VALIDATION REPORT

ENERGISA RIO GRANDE SHPPS, IN BRAZIL

REPORT NO. 2011-0163

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Approved by Edwin Aalders	Organisational unit: DNV KEMA Energy & Sustainability Accredited Climate Change Servce
Client: Energisa Soluções S.A.	Client ref.: Lacerda Lima

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Summary:
Project Name: Energisa Rio Grande SHPPs
Country: Brazil
Methodology: ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
Version: 12.2.0
GHG reducing Measure/Technology: Grid-connected electricity generation from hydro power (Sectoral Scope 1)
ER estimate: 11 189 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 for project activity "Energisa Rio Grande SHPPs" in Brazil, as described in the PDD, version 3 of 2 March 2012, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0002 version 12.2.0. Hence DNV requests the registration of the project as a CDM project activity. Prior to the submission of the final 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

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Abbreviations

ABNT	Brazilian Association of Technical Standards
ANEEL	Brazilian National Electric Energy Agency
BM	Build Margin
BNDES	Brazilian Development Bank
BOVESPA	Brazilian Stock Exchange
BRL	Brazilian Real; Brazilian currency
CAPM	Capital Asset Pricing Model
CAR	Corrective Action Request
CCEE	Brazilian Chamber of Commerce of Electric Energy
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CM	Combined margin
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COFINS	Tax of the Contribution for the Financing of Social Security
CONAMA	Brazilian National Environmental Council
CSLL	Tax of the Social Contribution over Net Profit
DNA	Designated National Authority
DNV	Det Norske Veritas
EF	Emission Factor
EMBI+	Emerging Markets Bond Index
FAR	Forward Action Request
FEEMA	Foundation of Environmental Engineering of the State of Rio de Janeiro
FGV	Foundation Getúlio Vargas
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
ICMS	Tax on Goods and Services
IGP-M	Index of General Prices of the Market – inflation index
INEA	Environmental Institute of the State of Rio de Janeiro
IPCA	Index of Prices for the Wide Consumer – inflation index
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
LoA	Letter of Approval
Ltda.	Public Limited Company (plc)
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating margin
ONS	Brazilian National Operator of the Electric System
PASEP	Tax of the Heritage of Public Server Program
PDD	Project Design Document

PIS	Tax of the Social Integration Program
PPA	Power Purchase Agreement
PROINFA	Program of Incentives to Alternative Sources of Energy
SHPP	Small Hydro Power Plant
SIN	Brazilian National Integrated System – Electricity Grid of Brazil
tCO_2e	Tonnes of CO_2 equivalents
TIPS	USA Treasury Inflation-Protected Securities
TJLP	BNDES' Long Term Interest Rate
TSFEE	Tax on regulation of electric energy services
TUSD	Tax on use of distribution system
UNFCCC	United Nations Framework Convention on Climate Change
WACC	Weighted Average Cost of Capital

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Energisa Rio Grande SHPPs" 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, which fulfils the participation criteria. The project is unilateral and there is no Annex I Party participating.

The project correctly applies the baseline and monitoring methodology ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 12.2.0.

The project activity is composed of three small hydro plants with: 9.97 MW (SHPP Caju), 8.27 MW (SHPP Santo Antônio) and 13.36 MW (SHPP São Sebastião do Alto), totalling 31.6 MW of installed capacity. By generating electricity from hydro power and displacing electricity from the grid that is partially generated from fossil fuels, the project results in reductions of CO_2 emissions that are real, measurable and give 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 11 189 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 are able to implement the monitoring plan.

In summary, it is DNV's opinion that the project activity "Energisa Rio Grande SHPPs" in Brazil, as described in the PDD, version 3 dated 2 March 2012, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0002, version 12.2.0. Hence, DNV requests the registration of the project as a CDM project activity.

Prior to the submission of the final 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, 9 April 2012.

Gabriel Baines
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DNV Rio de Janeiro, Brazil

Edwin Aalders
Approver,
DNV Climate Change Services AS

2 INTRODUCTION

Energisa Soluções S.A., the owner of Energisa Geração Rio Grande S.A. /17/ has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the "Energisa Rio Grande SHPPs" project in 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 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). 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 12.2.0 /24/. The validation was based on the recommendations in the *"Validation and Verification Manual"*, version 1.2 /22/.

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

Some links might open only when copied and pasted in the address bar of your browser.

/1/ Ecopart Assessoria em Negócios Empresariais Ltda.*: CDM-PDD for project activity* "Energisa Rio Grande SHPPs" in Brazil, version 1 dated 11 August 2010 and version 3 dated 2 March 2012.
File name: "Energisa_PDD_v3_2012.03.02.doc".

/2/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Emission reduction calculation spreadsheet,* version 3, dated 2 March 2012. File name: "Energisa_CERs_v3_2012.03.02.xls".

/3/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Benchmark calculation spreadsheet,* version 2, dated 1 March 2012. File name: "WACC ElectricGen_Energisa_01.03.2012.xls".

/4/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Financial analysis calculation spreadsheets,* version 2, dated 1 March 2012. File names: "FCF_EQAO_Caju_v2_01.03.2012.xls, FCF_EQAO_SantoAntonio_v2_01.03.2012.xls and FCF_EQAO_SãoSebastiadoAlto_v2_01.03.2012.xls".

/5/ Energisa Geração Rio Grande S.A.: *Meeting of the Board,* version 1, dated 17 July 2008.
File name: "Ata AGE ESOL 17072008.pdf".
This is the project investment decision date.

/6/ BNDES: *Contract of Financing,* between BNDES and Energisa Geração Rio Grande S.A., granting financing for the projects, version 1, dated 16 September 2009.
File name: "Contract BNDES final signed.pdf".
This is the project starting date.

/7/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Prior Consideration Notification form,* submitted to UNFCCC Secretariat for Prior Consideration of CDM and confirmed by UNFCCC Secretariat via email on 2 September 2009.

/8/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Prior Consideration Notification form,* submitted to the DNA of Brazil for demonstration and assessment of prior

consideration of CDM and confirmed by the DNA of Brazil via email on 9 September 2009.

/9/ Environmental Licences :

FEEMA: *Environmental Installation Licenses*

- Santo Antônio SHPP Installation License – N° FE 013122 issued by FEEMA on 3 August 2007 and valid until 2 August 2010.
- Caju SHPP Installation License – N° FE 013124 issued by FEEMA on 3 August 2007 and valid until 2 August 2010.
- São Sebastião do Alto SHPP Installation License – N° FE 012406 issued by FEEMA on 6 March 2007 and valid until 5 March 2010.

INEA: *Environmental Operation Licenses:*

- Santo Antônio SHPP Operation License – N° IN 018481 issued by INEA on 19 December 2011 and valid until 19 December 2012.
- Caju SHPP Operation License – N° IN 003282 issued by INEA on 26 November 2010 and valid until 25 November 2012.
- São Sebastião do Alto SHPP Operation License – N° IN 003281 issued by INEA on 26 November 2010 and valid until 26 November 2012.

/10/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Receipt of Delivery of Mail*, from 12 to 30 August 2010. Receipts filled by postal service when delivering registered mail (invitation to stakeholder's consultation) to recipients.

/11/ ANEEL: *Decree n° 1*, about the guaranteed energy of the three SHPPs, dated 14 January 2010.

Available at: http://www.aneel.gov.br/cedoc/prt2010001spde.pdf.

/12/ ANEEL: *Lifetime and depreciation of Turbines and Generators*, for equipment of hydro power plants, dated November 2010.

Available at:

http://www.aneel.gov.br/aplicacoes/audiencia/arquivo/2006/012/documento/relatorio_vida_util_volume_2.pdf

/13/ Ecopart Assessoria em Negócios Empresariais Ltda.*: Contracts of Power Purchase Agreement (PPA)*, signed between Energisa Geração Rio Grande S.A. and the following companies:

Date of PPA	Buyer	Start date	End date
18 September 2008	Eaton	1 January 2009	31 December 2020
13 April 2009	Bungee	1 January 2010	31 December 2016
13 April 2009	Telemar	1 August 2010	31 December 2020
25 June 2009	Light Esco	1 January 2010	31 December 2015
25 July 2009	Carrefour	1 March 2010	30 November 2023

/14/ Energisa Geração Rio Grande S.A.: *EPC Contracts,* between Energisa Geração Rio Grande S.A. and WEG Energy, MEK Engineering and Consulting Ltda., EMPA Services of Engineering, ENGECON Constructers Engineers Ltda., Engineering SERCCOM Ltda. (the EPC contractors) for the acquisition of the equipment, civil works, electromechanical assembling, executive project and management of integrated works during the construction of the SHPPs, all on its version 1 dated 24 October 2008.

File names: "Contract EPC PCH Caju.pdf"; "Contract EPC PCH São Sebastião Alto.pdf" and "Contract EPC PCH Santo Antônio.pdf".

This contract had a clause stating that it would only come into force when "Energisa Geração Rio Grande S.A." was successful in granting a financing for the project.

/15/ Energisa Geração Rio Grande S.A.: *Connection Contract,* between Companhia Força e Luz Cataguazes-Leopoldina (the previous name of Energisa Geração Rio Grande S.A.) and Zona da Mata Geração for transmission of electricity, version 1 dated 1 March 2007.

File name: "Contract Zona da Mata Generation.pdf"

This contract of connection was signed for another project from Energisa Geração Rio Grande S.A. and was used for estimation of connection costs of the proposed project.

/16/ Hicon Engineering: *Internal consumption and transmission losses,* version 1, dated 3 October 2011.

File names: "Calculation of guaranteed energy for SHPP Caju.pdf", "Calculation of guaranteed energy for SHPP Santo Antônio.pdf" and "Calculation of guaranteed energy for SHPP São Sebastião do Alto.pdf"

/17/ Energisa Geração Rio Grande S.A.: *Amendments for additional work due to storms and relationship between* Energisa Geração Rio Grande S.A. and Energisa Soluções S.A., version 1, dated 22 June 2011.

File names: "Amendment SHPP Caju.pdf", "Amendment SHPP Santo Antônio.pdf" and "Amendment SHPP São Sebastião do Alto.pdf"

/18/ Energisa Geração Rio Grande S.A.: *Common Practice,* version 1, dated 1 March 2012.

File name: "Energisa_Prática Comum_2012.03.01.xlsx"

/19/ Energisa Geração Rio Grande S.A.: *Diesel Generators emission,* version 1, dated 20 March 2012.

File name: "Emissão Gerador a Diesel_2012.03.20.xlsx"

/20/ Energisa Geração Rio Grande S.A. and Itaú Soluções S.A.: *Insurance Certification of Energisa Rio Grande SHPPs,* version 1, dated 13 March 2012.

File name: "Certificado 3424-RO_2012.03.13.pdf"

3.1.2 LETTERS OF APPROVAL

/21/ Interministerial Commission of Global Climate Change (DNA of Brazil): *Letter of approval:* Prior to the submission of the final 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.

3.1.3 METHODOLOGIES, TOOLS AND OTHER GUIDANCE BY THE CDM EXECUTIVE BOARD

/22/ CDM Executive Board: *"Validation and Verification Manual"*, version 1.2, adopted at EB55 Annex 1, dated 30 July 2010.

/23/ CDM Executive Board: *"Glossary of CDM terms"*, version 5, adopted at EB47, paragraph 71, dated 19 August 2009.

/24/ CDM Executive Board: *Baseline and monitoring methodology ACM0002, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"*, version 12.2.0, adopted at EB65, Annex 16, 21 November 2011.

/25/ CDM Executive Board: *"Tool for the demonstration and assessment of additionality"* version 6.0.0, adopted at EB65 Annex 21, dated 25 November 2011.

/26/ CDM Executive Board: *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1, adopted at EB63 Annex 19, dated 29 September 2011.

/27/ CDM Executive Board: *"Guidelines on the demonstration and assessment of prior consideration of the CDM"*, version 4.0, adopted at EB62 Annex 13, dated 15 July 2011.

/28/ CDM Executive Board: *"Guidelines on the Assessment of Investment Analysis"*, version 5.0, adopted at EB62 Annex 5, 15 July 2011.

/29/ CDM Executive Board: *"Guidelines on the Reporting and Validation of Plant Load Factors"*, version 1, adopted at EB48 Annex 11, 17 July 2009.

/30/ CDM Executive Board: *"General Guidelines to SSC CDM Methodologies"*, version 17, adopted at EB61 Annex 21, 3 June 2011.

3.1.4 DOCUMENTATION USED BY DNV TO VALIDATE / CROSS-CHECK THE INFORMATION PROVIDED BY THE PROJECT PARTICIPANTS

/31/ Brazilian Ministry of Environment, *Resolution CONAMA nº 001*, of 23 January 1986 about Environmental Impact Assessments. Available at: http://www.mma.gov.br/port/conama/res/res86/res0186.html

/32/ Brazilian Ministry of Environment: *Renewable Sources of Energy in Brazil*, book published in 2003.

