract with Voith Simens on 31 August 2007 /5/. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
		first payment of equipment is attached to this response.	
CL 12 Project participants are requested to include, in section D.2 of the PDD, the reference numbers and dates of issuance of the Preliminary and Installation Licenses.	D.1	PPs response: 02/02/2010 History of the licenses issuance was included in the new version of the PDD (version 2). All licenses were presented during the validation visit.	The PDD was amended and the licenses verified. Therefore this CL is closed.
CL 13 Project participants are requested to include, in Annex 5 of the PDD, the translation of all titles used as references to English language.	NA	PPs response: 02/02/2010 The view of references was changed in the new version of the PDD (version 2) for a better understanding. In addition, titles were translated in the PDD.	The references were added like foot note in the PDD text and are in English language. Annex 5 was updated, presenting now layout of Ibirama small hydro power. Therefore this CL is closed.
CL 14 Project participant is requested to explain the following: - Why it is considered an installed capacity of 21 MW if three turbines with 7.25MW will be installed? - The calibration will occur every 2 years (it is in red)? - In the financial analysis spreadsheet, why it was estimated that 113 880 MWh of energy produced will be sold in the regulated market and 8 067MWh of the energy produced will be sold in the free market? - Explain the following in the monitoring plan: "Each SHPP will have a meter and there will be two meters (principal and backup) utilized for billing from Centrais Elétricas Matogrossenses S/A. Before the operations start, CCEE demands that these meters are calibrated by an entity with Rede Brasileira de Calibração (RBC) credential. Measurements will be controlled in real time by the Operation and Management Center (COG) in Cuiabá, capital of Mato Grosso state".	A.3.3 B.3.3 B.10.4 B.10.5 B.10.8	PPs response: 02/02/2010 Considering CL 14, PPs clarify that: 5 Although the total power of turbines (3 x 7.250 MW) does not correspond exactly to the installed capacity of the project (21 MW), Ibirama project is authorized to produce electricity from 21 MW by ANEEL and FATMA. In addition, the energy assured used to estimate the electricity exported to the grid is the same. 6 Meters calibration will be made according to the National Operator System (in a free translation of the Portuguese *Operador Nacional do Sistema Elétrico*) recommendations and procedures. According to the "Sub-módulo 12.3 - Metering System Maintenance for Invoicing" (in a free translation from the Portuguese *Manutenção do*	It was clarified that the total nominal installed capacity of 21.75 MW for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is based on the information available in the design data sheet of hydraulic machine (hydro turbine) for Ibirama project, rev. A, issued on 1 October 2007, by Voith Siemens (turbine manufacturer) /56/. The referred document provides technical details of each hydro turbine, including and confirming the rated output capacity (nominal installed capacity) of 7 250 kW or 7.25 MW per turbine. Hence, by summing the three turbines with nominal installed capacity of 7.25MW each, this results in a total nominal capacity of 21.75 MW for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity. However, according to the revised "General Guidelines to SSC CDM methodologies" (EB59, Annex 9) /22/, "the rated/installed capacity for renewable energy

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
		Sistema de Medição para Faturamento), calibration shall be made every 2 (two) years. This information was included in the new version of the PDD (version 2). Periodicity of meters calibration was included in black. 7 Considering that the energy assured of Ibirama is 13.92 MW-ave and that the project sold in the energy auction 13 MW-ave, the 8,067 MWh corresponds to the complement of the energy produced by the project activity. 8 This information was reviewed in the new version of the PDD (version 2).	generating units that involve turbine-generator systems shall be based on the installed/rated capacity of the generator". Therefore, the installed capacity of the project activity was readjusted from 21.75 MW as per the sum of the turbines' nameplate capacities to 21 MW, as per the sum of the 3 generators of 7 MW each (7.780 MVA x 0.9 of power factor = 21 MW). Hence, it was confirmed by DNV that the total nominal installed capacity of 21 MW for Ibirama Small Hydropower Plant - a Brennand CDM Project Activity is based on the information available in the identification nameplate containing the generators' technical specification, dated 17 July 2009 /67/. Section B.7.2 of the PDD was updated in order to confirm that the power meters to be used for monitoring the net electricity to be dispatched to the grid will be calibrated once every 2 years by CELESC (Centrais Elétricas de Santa Catarina S/A), which is the electricity's transmission and distribution company of Santa Catarina State. The calibration frequency of once every 2 years is based on the National Standard "Procedimentos de Rede" set by the Grid Operator – Operador Nacional do Sistema (ONS) /57/, which represents good monitoring practices. It was clarified by the project participants that the amunt of 113 880 MWh of energy to be produced and sold in the regulated market refers to the energy auction of 13 MW-ave /36/ and the remaining estimated amount of 8 067 MWh of the energy to be produced and sold in the free market refers to the