/33/ ANEEL: *Authorization to establishment as an independent producer of electrical energy:*

- Caju SHHP ANEEL authorization resolution n° 1 452, issued on 8 July 2008.

  Available at: http://www.aneel.gov.br/cedoc/rea20081452.pdf

- Santo Antônio SHHP ANEEL authorization resolution n° 1 454, issued on 8 July 2008.

  Available at: http://www.aneel.gov.br/cedoc/rea20081454.pdf

- São Sebastião do Alto SHHP ANEEL authorization resolution n°1453, issued on 8 July 2008.

  Available at: http://www.aneel.gov.br/cedoc/rea20081453.pdf

/34/ ANEEL: *Dates of commissioning (after storms that destroyed part of the SHPPs):*

- SHPP Caju: 17 March 2011 (1st and 2nd units), as per ANEEL dispatch n°1 170, issued on 16 March 2011.

  Available at: www.aneel.gov.br/cedoc/dsp20111170.pdf

- SHPP Santo Antônio: 4 February 2012 (1st and 2nd units), as per ANEEL dispatch n° 399, issued on 3 February 2012.

  Available at: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/GeracaoTipoFase.asp?tipo=5&fase=3

- SHPP São Sebastião do Alto: 1 September 2011 (1st unit) as per ANEEL dispatch n° 3 548, issued on 31 August 2011 and 19 August 2011 (2nd unit), as per ANEEL dispatch n° 3395, issued on 18 August 2011.

  Available at: http://www.aneel.gov.br/cedoc/dsp20113548.pdf and http://www.aneel.gov.br/cedoc/dsp20113395.pdf

/35/ Presidency of Brazil: *Federal Decree n°5025, about PROINFA,* dated March 2004. Available at: http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/decreto/d5025.htm

/36/ Interministerial Commission of Global Climate Change (DNA of Brazil)

- *Emission factor for power grid of Brazil in 2009*, published in 2010. Available at: http://www.mct.gov.br/index.php/content/view/74689.html
- *Clarification note on the national grid emission factor calculation*, dated 29 April 2008. Available at: http://www.mct.gov.br/upd_blob/0024/24562.pdf

/37/ Interministerial Commission of Global Climate Change (DNA of Brazil) *Information for CDM Projects*, updated until 2012. Available at: http://www.mct.gov.br/index.php/content/view/4016.html#ancora

/38/ Brazilian National Operator of the Electric System: *Grid Procedures*, Dispatch nº 2744, dated 15 September 2010.

Available at: www.ons.org.br/procedimentos/index.aspx

/39/ CCEE Energy Auctions:

- *1st Brazilian Auction of Alternative Energy - Results*, dated 27 February 2007 – average price: BRL 139.12. Available at: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=3cb3f87495bd1110VgnVCM1000005e01010aRCRD
- *4th Brazilian Auction of New Energy - Results*, dated 26 July 2007 – average price: BRL 136.00. Available at: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=545d18816ded2110VgnVCM1000005e01010aRCRD
- *2nd Brazilian Auction of Reserve Energy - Auction nº 003/2009 - LER-2009 Results*, dated 14 December 2009 - average price: BRL 148.39. Available at: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=ec41d74d98114210VgnVCM1000005e01010aRCRD
- *3rd Brazilian Auction of Renewable Energy - Auction nº 2013-EOL20 – Results*, dated 26 August 2010 - average price: BRL 154.40. Available at:

http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=b32c645eb56ba210VgnVCM1000005e01010aRCRD

- *11th Brazilian Auction of New Energy – Auction nº 04/2010 - Results*, dated 15 December 2010 - average price: BRL 104.00. Available at: http://www.ccee.org.br/cceeinterdsm/v/index.jsp?contentType=RESULTADO_LEILAO&vgnextoid=1ece84227d3fc210VgnVCM1000005e01010aRCRD&qryRESULTADO-LEILAO-CD-RESULTADO-LEILAO=6adf84227d3fc210VgnVCM1000005e01010a____&x=15&y=11

/40/ Brazilian National Treasury

- *Normative Instruction nº 247, about taxes of Social Integration Program (PIS), Heritage of Public Server Program (PASEP) and Contribution for the Financing of Social Security (COFINS)*, dated 21 November 2002. Available at: http://www.receita.fazenda.gov.br/legislacao/ins/2002/in2472002.htm
- *Article n° 3 of Law nº 11727, for social contribution on net profit (CSLL)*, dated 23 June 2008. Available at: http://www.receita.fazenda.gov.br/aliquotas/ContribCsll/Aliquotas.htm

/41/ Rio de Janeiro State Hall, *law nº 4086/2003, for tax on goods and services (ICMS)*, dated 13 March 2003. Available at: http://alerjln1.alerj.rj.gov.br/contlei.nsf/c8aa0900025feef6032564ec0060dfff/c0ff48c7f0d235a283256cf500664206?OpenDocument

/42/ Brazilian National Treasury, *information on legislation about presumed profit companies*:

- *Note n° 517*, dated 2011. Available at: http://www.receita.fazenda.gov.br/PessoaJuridica/DIPJ/2005/PergResp2005/pr517a555.htm
- *Clarifications*, dated 31 December 2010. Available at: http://www.receita.fazenda.gov.br/Publico/perguntao/dipj2011/CapituloXIII-IRPJ-LucroPresumido2011.pdf

/43/ Aswath Damodaran: *Calculation of equity risk premium*, registry of the USA Treasury Yields, from 1927 to 2012.
Available at: http://pages.stern.nyu.edu/~adamodar/

/44/ Standard and Poor's: *S&P 500 Index*, index of the prices of the 500 large-cap common stocks actively traded in the United States, from 1957 to 2012.
Available at: http://www.standardandpoors.com/indices/sp-500/en/us/?indexId=spusa-500-usduf--p-us-l--

/45/ JP Morgan: *EMBI+*, index of the bonds from emerging markets, from 2003 to 2007. Available at: http://www.jpmorgan.com/pages/jpmorgan/investbk/solutions/research/EMBI

/46/ USA Treasury: *Treasury Inflation-Protected Securities (TIPS)*, for the year of 2007. Available at: http://www.treasurydirect.gov/indiv/products/prod_tips_glance.htm

/47/ Brazilian National Treasury: *Interest rates of general lending rate SELIC*, from 1995 to 2011. Available at: http://www.receita.fazenda.gov.br/pagamentos/jrselic.htm

/48/ Central Bank of Brazil: *Historical of target inflation rates*, from 1999 to 2012. Available at : http://www.bcb.gov.br/Pec/metas/TabelaMetaseResultados.pdf

/49/ BNDES: *Long Term Interest Rates,* from 2003 to 2007, available at: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Custos_Financeiros/Taxa_de_Juros_de_Longo_Prazo_TJLP/index.html

/50/ BNDES: *Financial Conditions for SHPPs*, financing costs charged for the year of 2008. Available at: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energias_alternativas.html

/51/ ANEEL: *Bank of Information of Generation*, about the capacity of generation of electricity in Brazil, dated 2011.
Available at: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp

/52/ ANEEL: *Official Decrees, Dispatches and Notes about Tariffs*:

- *Normative Resolution nº 77* about discount in tariff for alternative sources, dated 18 August 2004. Available at: http://www.aneel.gov.br/cedoc/ren2004077.pdf
- *Decree nº 2410*, creating the TSFEE tariff, dated 28 November 1997. Available at: http://www.aneel.gov.br/biblioteca/remissiva_legi.cfm?valida=9396
- *Dispatch nº 4774*, about the values of the TSFEE tariff, dated 22 December 2009. Available at: http://www3.aneel.gov.br/netacgi/cobaia.exe?s4=hidroluz&s5=LEGISLA%C7%C3O&l=20&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=3&f=G
- *Normative Resolution nº 320*, about charges of the shared installations of generation (nodes of transmission systems) for alternative sources, dated 10 June 2008. Available at: http://www.aneel.gov.br/cedoc/ren2008320.pdf

/53/ ANEEL: about the tariff of use of distribution system (TUSD). Available at: http://www.aneel.gov.br/area.cfm?idArea=96&idPerfil=2

/54/ Foundation Getúlio Vargas: *Cost of Capital for Small Hydroelectric Power Plants in the Clean Development Mechanism Context*, for years 2005 to 2009, dated November 2010.

/55/ Frederico Rosas, independent financial expert for DNV: *Financial Expert Assessment*, approving benchmark and investment analysis presented. Dated 27 February 2012.

/56/ CDM Executive Board: *Energisa Rio Grande SHPPs*:

- Validation page, dated 5 November 2010.
Available at: http://cdm.unfccc.int/Projects/Validation/DB/M3W6EJVBXSP3LXBZIWWZJ8U3CU67BS/view.html
- Prior consideration page, dated 2 September 2009.
Available at: http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

/57/ CDM Executive Board: *Goiandira, Pedra do Garrafão, Pirapetinga and Sítio Grande Small Hydropower Plants Project Activity*: Project page, dated 24 January 2011. Available at: http://cdm.unfccc.int/Projects/DB/SGS-UKL1268728393.62/view

/58/ Brazilian Institute of Geography and Statistics: *Index of Prices for the Wide Consumer (IPCA):* registry from 1979 until 2012. Used mostly to calculate inflation over the regular consumer.

Available at:
http://www.ibge.gov.br/home/estatistica/indicadores/precos/inpc_ipca/defaultinpc.shtm

/59/ Foundation Getúlio Vargas: *Index of General Prices of the Market (IGP-M):* registry from 1989 until 2012. Used mostly to calculate inflation for financial contracts. Available at the homepage of the Central Bank of Brazil: https://www3.bcb.gov.br/CALCIDADAO/publico/exibirFormCorrecaoValores.do?method=exibirFormCorrecaoValores

/60/ Institute of Post-Graduation and Research in Engineering of the State of Rio de Janeiro: *Rains in the Region of Mountains of the State of Rio de Janeiro in 2011*, version 1, dated 16 February 2011. Available at: http://www.coppe.ufrj.br/pdf_revista/relatoriochuvas.pdf

3.2 Follow-up interviews with project stakeholders

On 5 and 6 October 2011, DNV auditors Luis Filipe Tavares and Gabriel Baines visited the Energisa Geração Rio Grande S.A.'s office at the city of Rio de Janeiro and the SHPPs at São Sebastião do Alto and Bom Jardim, in the state of Rio de Janeiro, Brazil and performed interviews with project stakeholders.

	Date	Name	Organization	Topic
/61/	5 and 6 October 2011	Gustavo Nasser Moreira	Energisa Geração Rio Grande S.A.	• Project Design and adopted technology • Determination of baseline scenario • Demonstration of additionality • Emission reduction calculations • Application of monitoring methodology as well as design and application of the monitoring plan • Assessment of environmental impacts, environmental licences and legal compliance • Stakeholders consultation process • Financial analysis
/62/		Bruna Luiza Marigheto	Ecopart Assessoria em Negócios Empresariais Ltda.	
/63/		Marco Antonio Mazaferro		

3.3 Resolution of outstanding issues

The objective of this phase of the validation is to resolve any outstanding issues which need to be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the 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 project activity "Energisa Rio Grande SHPPs" in Brazil is enclosed in Appendix A to this report.

Table 2 of the validation protocol documents the findings of the desk review of the project design documentation and follow-up interviews with project stakeholders. Any findings raised in Table 2 are listed in Table 3 of the protocol, and changes to the description of the project design as a result of these findings will be addressed in Table 3. Table 2 thus may not reflect all aspects of the project as described in the final PDD submitted for registration.

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 **corrective 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	Financial expertise
Team leader (Validator)	Leiroz	Andrea	Brazil	✓		✓	✓		✓	
Validator	Baines	Gabriel	Brazil	✓	✓	✓			✓	
Validator	Tavares	Luis	Brazil	✓	✓				✓	
Financial Expert	Rosas	Frederico	Brazil							✓
Technical reviewer	Zhang (Applicant)	Lei Lucas	China					✓	✓	
Technical reviewer	Aalders	Edwin	Norway					✓	✓	

The qualification of each individual validation team member is detailed in Appendix B 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 final validation findings relate to the project design as documented and described in the PDD, version 3 dated 2 March 2012 /1/.

4.1 Participation requirements

The project participants are Energisa Geração Rio Grande S.A. and Ecopart Assessoria em Negócios Empresariais Ltda. from host Party Brazil. The host Party (Brazil) meets all relevant participation requirements. The project is unilateral and there is no Annex I Party participating.

The project does not involve any public funding from an Annex I Party – the project sought financing with the Brazilian Development Bank (BNDES) only - and the validation did not reveal any information that indicated that the project can be seen as a diversion of official development assistance (ODA) funding towards Brazil.

Prior to the submission of the final 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.

4.2 Project design

The "Energisa Rio Grande SHPPs" project is composed of three greenfield small hydro plants and are located in:

- SHPP Caju, located on the city of São Sebastião do Alto and Santa Maria Madalena;
- SHPP Santo Antônio, located on the city of Bom Jardim;
- SHPP São Sebastião do Alto, located on the city of São Sebastião do Alto e Santa Maria Madalena;

All located in the state of Rio de Janeiro, Brazil.

The geographical coordinates of the SHPPs of the proposed project activity are SHHP Caju: Latitude -21.8967° and Longitude: -42.0789°, SHPP Santo Antônio: Latitude: -22.1367° and Longitude: -42.3481° and SHPP São Sebastião do Alto: Latitude: -21.9358° and Longitude: -42.0883° and were confirmed by DNV through the environmental licences /9/ and ANEEL's authorization to establishment as an independent producer of electrical energy /33/.

Each SHPPs will use two generators SPA 1250 (SHPP Caju), SPA 1120 (SHPP Santo Antônio) and SPA 1400 (SHPP São Sebastião do Alto) and two turbines Kaplan S (in all SHPPs), as DNV confirmed cross-checking the nameplates during the site visit /61/ /62/ /63/.

The installed capacity of each turbine is 5.15 MW (SHPP Caju), 4.30 MW (SHPP Santo Antônio) and 6.90 MW (SHPP São Sebastião do Alto), as DNV confirmed cross-checking the nameplates during the site visit /61/ /62/ /63/.

The installed capacity of each generator is 4.986 MW (SPA 1250 - SHPP Caju), 4.133 MW (SPA 1120 - SHPP Santo Antônio) and 6.679 MW (SPA 1400 - SHPP São Sebastião do Alto), as DNV confirmed cross-checking the nameplates during the site visit /61/ /62/ /63/.

As per *"General Guidelines to SSC CDM Methodologies"* /30/, which is also applied to large scale projects when there is no similar guideline for large scale, "the rated/installed capacity for renewable electricity generating units that involve turbine-generator systems shall be based on the installed/rated capacity of generator". Consequently, the installed capacities of the SHHPs are 9.97 MW (SHPP Caju), 8.27 MW (SHPP Santo Antônio) and 13.36 MW (SHPP São Sebastião do Alto), totalling 31.6 MW /9/ /33/ /61/ /62/ /63/.

Kaplan model turbines are renowned and reliable hydraulic devices utilized not only in Brazil, but at other hydropower plants around the world. It was cross-checked by DNV through the manufacturer's product specifications in the EPC contracts /14/ and the project design engineering listed in the PDD that the project design is deemed to reflect good practices.

The net capacity values are defined by ANEEL /11/ as the assured energy determined by the government for a section of a river, considering 77 years (from 1931 to 2007) of historical data regarding the project's river and other rivers, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned), as the government's mission to optimize the use of natural resources in the country. Therefore, as per ANEEL definition /11/, the electricity to be delivered ($EG_{facility,y}$) to the Brazilian National Interconnected System (SIN) is expected to be 156 103 MWh, corresponding to an average net plant load factor of 58.78% (SHPP Caju), 58.16% (SHPP Santo Antônio) and 53.52% (SHPP São Sebastião do Alto) /11/. This load factor would incur then in net capacities of 5.86 MW (SHPP Caju), 4.81 MW (SHPP Santo Antônio) and 7.15 MW (SHPP São Sebastião do Alto), totalling 17.82 MW /11/. This value was used in the ex-ante emission reduction estimation purposes and for the investment analysis.

However, in the calculation of the project emissions, it was used the expected annual electricity generated (TEG_y) by the project, which is 159 257 MWh, the value before the discount of 2% due to internal consumption and transmission losses /16/, as calculated by third party engineering company Hicon Engineering /16/. The installed capacities before the discount of 2% due to internal consumption and transmission losses /16/ are 5.98 MW (SHPP Caju), 4.91 MW (SHPP Santo Antônio) and 7.29 MW (SHPP São Sebastião do Alto), totalling 18.18 MW.

DNV considered this as correct, since the values were confirmed through their sources /11/ /16/ /61/ /62/ /63/ and it is according to ACM0002 12.2.0 /24/.

Reservoir areas of the SHPP are 1.13 km^2 for SHHP Caju, 1.0 km^2 for SHPP Santo Antônio and 2.7 km^2 for SHPP São Sebastião do Alto - as DNV confirmed through the environmental licenses /9/ - thus producing a power density of 8.82 MW/km^2, 8.27 MW/km^2 and 4.95 MW/km^2, respectively.

The electricity generated by the project will be delivered to the SIN /11/ - which has part of its electricity generated by fossil fuel power plants /51/.

Being a renewable electricity project, the project activity will generate greenhouse gas (GHG) emission reductions by avoiding the CO_2 emissions from the electricity generation by fossil fuel power projects.

The project's system boundaries are clearly defined as the project site and the SIN.

At the time of commencing of validation, the physical implementation of the project had started and was verified during the site visit /61/ /62/ /63/.

The starting date of the proposed project activity was defined as 16 September 2009, the date of signature of the financing contract between Energisa and BNDES /6/.

The expected operational lifetime of the project activity is 30 years (from 2011 to 2031) derived from ANEEL's document "Lifetime and depreciation of Turbines and Generators" /13/.

According to ANEEL's resolutions /33/, all the three plants were expected to become operational until March 2010. However, heavy storms occurred at the region where the SHPPs are located in January 2011 /60/ and caused a delay in the expected schedule originally defined by ANEEL. At that time, the SHPPs were damaged due to the rains and river stream, especially SHPP Santo Antônio. Civil works stopped during a period and scheduled activities were overdue. ANEEL then defined new dates for the start of the SHPPs commercial operation /34/: SHPP Caju: 17 March 2011 (1st and 2nd units), SHPP Santo Antônio: 4 February 2012 (1st and 2nd units) and SHPP São Sebastião do Alto: 1 September 2011 (1st unit) and 19 August 2011 (2nd unit).

A 7-year renewable crediting period was chosen for the project, starting on 1 July 2012 or the registry date of the project activity at the CDM-UNFCCC, whichever is later. DNV considers the chosen crediting starting date deemed to be reasonable. The emission reductions are estimated to be 11 189 tCO_2e per year /2/ /36/, which corresponds to 78 324 tCO_2e over the first seven years of crediting period.

The project is expected to contribute to sustainable development objectives of the Brazilian Government focusing on economic and environmental benefits.

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

4.3 Application of selected baseline and monitoring methodology

The project correctly applies the approved baseline and monitoring methodology *ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"*, version 12.2.0 /24/.

The applied baseline methodology is justified as it has been demonstrated that the project activity ensures that:

Criteria	Outcome
Is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is the installation of three grid-connected and greenfield hydro power plants, as verified through ANEEL's authorization for independent power producer /33/ and the environmental licences /9/. The project is connected to the Brazilian National Interconnected System (SIN) /33/, the electricity grid of Brazil, for which the geographical and system boundaries are

	clearly identified and information on the characteristics of this grid is made available by the ANEEL /51/.
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.	The project activity is the installation of three grid-connected and greenfield hydro power plants, as verified through ANEEL's authorization for independent power producer /33/ and the environmental licences /9/.
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.	Not applicable as the proposed project activity does not correspond to a capacity addition, retrofit or replacement, as verified through ANEEL's authorization for independent power producer /33/ and the environmental licences /9/.

In case of hydro power plants, one of the following conditions must apply: - the project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or - the project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or - the project activity results in new single or multiple reservoirs and the power density of teach reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	Reservoir areas of the SHPP are 1.13 km^2 for SHHP Caju, 1.0 km^2 for SHPP Santo Antônio and 2.7 km^2 for SHPP São Sebastião do Alto, as per the environmental licences /9/, thus producing a power density of 8.82 MW/km^2, 8.27 MW/km^2 and 4.95 MW/km^2, respectively. The implementation of the proposed project activity will result in a new reservoir for each small hydropower plant which the power density is greater than $4W/m^2$.
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: - the power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; - multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project1 that collectively constitute the generation capacity of the combined power plant; - water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; - total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15MW; - total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	Reservoir areas of the SHPP are 1.13 km^2 for SHHP Caju, 1.0 km^2 for SHPP Santo Antônio and 2.7 km^2 for SHPP São Sebastião do Alto, as per the environmental licences /9/, thus producing a power density of 8.82 MW/km^2, 8.27 MW/km^2 and 4.95 MW/km^2, respectively. The implementation of the proposed project activity will result in a new reservoir for each small hydropower plant which the power density is greater than $4W/m^2$.

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.	The project activity is not switching generation from fossil fuel, is not a biomass fired plant and its power densities are greater than 4 W/m^2 as verified through ANEEL's authorization for independent power producer /33/ and environmental licences /9/.

The assessment of the project's compliance with the applicability criteria of methodology *ACM0002,* version 12.2.0 /24/ 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 spatial extent of the project boundary is correctly defined as the site of the project activity and the system boundary for the grid electricity system is also correctly defined as all power plants connected physically to the Brazilian National Interconnected System (SIN), the electricity grid of Brazil, to which the project will be connected. It is DNV's opinion that the project boundary of "Energisa Rio Grande SHPPs" is clearly defined in accordance with applicable guidelines of both *ACM0002,* version 12.2.0 /24/ and the *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1 /26/.

Emission sources and gases included in the project boundary are:

	GHGs involved	*Description*
Baseline emissions	CO_2	The baseline emission factor for the project is determined *ex-post* as a combined margin (CM), consisting of combination of the operating margin (OM) and build margin (BM) of the Brazilian National Interconnected System (SIN), the electricity grid of Brazil.
Project emissions	N/A	Main emission source. Emissions from reservoir are accounted as project emissions once power density of the plant is between 4 and 10 W/m^2.
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 12.2.0 /24/.

4.5 Baseline identification

A) Baseline determination

The baseline is in accordance with *ACM0002*, version 12.2.0 /24/ that electricity delivered to the grid by project activity would otherwise have been generated by the operation of grid-connected power plants in SIN 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"*, version 2.2.1 /26/.

According to *ACM0002*, version 12.2.0 /24/ baseline emissions are equal to power generated by the project delivered to the SIN, multiplied by the baseline emission factor. The grid emission factor will be determined *ex-post* as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM) emission coefficient for the project. The Brazilian grid emission factor is published yearly by the DNA of Brazil /36/.The calculations are based on electricity generation data provided by the Brazilian National Operator of the Electric System (ONS) for the electricity generated in the grid. The weighting of the OM and BM is set to be 0.5 and 0.5, which are the default values stipulated for hydro power projects by the *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1 /26/.

The approved baseline methodology has been correctly applied and it defines the baseline scenario.

As the project activity is a new grid-connected hydro power plant, the baseline scenario is already defined by the methodology and properly stated in section B.4 of PDD.

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

DNV considers the chosen baseline to be applicable and in line with the methodology *ACM0002*, version 12.2.0 /24/.

4.6 Additionality

As required by *ACM0002*, version 12.2.0 /24/, the additionality of the proposed project is demonstrated by applying the *"Tool for the demonstration and assessment of additionality"* version 6.0.0 /25/.

4.6.1 EVIDENCE FOR PRIOR CDM CONSIDERATION AND CONTINUOUS ACTIONS TO SECURE CDM STATUS

Project start date:

The starting date of the proposed project activity was defined as 16 September 2009, the date of signature of the financing contract between Energisa and BNDES /6/.

On an earlier date (24 October 2008), the EPC contracts /14/ were signed between Energisa Geração Rio Grande S.A. and WEG Energy, MEK Engineering and Consulting Ltda., EMPA Services of Engineering, ENGECON Constructers Engineers Ltda., Engineering SERCCOM Ltda. for the acquisition of the equipment, civil works, electromechanical assembling, executive project and management of integrated works during the construction of the SHPPs. However, there is a clause in it that states that only if Energisa Geração Rio Grande S.A. was successful in its obtaining a financing for the project, the EPC contract would come into force.

On 16 September 2009 Energisa Geração Rio Grande S.A. signed a contract with BNDES for the financing of the project /6/, thus, DNV considers this date (16 September 2009) as correctly established as the starting date of the project, since it is the date of earliest commitment to financial expenditure of the project, in accordance to *"Glossary of CDM terms"*, version 5 /23/. DNV considers the values at the time of decision date are valid for the time of the starting date of the project since less than one year has passed between them. Still, an evaluation of the potential impacts of the interval in the additionality of the project is described in the investment analysis, especially in the sensitivity analysis.

Prior consideration of CDM:

In accordance with the guidance from the CDM Executive Board /27/, the starting date of the project activity (16 September 2009 /6/) is after 2 August 2008 and thus both the UNFCCC Secretariat and the DNA of Brazil need to be informed about the intention to register it as a CDM project. The notification for the proposed project was sent by the project participant to the UNFCCC Secretariat and confirmation from the UNFCCC Secretariat was received via email on 2 September 2009 /7/. DNV confirmed this date in the UNFCCC website /56/. Notification was sent to the DNA of Brazil and confirmed on 9 September 2009 via email /8/. Both notifications were sent within six months of the project activity starting date. DNV considers that CDM was therefore seriously considered in the decision to proceed with the project activity.