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
			difference between the 13 MW-ave /36/ as per the energy auction and the the energy assured of 13.92 MW-ave as per ANEEL for Ibirama project /34/. Section B.7.2 of the PDD was updated in order to provide further details regarding the monitoring plan. Therefore this CL is closed.
CL 15 According to the first version of the financial analysis spreadsheet named "SHPP Ibirama (25 years).xls", the "Inputs" worksheet states that there were two options for selling the electricity produced by the project activity to the market: • Through the "Regulated Market": The tariff addopted was 148.48 BRL/MWh that was expected to be the energy tariff in regulated market on 2009, and; • Through the "Free Market": An energy tariff of 148.5 BRL/MWh to the energy sold in the free market. However, the latest version of the financial spreadsheet named "Ibirama_Cash flow-sens analysis_v.6.1.xls" applies an energy tariff of 114.00 BRL/MWh based on the weighted average of the energy prices negotiated in the Brazilian energy auction destined to new hydro power plant projects in 2005. Therefore, project participants is requested to explain the reasons for changing the energy tariff applied in the "Inputs" worksheet of the financial analysis spreadsheet of the project activity.	NA	Considering the differences of input data between the first version of the PDD and the PDD (version 6), PPs clarify that the main difference is related to the project investment and energy price. The IRR calculated and presented in the first version of the PDD considered the investment based on the most recent information available during validation (BRL 106MM). However, the actual investment of Ibirama project is BRL120MM as demonstrated and checked through the financing contract and its addendum. The same occurred to the energy price. The energy price considered in the first version of the PDD was based on the energy price negotiated during the 1st energy auction for alternative sources adjusted to the time of the CDM validation. However, based on the statement of the "guidelines on the assessment of investment analysis" (§6): "*Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant*", PPs reviewed the financial analysis considering the decision-making context and, therefore, considering data available at the time of the investment decision. If energy price of the energy auction was used	The price at which the IRR reaches the benchmark of 19.53% is at BRL 135.45/MWh, but the most likely price is BRL 114.07/MWh, which is based on the energy auction held on 16 December 2005 for new hydro power plant projects adjusted to the General Market Price Index (Índice Geral de Preços de Mercado - IGP-M) and it results in an IRR of 14.25%. The electricity sale price of 135.45 BRL/MWh is not a likely value to be achieved and this was justified through the following documental evidences: As per the results of the energy auctions promoted by the government for the electricity supply for the period from 2008 to 2012 demonstrates that the highest energy price from hydro power projects was BRL 129.14/MWh for 2012. In addition, as per the energy auction for alternative energy sources only (for small-hydro as Ibirama project, wind and biomass), the average of electricity price was BRL 137.62/MWh; if only hydro power plants were considered, the result is approximately BRL 135/MWh.Therefore, DNV considers that the enegy tariff adopted in the feasibility study is adequated and conservative.

Draft report clarifications and corrective action requests by validation team	Reference to Table 2	Summary of project owner response	Validation team conclusion
		(although the negotiation of electricity occurred after the decision making), for a reasonable comparison (it is not reasonable to compare values from different time), the price should be adjusted to inflation at the time of the investment decision and, therefore, the value would be around BRL 128/MWh. The same occurred with the total investment, which instead of BRL 120MM, we have BRL89 MM considering the time of the investment decision. This information is presented in the sensitivity analysis of the PDD. All input data considered in the revision of the financial analysis is based on documented and official source as can be checked by DOE. For full analysis, PPs also presented documents for crossing-check purposes at the time of the investment decision and the actual values incurred for the project implementation (*e.g.* financing contract and energy price negotiated, even these documents were made available after the investment decision).	Therefore this CL is closed.