The project participants started the global stakeholder consultation on 5 November 2010 /56/. To the consideration of DNV, this shows sufficient regular actions (with gaps no longer than two years) to secure CDM status in parallel with the physical implementation of the project.

It is DNV's opinion that the proposed CDM project activity complies with the requirements of the latest version of *"Guidelines on the demonstration and assessment of prior consideration of the CDM"*, version 4.0 /27/.

4.6.2 IDENTIFICATION OF ALTERNATIVES TO THE PROJECT ACTIVITY

The project activity is the installation of three new grid-connected renewable power plants, thus according to the methodology *ACM0002*, version 12.2.0 /24/, the baseline alternatives for the project activity are defined as follows:

- Continuation of the current situation, i.e. electricity supplied by the Brazilian Interconnected Grid
- The proposed project activity undertaken without being registered as a CDM project activity

The list of alternative scenarios to the project activity is in compliance with local mandatory legislation and regulations.

In accordance with the paragraph 105 of VVM /22/, the approved methodology *ACM0002*, version 12.2.0 /24/, that is selected by the proposed project activity and considering it is a greenfield project, prescribed the baseline scenario as *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"*, version 2.2.1 /26/, thus no alternatives to the project activity in order to determine the baseline scenario are identified in the PDD /1/.

DNV considers the listed alternatives to be credible and complete.

4.6.3 INVESTMENT ANALYSIS

Since the project activity generates income by the sale of electricity, and the only alternative scenario (i.e. electricity supplied by the SIN) does not involve any similar investment, the benchmark analysis is appropriate for the demonstration of the financial barrier. DNV considers this approach was correct, as it is according to *"Guidelines on the Assessment of Investment Analysis"* version 5.0 /28/. As the investment decision was made in the meeting of Energisa Soluções S.A.'s Board on 17 July 2008 /5/, to guarantee availability of all data, benchmark was based on data until the end of the previous year (i.e.: 31 December 2007). DNV considers this approach was correct; thus avoiding lack of data that is consolidated annually. DNV considers the values at the time of decision date are valid for the time of the starting date of the project since less than one year has passed between them. Still, an evaluation of the potential impacts of the interval in the additionality of the project is described in the investment analysis, especially in the sensitivity analysis.

BENCHMARK SELECTION

The selected benchmark is the weighted average cost of capital (WACC), a project benchmark calculated based in bond rates and it is post-tax and nominal. The nominal post-tax WACC benchmark was calculated as 15.86% /3/ by Energisa Geração Rio Grande S.A. based on paragraph 12 of the *"Guidelines on the Assessment of Investment Analysis"*, version 5.0 /28/: "weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR". The nominal post-tax WACC was calculated based in the capital asset pricing model (CAPM) as per the option 6 (a) presented in the *"Tool for the demonstration and assessment*

of additionality" version 6.0.0 /25/. Nominal expected return on capital (K_e') is calculated as follows:

$$K_e' = [(1+Rf) / (1+\pi_{usa}) * (1+\pi_{br}) - 1] + (\beta * Rm) + Rc$$

Where:

- R_f (risk free rate) is calculated as 4.72%. It is based on 20-year (from 1987 to 2007) USA Treasury Bonds, researched from the renowned registry of Damodaran /43/. Bonds returns are post-tax. DNV cross-checked the values presented with the Damodaran's home page /43/ and confirmed that this value is appropriate for the time of the investment decision (17 July 2008) /6/ with support of an independent financial expert /55/ and is thus correct;

- π_{usa} (USA expected inflation) is considered to be 2.39%, based on the one year average difference of 20-year USA Treasury Notes /43/ minus Treasury Inflation-Protected Securities (TIPS) /46/. DNV cross-checked the values presented with the Damodaran home page /43/ and confirmed that this value is appropriate for the time of the investment decision (17 July 2008) /6/ with the support of an independent financial expert /55/ and is thus correct;

- π_{br} (Brazil expected inflation) is considered to be 4.50%, as the inflation target determined by the Central Bank of Brazil /48/ for the estimation of the yearly inflation since 2003. DNV confirmed this value cross-checking it with official sources /48/ with support of an independent financial expert /55/ and considered correct.

- β (adjusted industry beta) is considered to be 1.81 for the year of 2007, based on the covariance of the daily return of bonds of companies from the USA Electrical Energy Sector (127 companies of the sector were considered). Beta is first found for companies in the USA (which is the unlevered beta), and then relevered, using the tax conditions of presumed profit regime of the project. This tax rate is zero when relevering beta /42/. DNV cross-checked the values presented with the Damodaran home page /43/ and confirmed that this value is appropriate for the time of the investment decision (17 July 2008) /6/ with support of an independent financial expert /55/ and is thus correct;

- R_m (equity risk premium) is calculated as 6.20%. It is based on the difference of the average return of a stock market (index used was S&P500 /44/, of the prices of the 500 large-cap common stocks actively traded in the USA) and the average return of the government securities in the long term (10-year USA Treasury Bond Yield, calculated by Damodaran /43/), from 1927 to 2007. Bonds returns are post-tax. DNV cross-checked the values presented with Damodaran's home page /43/ and confirmed that this value is appropriate for the time of the investment decision (17 July 2008) /6/ with support of an independent financial expert /55/ and is thus correct;

- R_c (country risk premium) is calculated as 3.91%, The country risk is added to reflect the difference of risk between the economies of Brazil and the USA. The Brazilian External Debt bond (C-bonds) – the most liquid bonds from Brazil – are compared to the USA Treasury Bonds, the most liquid bonds in the world, through and index called EMBI+ (Emerging Markets Bond Index), from JP Morgan /45/. It is commonly to use a five year average, thus 3.91% per year. Bonds returns are post-tax. DNV cross-

checked the values presented with JP Morgan home page /45/ and confirmed that this value is appropriate for the time of the investment decision (17 July 2008) /6/ with support of an independent financial expert /55/ and are thus correct;

Thus the nominal expected return on capital (K_e') is:

= [(1 + 4.72%) / (1 + 2.39%) * (1 + 4.50%) – 1] + (1.81 * 6.20%) + 3.91% = 21.99%.

The nominal post-tax WACC is calculated as follows:

$$WACC = K_e' * W_e + K_d * W_d$$

Where:

- K_e' (return on capital) is calculated as 21.99% as per indicated above;
- K_d (cost of debt financing) is calculated as 12.56%, which is the sum of 9.06% - as the average of the five previous years of Long Term Interest Rate (TJLP) - with 1%, the BNDES fee and 2.5% as the BNDES spread for the credit risk rate. DNV cross-checked the values presented with BNDES home page /50/ and confirmed that this value is appropriate for the time of the investment decision (17 July 2008) /6/ with support of an independent financial expert /55/ and are thus correct;
- W_e (weight of equity) is 35%, as the remaining of the W_d explained below;
- W_d (weight of debt) is estimated in 65%, as the historical rate of financing given to SHPPs by BNDES /50/. DNV cross-checked the value with the historical financing granted by BNDES and considers it is correct.

Thus, WACC is calculated by: 21.99% * 35% + 12.56% * 65% = 15.86%.

This benchmark is not specific to the project participants, since it was calculated based on public data considering the risks faced by any small hydro power project in Brazil. Although CAPM model is generally used to calculate a benchmark on an equity basis, in this case it is accepted to be applied for a benchmark on a project basis, because it was adapted to the project using relevered beta for condition of a presumed profit regime, for which tax rate is zero in relevering. DNV confirmed this approach is correct with support of and independent financial expert /55/.

DNV also compared the benchmark demonstrated in the PDD with a benchmark estimated by Foundation Getúlio Vargas (FGV) for the Cost of Capital to Small Hydroelectric Plants /54/. FGV is a renowned and trustable independent centre of economic studies in Brazil. In the estimation developed by FGV the calculation of the benchmark is performed in the same way as of the above mentioned, also founded on official sources (USA Treasury /46/, BNDES /49/ /50/) and specific literature (Damodaran /43/, Ibbotson /54/). The values obtained for the WACC for a theoretical hydro power plant of up to 50 MW in Brazil were 31.81% in the year of 2005, 18.58% in 2006, 17.40% in 2007, 16.32% in 2008 and 16.78% in 2009 /54/. All these values are higher than the value of the benchmark calculated by Energisa Geração Rio Grande S.A.(15.86%) and this lower value of the benchmark presented in the project is in accordance with an observed tendency of decrease of interest rates in Brazil in the past recent years /47/.

DNV confirmed that the assumptions taken and the values considered for the benchmark calculation are reasonable, according to assessment from Financial Expert /55/.

Hence, DNV concludes that the benchmark calculated for the proposed project is reasonable.

INPUT PARAMETERS

Energisa Rio Grande SHPPs is composed of three SHPPs /9/ /11/. The net capacity values are defined by ANEEL /11/ as the assured energy determined by the government for a location of a river, considering 77 years (from 1931 to 2007) of historical data regarding the project's river, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned), as the government's mission to optimize the use of natural resources in the country. Therefore the electricity to be delivered ($EG_{facility,y}$) to the Brazilian National Interconnected System (SIN) is expected to be 156 103 MWh, corresponding to an average net plant load factor of 58.78% (SHPP Caju), 58.16% (SHPP Santo Antônio) and 53.52% (SHPP São Sebastião do Alto) /11/. This load factor would incur then in net capacities of 5.86 MW (SHPP Caju), 4.81 MW (SHPP Santo Antônio) and 7.15 MW (SHPP São Sebastião do Alto), totalling 17.82 MW /11/. This value was used in the ex-ante emission reduction estimation purposes and for the investment analysis.

However, for calculating the project emissions, it has been used the total expected annual electricity generated by the project (TEG_y), which is 159 257 MWh. This is the value before the discount of 2% due to internal consumption and transmission losses /16/. The installed capacities before the discount of 2% due to internal consumption and transmission losses are 5.98 MW (SHPP Caju), 4.91 MW (SHPP Santo Antônio) and 7.29 MW (SHPP São Sebastião do Alto), totalling 18.18 MW.

The cashflow is impacted by inflation, thus in accordance with the benchmark, which is nominal. Two official inflation indexes were used according to what was negotiated in contracts: IPCA /58/ and IGP-M /59/. DNV considered this as correct, as it reflects the current financial practices in Brazil, as confirmed by and independent financial expert /55/.

Each SHPP and its additionality were assessed separately. DNV has validated all input values to the investment analysis based on appropriate evidence, as described below.

Investment costs:

- The Total Investment used in the investment analysis were BRL 64 211 157.00 (SHPP Caju), BRL 52 823 644.00 (SHPP Santo Antônio) and BRL 99 495 418.00 (SHPP São Sebastião do Alto) /4/. These values correspond to an estimate specific cost of BRL 6 188 .68 / MW (SHPP Caju), BRL 6 126.55 (SHPP Santo Antônio) and BRL 7 143.15 (SHPP São Sebastião do Alto) – considering inflation during the three investment years. They were estimated by the office of studies and engineering projects of Energisa Geração Rio Grande S.A. /4/ based on previous SHPPs of the company in the end of 2007.

  These Total Investment values were compared by DNV with registered Brazilian SHPP projects below:

UNFCCC Ref. N°	Name of Project	Date of Registration	Capacity (MW)	Total Investment (BRL/MW)
968	Incomex Hydroelectric Project	27 April 2007	2.10	3 962.79

1526	Saldanha Small Hydroelectric Project	16 March 2009	5.00	5 668.04
2500	CDM Project of Moinho and Barracão Small Hydropower Plant (SHPP Moinho)	11 January 2010	7.30	9 594.52
2500	CDM Project of Moinho and Barracão Small Hydropower Plant (SHPP Barracão)	11 January 2010	6.00	10 200.00
2793	Santana I SHP CDM Project (JUN 1118)	11 January 2010	14.76	2 825.37
3002	São Domingos II Hydroelectric Project	20 April 2010	24.30	5119.88
3669	Rodeio Bonito Small Hydro Power Project	20 May 2011	14.64	3 924.67
Proposed Project	SHPP Caju	-	9.97	6 188.68
Proposed Project	SHPP Santo Antônio	-	8.27	6 126.55
Proposed Project	SHPP São Sebastião do Alto	-	13.36	7 143.15

Total Investment values used in the estimates are within the range of BRL/MW found in recent Brazilian SHPP projects. However, the breakdowns of the EPC contracts /14/, signed later than the time of decision and therefore not known at that time, present costs smaller than the estimates values above. The impact of this difference in the additionality of the project was assessed by DNV in the sensitivity analysis section.

Total costs:

The operation and maintenance cost for the proposed project includes O&M cost of the hydro power plants (both preventive and corrective maintenance), transmission and connection charges, deductions from revenue (PIS/PASEP /40/, COFINS /40/ and ICMS /41/), insurance and inspection fees /4/.

As per the estimation of the office of studies and engineering projects of Energisa Geração Rio Grande S.A. /4/, the cost for the preventive maintenance was BRL 10/MWh per year and the cost of corrective maintenance was BRL 3/MWh per year, totalling BRL 775 244.30/year (SHPP Caju), BRL 661 788.88/year (SHPP Santo Antônio) and BRL 945 903.90/year (SHPP São Sebastião do Alto) for the first complete year of operation.

Electricity charges and taxes applied during operation are:

- TSFEE tax is for regulation of electric energy services and was applied following regulatory decrees /52/ and will cost BRL 303.78/kW, totalling BRL 13 047.00/year (SHPP Caju), BRL 13 756.00/year (SHPP Santo Antônio) and BRL 19 426.00/year (SHPP São Sebastião do Alto) /52/, in the first complete year of operation and will vary according to inflation. DNV confirmed that these values are in accordance with the Brazilian national regulation.
- TUSD tax is for the use of the distribution system and was applied following regulatory decrees /53/ and varies on the production of energy, BRL 4.36/kW per month, totalling BRL 466 582.30/year (SHPP Caju), BRL 491 951.40/year (SHPP Santo Antônio) and BRL 694 699.70/year (SHPP São Sebastião do Alto) /53/ and will vary according to inflation. DNV confirmed that these values are in accordance with the Brazilian national regulation.
- Costs of connection to the grid were estimated using the contract between Companhia Força e Luz Cataguazes-Leopoldina (the previous name of Energisa Geração Rio Grande S.A.) and Zona da Mata Geração for transmission of electricity, being BRL 0.52/kW per month, totalling BRL 56 141.90/year (SHPP Caju), BRL 59 194.50/year (SHPP Santo Antônio) and BRL 83 590.40/year (SHPP São Sebastião do Alto) and will vary according to inflation. DNV confirmed that these values are in accordance with the contract presented /15/ and represent a reasonable estimative for the proposed project. The taxes over use of installations of connection are values owed by companies of distribution of electric energy that use transmission lines connected to the grid.
- ICMS is a state level tax determined by each state over the operations with electric energy. It was applied following the Rio de Janeiro State law for tax on goods and services /41/, with the value of 25% over the electricity tariff. DNV confirmed that these values are in accordance with the Rio de Janeiro State regulation.

O&M insurance will cost BRL 5.53/kW per year, as estimated by the office of studies and engineering projects of Energisa Geração Rio Grande S.A. /4/. Insurance covers installation, performance and operation, totalling BRL 65 850.30/year (SHPP Caju), BRL 50 501.10/year (SHPP Santo Antônio) and BRL 88 240.70/year (SHPP São Sebastião do Alto) for the first complete year of operation. This estimate of BRL 5.53/kW per year is smaller than the last insurance contract signed by Energisa Geração Rio Grande S.A. /4/ in 13 March 2012, with a price of BRL 16.01/kW per year /20/. Being a positive variation that would worsen the additionality of the project, DNV considers the price used is reasonable and conservative.

O&M per year thus represents an estimate of 2.47% (SHPP Caju), 2.28% (SHPP Santo Antônio) and 2.04% (SHPP São Sebastião do Alto) of the Total Investment.

Comparing with projects presented in the book from the Brazilian Ministry of Environment "Renewable Sources of Energy in Brazil" /32/, which considered values of O&M ranging from 1% to 4%, these values of O&M of the three SHPPs of project are reasonable.

DNV confirmed that the values of the parameters were the latest available in the time of the investment decision (17 July 2008) and concludes that the O&M cost for the proposed project are reasonable for SHPPs.

Plant load factor:

According to ANEEL /11/, it is expected that the proposed project will supply to SIN approximately 156 103 MWh at plant load factors of 58.78% (SHPP Caju), 58.16% (SHPP Santo Antônio) and 53.52% (SHPP São Sebastião do Alto) and thus with net capacities of 5.86 MW (SHPP Caju), 4.81 MW (SHPP Santo Antônio) and 7.15 MW (SHPP São Sebastião do Alto), totalling 17.82 MW. *"Guidelines on the Reporting and Validation of Plant Load Factors"* /29/ gives instruction for validation of plant load factor for renewable energy. One option is to use plant load factor provided by a third party contracted by the project participants. The other option is to use a plant load factor provided to the government while applying the project activity for implementation approval. ANEEL is both government and a third party (although it cannot be contracted by the project proponents to calculate the plant load factor). Its calculations consider 77 years (from 1931 to 2007) of historical data regarding the project's river, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned). Considering that the interest of the government is to optimize the use of natural resources in the country, the plant load factor estimate by ANEEL is theoretically the highest possible for a given section of a river. Nevertheless, DNV compared the plant load factor with the average plant load factor of a SHPP in Brazil, according to "*Renewable Sources of Energy in Brazil*", which is 55% /32/, thus in the same range of the plant load factors of the project.

DNV confirmed that the values of the parameters were the latest available in the time of the investment decision (17 July 2008) and consider that the plant load factors for "Energisa Rio Grande SHPPs" are reasonable for SHPPs in Brazil.

Electricity tariff:

The price of electricity estimated in the decision date by Energisa Geração Rio Grande S.A. for all SHPPs, was BRL 215.73 (average of BRL 224.80 and BRL 206.67 /4/ - with ICMS tax of 25% added) until 2020 and BRL 206.67 from 2021 to 2031 /4/ – corrected by inflation. These were the prices and conditions that Energisa Geração Rio Grande S.A. was expecting to sign in a future PPA that was under negotiations with buyers at the time of decision.

Compared to the average prices of purchase in the previous two auctions of energy in Brazil /39/ (BRL 139.12 - or BRL 173.90 with ICMS tax - in 27 February 2007 and BRL 136.00 - or BRL 170.00 with ICMS tax - in 26 July 2007), the prices considered for the proposed project are higher. This is conservative for CDM purposes, as it increases the IRR. Furthermore, the sensitivity analysis will demonstrate the differences of the prices negotiated in the PPAs and its impact in the additionality analysis.

Taxes and depreciation:

DNV also confirmed that the special purpose societies formed for the project are eligible for the presumed profit regime, in accordance to the Brazilian national fiscal legislation /42/ with the support of an independent financial expert /55/. Values of 8% /42/ for the income rate basis and income tax of 25%, 0.65% for the PIS/PASEP tax /40/, 3% for the COFINS tax /40/, 12% of revenues basis and a 9% rate is applied as CSLL /40/ and a linear depreciation of 3.3% were established according to the ANEEL requirements for hydro power plants equipment /12/. A fair value at the end of the period of assessment was returned back as income: BRL 21 446 526.50(SHPP Caju), BRL 17 960 039.00 (SHPP Santo Antônio) and BRL 33 828 442.10 (SHPP São Sebastião do Alto) /4/. DNV cross-checked the used values with government sources /12/ /40/ /42/ and confirmed that the regulations and values of taxes used in the project are the latest available in the time of the investment decision and are correct. In the presumed profit regime, depreciation has no impact in the IRR. In this case, income tax rates are calculated over revenues and not over gross profits.

CALCULATION AND CONCLUSION:

The IRR calculations were provided in spreadsheet /4/ and verified by DNV. The assumptions and calculations were verified and found to be correct by DNV with support of an independent financial expert /4/ /55/. The Project IRR is nominal and post-tax and the assessment period of 20 years plus the years of construction. It is shorter than the lifetime of the project /12/, and a fair value was corrected added to the end of the period /4/. The nominal and post-tax project IRRs without CDM revenues are 11.32% (SHPP Caju), 10.67% (SHPP Santo Antônio) and 8.58% (SHPP São Sebastião do Alto). This confirms that the project in the absence of CDM benefits and compared to the benchmark of 15.86% is not financially attractive /3/ /4/.

SENSITIVITY ANALYSIS:

A sensitivity analysis was carried out for parameters contributing more than 20% to the revenues or costs in order to check the robustness of the investment analysis. Reasonable variations of the revenues, capital expenditures and operation & maintenance costs were checked by calculating the variation necessary to reach the benchmark and then discussing the likelihood for that to happen. All variations made were greater than 10%. None of the parameters in the sensitivity analysis are considered to have any significant positive correlation. DNV verified that the project IRRs will reach the benchmark only if the above mentioned parameters change by values as mentioned below:

	SHPP Caju	SHPP Santo Antônio	SHPP São Sebastião do Alto
Key Indicators	Variation needed for the IRR to changefrom 11.32%to 15.86%	Variation needed for the IRR to change from 10.67% to 15.86%	Variation needed for the IRR to change from 8.58% to 15.86%

Total Investment	- 31.25%	- 42.40%	- 49.14%
Total Costs	- 62.40%	- 82.30%	- 127.00%
Plant Load Factor	+40.90%	+54.10%	+85.40%
Electricity Tariff	+ 37.30%	+ 49.40%	+ 77.90%

1) Total investment: DNV assessed the three contracts signed between Energisa Geração Rio Grande S.A. and the five EPC companies on 24 October 2008 /14/, thus within one year of the decision date. It stands for the acquisition of the equipment, civil works, electromechanical assembling, executive project and management of integrated works during the construction of the SHPPs. The breakdowns of the EPC contracts are the following:

(values in BRL)	SHPP Caju	SHPP Santo Antônio	SHPP São Sebastião do Alto
Civil works	25 546 012.93	30 272 625.27	27 668 855.26
Equipment	18 881 780.68	18 242 321.57	19 870 897.74
Electromechanical assembling	3 147 858.00	3 322 876.00	3 364 784.00
Executive project	2 195 000.00	2 195 000.00	2 195 000.00
Integration Management	449 746.41	449 746.41	449 746.41
Total Investment	50 220 398.02	54 482 569.25	53 549 283.41

These reductions in the Total Investment from the investment decision date estimate (17 July 2008) and the EPC contracts signed (24 October 2008) produced the following changes in the IRRs:

	SHPP Caju	SHPP Santo Antônio	SHPP São Sebastião do Alto
Variation of Total Investment from the original estimate	-21.79%	+ 3.14%	- 46.18%
Original IRR	11.32%	10.67%	8.58%
IRR (with the EPC values)	14.19%	10.37%	15.16%

After these variations in the Total Investment, none of the IRRs reached the benchmark of 15.86%.

Additionally, after heavy storms and river streams that damaged the SHPPs /60/ (especially SHPP Santo Antônio), amendments were signed on 22 June 2011 between the same companies to contract corrective works in these plants /17/. These costs were composed by: material, equipment, recovering / reconstruction of dams and claim. The actual values of total investment and its impact in the IRRs were assessed:

(values in BRL)	SHPP Caju	SHPP Santo Antônio	SHPP São Sebastião do Alto
Total value of amendments	5 614 139.85	20 916 468.53	5 928 984.37
Final Total Investment (EPC + amendments)	55 834 537.79	75 399,037.92	59 478 267.47
Variation of Total Investment from the original estimate to actual Total Investment (EPC + amendments)	-13.05%	42.74%	-40.22%
IRR (EPC + amendments)	12.90%	7.47%	13.89%

After these variations in the Total Investment, none of the IRRs reached the benchmark of 15.86%.

It would be necessary a further change in the Total Investment, decreasing an extra 18.22% (SHPP Caju), 80.34% (SHPP Santo Antônio) and 8.98% (SHPP São Sebastião do Alto) to the IRR to reach the benchmark of 15.86%. This is not likely to happen, since these values have already been paid and the SHPPs are operational.

Total Investment considering EPC and amendments are BRL 55 834 537.79 (SHPP Caju), BRL 75 399 037.92 (SHPP Santo Antônio) and BRL 59 478 267.47 (SHPP São Sebastião do Alto), meaning that the projects present actual specific costs of BRL 5 500.25/MW (SHPP Caju), BRL 9 117.18/MW (SHPP Santo Antônio) and BRL 4 451.97/MW (SHPP São Sebastião do Alto), which are also within the range of BRL/MW presented above.

DNV confirmed that the values of the parameters of "Energisa Rio Grande SHPPs" were the latest available in the time of the investment decision (17 July 2008) and concluded that the Total Investment for the proposed project are reasonable for SHPPs.

2) Total costs: Composed by the annual O&M cost includes O&M of the hydro power plants (both preventive and corrective maintenance), transmission charges and insurance fees. It would be necessary a decrease of 62.40% (SHPP Caju), 82.30% (SHPP Santo Antônio) and 127.00% (SHPP São Sebastião do Alto) in the O&M cost to the IRRs reach the benchmark of 15.86%, this is unlikely to happen.

3) Plant load factor To reach the 15.86% benchmark, plant load factor must increase by 40.90% (SHPP Caju), 54.10% (SHPP Santo Antônio) and 85.40% (SHPP São Sebastião do Alto). According to and ANEEL's decree about guaranteed energy for the SHPPs of the project /11/, the assumed annual output is based on 77 years (from 1931 to 2007) of historical data regarding the project's river, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned). With this, the plant load factor was defined as 58.78% (SHPP Caju), 58.16% (SHPP Santo Antônio) and 53.52% (SHPP São Sebastião do Alto). Consequently, the net installed capacity of the SHPPS are 5.86 MW (SHPP Caju), 4.81 MW (SHPP Santo Antônio) and 7.15 MW (SHPP São Sebastião do Alto), totalling 17.82 MW. ANEEL, when calculating the guaranteed energy of a section of a river, has the mission

to optimize the use of natural resources in the country, and therefore DNV considered it is unlikely that the electricity delivered to the grid will suffer this additional increase until it reaches the benchmark.