APPENDIX C

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

David Freire da Costa

Mr. David Freire da Costa: holds a Bachelor's Degree in Chemical Engineering and has a Master's Degree in Energy. Having an overall experience of around 10 years. Prior to joining DNV having 1 year experience in gas industry, 3 years experience in biomass and 3 years experience in CDM project developing covering the development, research and implementation of the project "Electric Energy Generation with Biogas from Sewage Treatment" at the Sewage Treatment Station of SABESP (Basic Sanitation Company of São Paulo State) and the development of Project Design Documents - PDDs, helping with the registration of more than 30 CDM projects and assisting the verification processes in order to assure the issuance of CERs – Certified Emissions Reductions under UNFCCC's rules.

He has experience of around 2.5 years in validation and verification of numerous CDM projects in DNV, both in Brazil & abroad.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in energy generation from renewable energy sources.

A native of Brazil, he speaks Portuguese, English and Spanish.

Fabiana Philipi

Holds a bachelor degree in Environmental Engineering and has been working as a Greenhouse Gas – GHG Auditor in the Climate Change Services – CCS Business Area of Det Norske Veritas – DNV, since April 2009.

Prior to joining DNV, Fabiana has been working with Green House Gas reduction projects since 2006. Her first experience was in the Brazilian Mercantile and Future Exchange, where worked in the intern position doing researches of the UNFCCC methodologies. After it, she moved to SGS where she participated of the validation and verification of CDM projects, including hydro and wind energy and landfill. Then she moved to Voltalia developing PDDs (Project Design Documents) of small hydro projects, assisting them until registered in the UNFCCC.

Felipe Antunes

Holds a Master's Degree in Production Engineering (Quality) and a Post Graduate Diploma in Environmental Management and Industrial Waste Management and Treatment. Possesses an International experience of more than 10 years in the field of quality and environmental auditing, working two years as the responsible of the QMS of Rede Metrológica RS and since 1999 as a QMS and EMS auditor in DNV.

He has experience of more than 3 years in validation and verification of numerous CDM projects in DNV, both in South America & abroad. He has also been actively involved in Management System Audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 10 years in DNV.

His qualification and experience in CDM demonstrate him sufficient sectoral competence in energy generation from renewable energy sources, waste handling and disposal, and animal waste management.

CERTIFICATE OF COMPETENCE

Lumir Němeček

Mr. Lumír Nemecek holds a MSc. Degree in Energy industries. Having an overall experience of around 32 years. Prior to joining DNV having 33 years experience in nuclear, hydro, fossil-fuelled power and other renewables . He worked for large and medium size energy companies in different roles and capacities including project management, project engineering and consulting. He has acquired his experience in energy industry markets from both Subcontractor and Client Company's perspective combined with understanding of business climate and adopted practice covering
1. Staff member of power plant during the construction - direct participation on construction and equipment installations, supervision of suppliers and designers, safety aspects of construction and operation.
2. Energy utility (10yrs) - Project preparation and project management activities, preparation and supervision of the plants technical development, site visits, supervision of suppliers installations., bidding procedures and construction preparation of new power plants, plant operations support, project management, supervision individual plants technical departments.
3. Consultancy activities in energy sector (11yrs) - feasibility studies, site visits, supervision of suppliers, supervision of installations, bidding procedures, supervision of reengineering and plant renovations, time scheduling, administrative and legal procedures during projects preparations
4. Export/import of complete power plants, equipment and technology (5yrs) Bidding procedures, preparation and realization supervision of power facilities, project management, planning, monitoring, and reporting.

He has experience of around 1 year in validation and verification of numerous CDM projects. His qualification, industrial experience and experience in CDM demonstrate him sufficient sectorial competence in 1.1, 1.2 ."

Andrea Leiroz

Andrea Leiroz holds a Bachelor's Degree in Chemical Engineering, Master Degree in Material Science and Doctor Degree in Mechanical Engineering having an overall experience of around thirteen years.

She has experience of around 4 years in validation and verification of numerous CDM projects in DNV, both in Brazil & abroad.

Her qualification, experience in CDM demonstrates her sufficient sectoral competence in Energy Generation from renewable energy sources, Waste handling and disposal and Animal waste management.