4) Electricity Tariff: To reach the 15.86% benchmark, electricity tariff must increase by 37.30% (SHPP Caju), 49.40% (SHPP Santo Antônio) and 77.90% (SHPP São Sebastião do Alto) above inflation. There are currently five PPAs signed /13/ that cover all the energy generated by the three SHPPS. The PPAs end dates vary from 31 December 2015 to 30 November 2023 and the prices cannot be changed. They will only vary according to the inflation during the contracted period. However, the tariffs defined in the PPAs contracts vary from BRL 152.00/MWh to BRL 192.00/MWh (with a weighted average of BRL 164.61/MWh, already added with ICMS), or 23.70% smaller than the price of the investment decision (BRL 215.73). As a comparison, in the 2nd Brazilian Auction of Reserve Energy of 14 December 2009 /39/ the average price of energy sold was BRL 148.39 (or BRL 185.49 with ICMS) and presented a range of BRL 131.00 to BRL 153.07 (or BRL 163.75 and BRL 191.34 with ICMS). Electricity values are facing a decreasing trend in Brazil, as can be confirmed through the prices reached in the 11th Auction of New Energy /39/, in 15 December 2010. In this auction, the price was BRL 104.00 (or BRL 130.00 with ICMS).
Therefore, it is not likely that electricity prices will increase the necessary range to achieve the benchmark of 15.86%.

5) Combined sensitivity analysis (decreased Total Investments and increased revenues): DNV assessed the variations that occurred between the date of investment decision and the project that actually implemented and the original estimate IRRs and the actual values of the IRRs are thus:

	SHPP Caju	SHPP Santo Antônio	SHPP São Sebastião do Alto
Variation in Total Investment	-13.05%	+42.74%	-40.22%
Variation in electricity tariff	-23.70%	-23.70%	-23.70%
OriginalIRR at time of decision	11.32%	10.67%	8.58%
IRR based on actual costs	8.23%	4.14%	15.16%

Therefore variations in parameters after the actual modifications occurred would be higher than the demonstrated in items 1 to 4 above.

The sensitive analysis above shows that unfavourable circumstances would be needed for the IRRs to reach the benchmark. In conclusion, the investment analysis and sensitivity assessment have shown that the proposed project is not financially attractive.

4.6.4 BARRIER ANALYSIS

Barrier analysis was not applied for the proposed project.

4.6.5 COMMON PRACTICE ANALYSIS

According to the EB *"Tool for the demonstration and assessment of additionality"* version 6.0.0 /25/ the common practice analysis is carried out on similar projects which are considered to be in the same region, 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.

The geographical scope for common practice analysis was determined by the project proponents to be the state of Rio de Janeiro, where the project is located.

The choice of the state of Rio de Janeiro is justified by the project participant considering the Brazilian territorial extension (Brazil has an extension of 8 514 876 square kilometres (with over 4 000 km distance in the north-south as well as in the east-west axis) and 6 distinct climate regions: sub-tropical, semi-arid, equatorial, tropical, highland-tropical and Atlantic-tropical (humid tropical), the region of the project to be implemented, climate, topography, availability of transmissions lines,and taxation on electrical energy (which is different in each state /41/). DNV considers this approach acceptable, since there are great variations in the environment for each state in Brazil.

The applicable output range was calculated considering the individual installed capacity of 9.97 MW (SHPP Caju), 8.27 MW (SHPP Santo Antônio) a nd 13.36 MW (SHPP São Sebastião do Alto) and also the combined capacity of the three SHPPs, 31.6 MW. However, only small hydro power plants were considered (1 MW < installed capacity < 30 MW /51/), therefore only projects hydro projects between 4.13 MW and 30 MW of installed capacity were taken into consideration.

Following the steps of the *"Tool for the demonstration and assessment of additionality"* /25/,

- "N_{all}" was calculated as 5, because 6 projects were identified considering the range between 4.13 MW and 30 MW and but one having started commercial operations before the project starting date (16 September 2009). SHPP Pirapetinga, which is part of the CDM Project "Goiandira, Pedra do Garrafão, Pirapetinga and Sítio Grande Small Hydropower Plants Project Activity" /57/, was excluded.
- "N_{diff}" was calculated as 4, because SHPP Bonfante, SHPP Monte Serrat, SHPP Santa Rosa II and SHPP Calheiros benefit from PROINFA /35/ /51/.
- "Factor F" was calculated as: $F=1-N_{diff}/N_{all}$ wich results in 0.2.

DNV confirmed this information through ANEEL's Bank of Information of Generation /51/ and the CDM Project page of "Goiandira, Pedra do Garrafão, Pirapetinga and Sítio Grande Small Hydropower Plants Project Activity" /57/.

Finally, it is DNV opinion that as "Factor F" is not greater than 0.2, the development of Energisa Rio Grande SHPPs does not represent a common practice in Brazil.

In conclusion, it is DNV's opinion that the project is not a likely baseline scenario and that emission reductions from the project are thus additional.

4.7 Monitoring

The project applies the approved monitoring methodology *ACM0002*, *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"*, version 12.2.0 /24/. The selected monitoring methodology is applicable for the project activity as it involves grid-connected renewable power generation using hydro energy.

Monitoring of sustainable development indicators is not required by the DNA of Brazil. The monitoring plan will give opportunity for real measurements of achieved emission reductions.

The project monitoring plan is in compliance with the monitoring methodology *ACM0002, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"*, version 12.2.0 /24/.

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 determined ex-ante are:

- GWP_{CH4} - the global warming potential of methane valid for the commitment period;
- EF_{RES} - default emission factor for emissions from reservoirs;
- Cap_{BL} - installed capacity of the hydro power plant before the implementation of the project activity;
- A_{BL} - area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).

For new hydro power plants, Cap_{BL} and A_{BL} are zero.

4.7.2 PARAMETERS MONITORED EX-POST

The parameters monitored ex-post are:

- TEG_y - total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*.
- $EG_{facility,y}$ - electricity supplied by each plant of the project activity to the grid.
- $EF_{grid,OM,y}$ - operating margin CO_2 emission factor for grid connected power generation in year *y* calculated by the DNA of Brazil /36/ using the latest version of the *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1 /26/.
- $EF_{grid,BM,y}$ - build margin CO_2 emission factor for grid connected power generation in year *y* calculated by the DNA of Brazil /36/ using the latest version of the *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1/26/.
- $EF_{grid,CM,y}$ - combined margin CO_2 emission factor for grid connected power generation in year *y* calculated by the DNA of Brazil /36/using the latest version of the *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1 /26/.
- CAP_{PJ} - Installed capacity of the hydro power plant after the implementation of the project activity

- A_{PJ} - area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.

According to the *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1 /26/ the dispatch data analysis OM method was considered by the DNA of Brazil /36/ for the determination of the operating margin (OM). The Brazilian grid emission factor is calculated and published yearly by the DNA of Brazil following the latest version of the *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1 /36/. Thus, the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) will be monitored ex-post. The calculations are based on electricity generation data provided by the Brazilian National Operator of the Electric System (ONS) /38/ for the electricity generated in the grid, as described in section 4.8.

The net electricity dispatched ($EG_{facility,y}$) of each plant will be measured through the metering equipment (main and backup) at the points of connection of the proposed project to the Brazilian grid, which are:

- substation Coletora for SHPP Caju and SHPP São Sebastião do Alto;
- substation Bom Jardim for SHPP Santo Antônio.

The amount of electricity dispatched to the grid will be monitored, according to ONS procedures /38/, by CCEE, which controls the electricity provided to the grid and contractually assures, for the buyer, that the electricity sold will be properly delivered. Energy losses are accounted and the data consistency is verified, then CCEE issues an official report that indicates weekly the amount of electricity dispatched in a month. The official reports issued by CCEE sales receipts will be provided for data quality control and cross-check. In addition, this data will be verified against data provided in the CCEE databank.

Meters used are:

Substation Coletora

Principal meter

Type: ION
Serial number: PT-1008A533-01
Accuracy class: 0.2%
Calibration frequency: each 2 years according to ONS recommendations
Date of the last calibration: 24 September 2010

Backup meter

Type: ION
Serial number: PT-1008A512-01
Accuracy class: 0.2%
Calibration frequency: each 2 years according to ONS recommendations
Date of the last calibration: 24 September 2010

Substation Bom Jardim

Principal meter

Type: ION 8600C
Serial number: PT-1011A033-01
Accuracy class: 0.2%
Calibration frequency: each 2 years according to ONS recommendations
Date of the last calibration: 4 November 2011

Backup meter
Type: ION 8600C
Serial number: PT-1011A042-01
Accuracy class: 0.2%
Calibration frequency: each 2 years according to ONS recommendations
Date of the last calibration: 3 January 2011

The total electricity generated (TEG_y) by the project and the electricity supplied by the project bySIN will be monitored continuously and consolidated monthly and recorded on monthly basis.
The meters accuracy is not lower than 0.2%, as determined in the standards of the ABNT - Brazilian Association of Technical Standards adopted by Brazilian National Operator of the Electric System /38/.

The total electricity generated (TEGy) of each SHPP will be measured through the metering equipment at the each SHPP.

Meters used are:

SHPP Caju

Principal meter
Type: ION8600A
Serial number: PT-0910A473-01
Accuracy class: 0.2%
Calibration frequency: every 2 years
Date of the last calibration: 9 December 2009

Backup meter
Type: ION8600C
Serial number: PT-1008A611-01
Accuracy class: 0.2%
Calibration frequency: every 2 years
Date of the last calibration: 27 August 2010

SHPP Santo Antônio

Principal meter
Type: ION8600C
Serial number: PT-1102A168-01

Accuracy class: 0.2%
Calibration frequency: every 2 years
Date of the last calibration: 24 September 2010

Backup meter
Type: ION8600C
Serial number: PT-1102A178-01
Accuracy class: 0.2%
Calibration frequency: every 2 years
Date of the last calibration: 24 September 2010

SHPP São Sebastião do Alto

Principal meter
Type: ION8600C
Serial number: PT1010A0638-01
Accuracy class: 0.2%
Calibration frequency: every 2 years
Date of the last calibration: 30 November 2010

Backup meter
Type: ION8600C
Serial number: PT-1009A917-01
Accuracy class: 0.2%
Calibration frequency: every 2 years
Date of the last calibration: 23 November 2010

All meters will be calibrated every two years by a qualified third party according to the national and industrial regulations "Grid Procedures" from the ONS Module 12, Sub-module 12.3 /38/.

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

The project's monitoring plan includes:

- A description of the monitoring management structure and the main responsibility of each department.

- Monitoring parameters.

- A description of the installation of meters.

- A description of the meters calibration and maintenance.

- Data monitoring.

- Data quality control.

- Data management system.

- Training program.

Detailed procedures have been elaborated in section B.7.2 of the PDD. These will be maintained and implemented to enable subsequent verification of emission reductions. The application of the monitoring methodology is transparent and DNV considers that the project participants are able to implement the monitoring plan. Algorithms and/or formulae used to determine emission reductions

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 calculated as the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - LE_y$$

1) Baseline emissions: baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by each plant of the project activity to the grid ($EG_{facility,y}$ in MWh).
2) Project emissions: for power density of a plant being between 4 and 10 W/m^2, emissions from reservoir (EF_{Res}) are per default 90 $kgCO_2e$/MWh and shall be accounted as project emissions (PE_y), which are calculated as the emissions from reservoir (EF_{Res}) times total energy generated (TEG_y) divided by 1000.
3) Leakage: according to the methodology, no leakage has to be considered for the proposed project activity.

Therefore:

$$ER_y = BE_y - PE_y$$

The baseline emission factor for the project will be determined *ex-post* as a combined margin (CM), consisting of combination of the monitored parameters operating margin (OM) and build margin (BM) according to *"Tool to calculate the emission factor for an electricity system"*, version 2.2.1 /26/ for the 7-year renewable crediting period.

The Brazilian grid emission factor is published yearly by the DNA of Brazil /36/. The calculations are based on electricity generation data provided by the Brazilian National Operator of the Electric System (ONS) for the electricity generated in the grid in the year of 2009. This is the most recent information available at the start of the validation, when the PDD was published (5 November 2010).

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} = 0.50; w_{BM} = 0.50) of the operating margin and the build margin emission factors.

The method dispatch data analysis OM was chosen by the DNA of Brazil /36/. The Brazilian grid emission factors, OM and BM are published regularly by the Brazilian DNA /36/. The OM for 2009 was calculated as 0.2476 tCO_2/MWh and the BM for 2009 was calculated as 0.0794 tCO_2e/MWh. This results in a combined margin emission factor of 0.1635 tCO_2e/MWh in 2009 /36/. DNV confirms that the database is an official publication of the Brazilian Government for the purpose of CDM baselines and as stated in the Brazilian DNA website it is in line with the "*Tool to calculate the emission factor for an electricity system*" /26/ and according to the *Clarification Note* /36/ the dispatch data method is being used.

The annual electricity delivered to the SIN was estimated as 156 103 MWh based on the plant load factor of 58.78% (SHPP Caju), 58.16% (SHPP Santo Antônio) and 53.52% (SHPP São Sebastião do Alto), calculated by ANEEL /11/. DNV confirmed these values cross-checking the decree issued by ANEEL /11/.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average ex-ante estimation of emission reduction conservatively calculated to be 11 189 tCO_2e per year for the selected crediting period.

Through cross-checking, DNV assessed and confirms that:

- 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 methodology 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.

4.9 Environmental impacts

According to Brazilian environmental law (Federal Resolution CONAMA 001/86 /31/), the sponsor of any project that involves construction, installation, expansion or operation of any polluting or potentially polluting activity or any other capable to cause environmental degradation is obliged to secure a series of permits from the relevant environmental agency /31/. The project obtained all licenses required by FEEMA (Installation License) and INEA (Operation Licence) /9/, , demonstrating that they have followed all steps that guarantee that the environmental regulations were respected. The potential significant environmental impacts of the project have been sufficiently identified.

DNV verified that the SHPPs were granted the Installation Licences issued by FEEMA and Environmental Operational Licences issued by INEA, which are valid until 19 December 2012 (SHPP Caju), 25 November 2012 (SHPP Santo Antônio) and 26 November 2012 (SHPP São Sebastião do Alto) /9/.

4.10 Comments by local stakeholders

Local stakeholders, such as the municipal governments and city councils, federal and state attorney, the environmental state and local agencies, the Brazilian forum of NGOs and local communities associations, were invited on 12 to 30 August 2010 to visit the website https://sites.google.com/site/consultadcp/Inicio/projetos-pchs-energisa in order to access the project documentation - which includes the CDM-PDD and a correspondent version in Portuguese - and to comment on the project, in accordance with the requirements of Resolution 7 (5 March 2008) of the DNA of Brazil /37/.

DNV has checked all the invitation letters and the mail receipts /10/. No comments were received for the proposed project

DNV considers the local stakeholder consultation was carried out adequately.

4.11 Comments by Parties, stakeholders and NGOs

The PDD, version 1 dated 11 August 2010 /1/, was made publicly available on the CDM website /56/ on 5 November 2010. Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period, from 5 November 2010 to 4 December 2010 on

http://cdm.unfccc.int/Projects/Validation/DB/M3W6EJVBXSP3LXBZIWWZJ8U3CU67BS/view.html/56/.

No comments were received for the proposed project.

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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	OK. The project is unilateral and there is no Annex I Party participating.
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 final 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 final 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

Requirement	Reference	Conclusion
		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. The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK. The Brazilian designated national authority for the CDM is the Interministerial Commission of Global Climate Change.
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK. Brazil has ratified the Kyoto Protocol on 23 August 2002. The project is unilateral and there is no Annex I Party participating.
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK. The project is unilateral and there is no Annex I Party participating.
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	OK. The project is unilateral and there is no Annex I Party participating.
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.

Requirement	Reference	Conclusion
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.
For large-scale projects only		
12. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK. The Environmental Operational Licences, as required by the Brazilian regulation, were presented by the project participants.
About stakeholder involvement		
13. 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.
14. 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		
15. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK.
16. 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.
17. 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.
18. 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 ☐ No		OK.
A.2	**Description of the project activity (VVM para 58-64)**					
A.2.1	How was the design of the project assessed?	/1/ /2/ /3/ /4/ /7/ /9/ /10/ /13/	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		OK.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			project activity with emission reductions not exceeding 15 000 tCO_2e per year. In 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 *If a physical site inspection is not undertaken, justify why no site visit was undertaken:* The project is composed by three SHPPs; through the documents which the project participant provided, DNV can confirm the project design, construction, operation and monitoring plan and all baseline scenario information. The representatives of the project participants Energisa Geração Rio Grande S.A. and Ecopart Assessoria em Negócios Empresariais Ltda. were interviewed on 5 and 6 October 2011 at Energisa Geração Rio Grande S.A. office at the city of Rio de Janeiro and the plants, in the state of Rio de Janeiro by DNV auditors Luis Filipe Tavares and Gabriel Baines, to resolve the issues identified during the desk review. During the desk review, the relevant documents including the PDD, the ER calculation spreadsheet, the benchmark calculation, the IRR spreadsheet, the notification to UNFCCC and its confirmation, the notification to DNA of Brazil		

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				and its confirmation, the Environmental Licences, the environmental studies, the receipts of delivery of mail to stakeholders, the contracts of PPA .		
A.2.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/	DR	The EPC contracts were signed in 24 October 2008, and thus construction had been already initiated by the time of the beginning of the validation. Project participants did not present the construction contract. A site visit was held on 5 and 6 October 2011. DNV auditor Gabriel Baines visited the Energisa Geração Rio Grande S.A.'s office at the city of Rio de Janeiro and the, in the state of Rio de Janeiro, Brazil and performed interviews with project stakeholders.	~~CL13~~	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	It is not applicable for the proposed project since it is not a bundled small scale project.		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/ /6/ /9/ /11/ /14/ /33/	DR	The "Energisa Rio Grande SHPPs" project is composed of three greenfield small hydro plants and is located in the municipality of São Sebastião do Alto and Bom Jardim, in the state of Rio de Janeiro. The geographical coordinates of the SHPPs of the proposed project activity are SHHP Caju: Latitude -21.8967° and Longitude: -42.0789°, SHPP Santo Antônio: Latitude: -22.1367° and Longitude: -42.3481° and SHPP São Sebastião do Alto: Latitude: -21.9358° and Longitude: -42.0883° and were confirmed by DNV through the environmental licences and ANEEL's authorization to establishment as an independent	CL4 ~~CL4~~ ~~CL16~~	OK.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			producer of electrical energy. The SHPPs will use generators SPA 1250 (SHPP Caju), SPA 1120 (SHPP Santo Antônio) and SPA 1400 (SHPP São Sebastião do Alto) and turbines Kaplan S (all SHPPs). The installed capacity of each turbine is 5.15 MW (SHPP Caju), 4.30 MW (SHPP Santo Antônio) and 6.90 MW (SHPP São Sebastião do Alto). The installed capacity of each generator is 4.986 MW (SPA 1250 - SHPP Caju), 4.133 MW (SPA 1120 - SHPP Santo Antônio) and 6.679 MW (SPA 1400 - SHPP São Sebastião do Alto), thus constituting an installed capacity of 9.97 MW (SHPP Caju), 8.27 MW (SHPP Santo Antônio) and 13.36 MW (SHPP São Sebastião do Alto), totalling 31.6 MW. It was cross-checked by DNV through the manufacturer's product specifications in the EPC contracts that the project design is deemed to reflect good practices. The net capacity values are defined by ANEEL as the assured energy determined by the government for a section of a river, considering 77 years (from 1931 to 2007) of historical data regarding the project's river and other rivers, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned), as the government's mission to optimize the use of natural resources in the country. Therefore the electricity to be delivered ($EG_{facility,y}$) to the Brazilian National Interconnected System (SIN) is expected to be		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			156 103 MWh, corresponding to an average net plant load factor of 58.78% (SHPP Caju), 58.16% (SHPP Santo Antônio) and 53.52% (SHPP São Sebastião do Alto). This load factor would incur then in a net capacity of 5.86 MW (SHPP Caju), 4.81 MW (SHPP Santo Antônio) and 7.15 MW (SHPP São Sebastião do Alto), totalling 17.82 MW/11/. This value was used in the ex-ante emission reduction estimation purposes and for the investment analysis. However, in the calculation of the project emissions, it was used the expected annual electricity generated (TEG_y) by the project, which is 159 257 MWh, the value before the discount of 2% due to internal consumption and transmission losses. The installed capacities before the discount of 2% due to internal consumption and transmission losses are 5.98 MW (SHPP Caju), 4.91 MW (SHPP Santo Antônio) and 7.29 MW (SHPP São Sebastião do Alto), totalling 18.18 MW. DNV considered this as correct. Reservoir areas of the SHPP are 1.13 km^2 for SHHP Caju, 1.0 km^2 for SHPP Santo Antônio and 2.7 km^2 for SHPP São Sebastião do Alto, thus producing a power density of 8.82 MW/km^2, 8.27 MW/km^2 and 4.95 MW/km^2, respectively. The electricity generated by the project will be delivered to the SIN - which has part of its electricity generated by fossil fuel power plants. Being a renewable electricity project, the project activity will generate greenhouse gas (GHG)		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			emission reductions by avoiding the CO_2 emissions from the electricity generation by fossil fuel power projects. The project's system boundaries are clearly defined as the project site and the SIN. At the time of commencing of validation, the physical implementation of the project had started and were verified during the site visit. The starting date of the proposed project activity was defined as 16 September 2009, the date of signature of the financing contract between Energisa and BNDES. According to ANEEL's Resolutions, all the three plants were expected to become operational until March 2010. However, a storm occurred at the region where the SHPPs are located in January 2011 caused a delay in the expected schedule defined by ANEEL. At that time, the SHPPs were damaged due to the rain, especially SHPP Santo Antônio. Civil works stopped during a period and scheduled activities were delayed. ANEEL then defined new dates for the start of the SHPPs commercial operation: SHPP Caju: 17 March 2011 (1st and 2nd units), SHPP Santo Antônio: 4 February 2012 (1st and 2nd units) and SHPP São Sebastião do Alto: 1 September 2011 (1st unit) and 19 August 2011 (2nd unit). A 7-year renewable crediting period has been chosen for the project, starting on 1 July 2012 or the registry date of the project activity at the CDM-UNFCCC, whichever is later. The chosen		

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				crediting starting date is deemed to be reasonable. The emission reductions are estimated to be 11 189 tCO_2e per year, which corresponds to 78 324 tCO_2e over the first seven years of crediting period. The project is expected to contribute to sustainable development objectives of the Brazilian Government focusing on economic and environmental benefits. DNV considers the project description of the project contained in the PDD to be complete and accurate. The PDD complies with the relevant forms and guidance for completing the PDD. The expected operational lifetime of the project activity is 30 years. Project participants did not provide documental evidence in order to confirm the expected operational lifetime of the project activity. It is not clear in tables A.4.4 and B.6.4 of version 1 of the PDD what is the total emission reduction for the crediting period.		
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/ /39/	DR	No, it is a greenfield project that will utilize new equipment. The project activity is the installation of three hydro power plants that are connected to the Brazilian national grid, as confirmed by ANEEL.		OK.
A.2.6	Does the project design engineering reflect current good practices?	/1/ /12/	DR	It was cross-checked by DNV through the manufacturer's product specifications good practices are followed in the project design and applied in construction works. The technology employed by the project is currently employed worldwide.		OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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-I Party involved?	/1/ /51/	DR	DNV has confirmed that both the installed capacity and generation of small hydro power plants was only around 3% of the total capacity and power generation of Brazil according to the ANEEL's Bank of Information of Generation. DNV has confirmed that by the time of the project investment decision phase, there were 356 small hydro power plants operating Brazil. DNV was able to verify that the 50 small hydro power plants to be installed are national equipment which will be installed using mainly local work labour as alleged by the project participants.		OK.
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	The involved party is Brazil as the host Party. The project is unilateral and there is no Annex I Party participating.. The project participants are Energisa Geração Rio Grande S.A. and Ecopart Assessoria em Negócios Empresariais Ltda. The project participants are listed in Section A.3 of the PDD and the information is consistent with the contact details provided in Annex 1 of the PDD.		OK.
		Brazil (host)				
	a) Party has ratified the Kyoto Protocol	☒ Yes ☐ No				
	b) Party has designated a Designated National Authority	☒ Yes ☐ No				
	c) The assigned amount has been determined	☒ Yes ☐ No				
A.3.2	Do the letters of approval meet the following requirements?	/1/ /21/	DR	Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			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 b) LoA confirms that participation is voluntary ☐ Yes ☐ No c) The LoA confirms that the project contributes to the sustainable development of the host country? ☐ Yes ☐ No d) The LoA refers to the precise project activity title in the PDD ☐ Yes ☐ No e) The LoA is unconditional with respect to (a) to (d) above ☐ Yes ☐ No f) The LoA is issued by the respective Party's DNA ☐ Yes ☐ No g) The LoA was received directly by the DNA or the 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		
A.3.3 Have all private/public project participants been authorized by an involved Party?	/1/ /21/	DR	Prior to the submission of the final 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/ /11/	DR	The "Energisa Rio Grande SHPPs" project is composed of three greenfield small hydro plants and are located in: • SHPP Caju, located on the city of São Sebastião do Alto and Santa Maria	~~CL1~~CL 1	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Madalena; • SHPP Santo Antônio, located on the city of Bom Jardim; • SHPP São Sebastião do Alto, located on the city of São Sebastião do Alto e Santa Maria Madalena; all located in the state of Rio de Janeiro, Brazil. The geographical coordinates of the SHPPs in version 1 of the PDD do not represent the correct position of the projects.		
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/ /6/	DR	The project does not involve public funding from Parties included in Annex I, and 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, since the source of funding is BNDES (Brazilian Development Bank) .		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/ /24/	DR	The project correctly applies the approved baseline and monitoring methodology *ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"*, version 12.2.0.		OK
B.1.2	If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/1/ /25/ /26/	DR	Yes, the *"Tool to calculate the emission factor for an electricity system"* (version 2.2.1) and the *"Tool for the demonstration and assessment of*		OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				additionality" (version 6.0.0) are also applicable. .		
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: Is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s)?	/1/ /24/	DR	The project activity is the installation of three grid-connected and greenfield hydro power plants, as verified through ANEEL's authorization for independent power producer and the environmental licences. The project is connected to the Brazilian National Interconnected System (SIN), the electricity grid of Brazil, for which the geographical and system boundaries are clearly identified and information on the characteristics of this grid is made available by the Brazilian National Electric Energy Agency (ANEEL).		OK.
B.2.2	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/ /24/	DR	The project activity is the installation of three grid-connected and greenfield hydro power plants, as verified through ANEEL's authorization for independent power producer and the environmental licences.		OK.
B.2.3	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	/1/ /24/	DR	Not applicable as the proposed project activity does not correspond to a capacity addition, retrofit or replacement, as verified through ANEEL's authorization for independent power producer and the environmental licences.		OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	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?					
B.2.4	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 single or multiple reservoirs, with no change in the volume of any of reservoirs; or - the project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or - the project activity results in new single or multiple reservoirs and the power density of teach reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2?	/1/ /24/	DR	Reservoir areas of the SHPP are 1.13 km^2 for SHHP Caju, 1.0 km^2 for SHPP Santo Antônio and 2.7 km^2 for SHPP São Sebastião do Alto, thus producing a power density of 8.82 MW/km^2, 8.27 MW/km^2 and 4.95 MW/km^2, respectively. The implementation of the proposed project activity will result in a new reservoir for each small hydropower plant which the power density is greater than $4W/m^2$.		OK.
B.2.5	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/ /24/	DR	In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: - the power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; - multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project1 that collectively constitute the generation capacity of the combined power plant; - water flow between multiple reservoirs is not		OK.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			used by any other hydropower unit which is not a part of the project activity; - total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15MW; - total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.		
How was it validated that project complies with the following applicability criteria: Not applicable to the following: B.2.6 - 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/ /24/	DR	The project activity is not switching generation from fossil fuel, is not a biomass fired plant and its power densities are greater than 4 W/m^2 as verified through ANEEL's authorization for independent power producer and environmental licences.		OK.
B.2.7 Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/ /24/	DR	Yes. The selected baseline of the project is based on the baseline described in *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"* and all applicability criteria were followed.		OK.
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/ /26/	DR	The spatial extent of the project boundary is correctly defined as the site of project activity and the system boundary for the grid electricity system is also correctly defined as all power plants connected physically to the National		OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Interconnected System (SIN), the electricity grid of Brazil, to which the project will be connected. Project and system boundaries are defined in accordance with applicable guidelines of both *ACM0002* version 12.2.0 and the "*"Tool to calculate the emission factor for an electricity system"* version 2.2.1".		
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	The only GHG sources applied are the CO_2 generated by fossil fuel power plants connected to the National Interconnected System (SIN – the electricity grid of Brazil) and the CH_4 emissions from the reservoirs.		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/ /24/ /26/	DR	The baseline is in accordance with *ACM0002* version 12.2.0 that electricity delivered to the grid by project activity would otherwise have been generated by the operation of grid-connected power plants in SIN 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.4.2	How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/ /24/	DR	Not applicable, as *ACM0002*, version 12.2.0 prescribes the baseline scenario.		OK.
B.4.3	What is the baseline scenario?	/1/	DR	Refer to B.4.1.		OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4.4	Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/ /24/	DR	The baseline determination is in line with *ACM0002*, version 12.2.0.		OK.
B.4.5	Has the baseline scenario been determined using conservative assumptions where possible?	/1/ /24/	DR	This is not applicable as the baseline is directly determined as per *ACM0002*, version 12.2.0.		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/ /24/	DR	This is not applicable as the baseline is directly determined as per *ACM0002*, version 12.2.0.		OK.
B.4.7	Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/ /24/	DR	This is not applicable as the baseline is directly determined as per *ACM0002*, version 12.2.0.		OK.
B.4.8	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 • 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	/1/	DR	The baseline determination has been adequately documented in the PDD: • Not applicable. • Not applicable. • Not applicable. • Not applicable. • The methodology has been correctly applied to identify what would occur in the absence of the proposed CDM project activity		OK.
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? In case of small-scale CDM project activities, is Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities applied considering also	/1/ /24/ /25/	DR	As required by *ACM0002*, version 12.2.0, the additionality of the project has been established using the *"Tool for the demonstration and assessment of additionality"*, version 6.0.0. As the project activity is composed of three new	~~CL6~~CL 6	OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	the "Non-binding best practice examples to demonstrate additionality for SSC project activities".			grid-connected small hydro power plants, the baseline scenario is already defined by the methodology and properly stated in section B.4 of version 1 of the PDD. However, the *"Combined tool to identify the baseline scenario and demonstrate additionality"* mentioned in section B.1 of the PDD was not used.		
B.5.2	Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR	Yes, the baseline alternative complies with regulatory requirements.		OK.
B.5.3	Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	Yes, as described below in the following items.		OK.
B.5.4	What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/	DR	The 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/ /7/ /8/	DR	The serious consideration of CDM prior to the time of decision to proceed with the project activity needs to be revised, since the starting date of project activity was not correctly defined (see CAR 1). The starting date of the project activity is defined in section C.1.1 of version 1 of the PDD as 8 July 2008, the date in which ANEEL authorized Energisa Soluções S.A. to explore the hydro potential of the SHPP Caju, SHPP Santo Antonio, and SHPP São Sebastião do Alto. According to the "Glossary *of CDM terms", "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 (...) the start date shall be considered to be the date on which the project*	~~CAR1~~ ~~CAR2~~	OK.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			participant has committed to expenditures related to the implementation or related to the construction of the project activity". *Project proponents did* not provide documental evidence of the starting date of the project as the earliest of implementation, construction and real action in line with the definition in the CDM EB *"Glossary of CDM Terms"*. In addition, section C.1.1 of version 1 of the PDD does not present the evidence available to support this date. According to the *"Glossary of CDM terms"* and following the timeline provided in section B.5 of the version 1 of the PDD, the project starting date was supposed to be defined as 24 October 2008, which corresponds to the date of signature of the EPC contract. Thus, in accordance with the guidance from the "*Glossary of CDM terms",* the proposed project is a newly built hydro project and the starting date of the project activity (24 October 2008) is after 2 August 2008. However, documental evidence was not provided in order to confirm that the CDM Secretariat and the DNA of Brazil have been informed about the CDM project as per *"Guidelines on the demonstration and assessment of prior consideration of the CDM"*.		
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/ /7/ /8/	DR	According to the "Glossary of CDM terms" and following the timeline provided in section B.5 of the version 1 of the PDD, the project starting date was supposed to be defined as 24 October 2008, which corresponds to the date of signature of the EPC contract. Thus, in accordance with the guidance from the "Glossary of CDM terms", the	~~CAR2~~	OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				proposed project is a newly built hydro project and the starting date of the project activity (24 October 2008) is after 2 August 2008. However, documental evidence was not provided in order to confirm that the CDM Secretariat and the DNA *of Brazil have been informed about the CDM project as per "Guidelines* on the demonstration *and assessment of prior consideration of the* CDM*"*.		
	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/	DR	It is not applicable to the proposed project activity as its starting date is 16 September 2009, thus after 2 August 2008.		OK.
B.5.8	When did the construction of the project activity start?	/1/	DR	It is not applicable to the proposed project activity as its starting date is 16 September 2009, thus after 2 August 2008.		OK.
B.5.9	When was the project commissioned?	/1/	DR	It is not applicable to the proposed project activity as its starting date is 16 September 2009, thus after 2 August 2008.		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 not applicable to the proposed project activity as its starting date is 16 September 2009, thus after 2 August 2008.		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 proposed project activity generates financial and economic benefits through the sales of electricity other than CDM-related income		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 other alternatives listed in the investment analysis do not involve investments.		OK.
B.5.13	Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	Since the proposed project generates financial and economic benefits through the sales of		OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				electricity other than CDM-related income, a benchmark analysis is correctly selected as the analysis method.		
B.5.14	Is the benchmark/discount rate the latest available at the time of decision?	/1/ /43/	DR	The selected benchmark is the weighted average cost of capital (WACC), a project benchmark calculated based in bond rates and it is post-tax, project and nominal. The nominal post-tax WACC benchmark was calculated to be 15.86% by Energisa Geração Rio Grande S.A. based on paragraph 12 of the *"Guidelines on the Assessment of Investment Analysis"*, version 5.0: "weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR". The nominal post-tax WACC was calculated based in the capital asset pricing model (CAPM) as per the option 6 (a) presented in the *"Tool for the demonstration and assessment of additionality"* version 6.0.0. All values estimated in project were applicable at the time of the investment decision. Data presented was cross-checked with official sources from the Brazilian and USA National Treasury, Damodaran and BOVESPA to assess its validity. In the Investment Analysis of version 1 of the PDD, it is not clear if the WACC is nominal or real.	~~CL19~~	OK.
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 project IRR calculated after tax in nominal terms, therefore in correspondence with the benchmark presented.		OK.
B.5.16	Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero	/1/	DR	The IRR calculations were provided in a spreadsheet and verified by DNV. However,	~~CAR4~~ CAR4	OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	value?			DNV was not able to confirm that the assumptions used in the calculations were deemed to be correct while related CAR3 are not properly answered and closed.		
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/ /28/ /40/ /42/	DR	Project participants did not present on section B.5 of version 1 of the PDD detailed investment analysis, presenting the costs related to the equipment, insurance, project installation and operation/maintenance, prices, taxes, resolutions, estimates. In addition, since the project starting date was not correctly defined, DNV was not able to confirm that the input parameters used in the investment analysis are reasonable and adequately represent the economic situation of the project in the date of the decision of investment. The expected operational lifetime of the project activity is 30 years. Project participants did not provide documental evidence in order to confirm the expected operational lifetime of the project activity.	~~CAR3~~ ~~CL4~~	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/	DR	Project participants did not present on section B.5 of version 1 of the PDD detailed investment analysis, presenting the costs related to the equipment, insurance, project installation and operation/maintenance, prices, taxes, resolutions, estimates. In addition, since the project starting date was not correctly defined, DNV was not able to confirm that the input parameters used in the investment analysis are reasonable and adequately represent the economic situation of the project in the date of the decision of	~~CAR3~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				investment.		
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	Not applicable.		OK.
B.5.20	How was the amount of output (e.g. sales of electricity) assessed?	/1/	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 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 net capacity values are defined by ANEEL /11/ as the assured energy determined by the government for a section of a river, considering 77 years (from 1931 to 2007) of historical data regarding the project's river and other rivers, such as river flow data, downstream and upstream levels, unavailability (compulsory and planned), as the government's mission to optimize the use of natural resources in the country. Therefore the electricity to be delivered ($EG_{facility,y}$) to the Brazilian National Interconnected System (SIN) is expected to be 156 103 MWh, corresponding to an average net plant load factor of 58.78% (SHPP Caju), 58.16% (SHPP Santo Antônio) and 53.52% (SHPP São	~~CL16~~	OK.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Sebastião do Alto). This load factor would incur then in a net capacity of 5.86 MW (SHPP Caju), 4.81 MW (SHPP Santo Antônio) and 7.15 MW (SHPP São Sebastião do Alto), totalling 17.82 MW/11/. This value was used in the ex-ante emission reduction estimation purposes and for the investment analysis. However, in the calculation of the project emissions, the expected annual electricity generated (TEG_y) by the project is 159 257 MWh, which is the value before the 2% of internal consumption and transmission losses /16/ (TEG_y) (5.98 MW (SHPP Caju), 4.91 MW (SHPP Santo Antônio) and 7.29 MW (SHPP São Sebastião do Alto), totalling 18.18 MW) is used. It is not clear in tables A.4.4 and B.6.4 of version 1 of the PDD what is the total emission reduction for the crediting period.		
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/ /39/	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 *Provide details on how the output price was validated:* Project participants did not present on section B.5 of version 1 of the PDD detailed investment analysis, presenting the costs related to the equipment, insurance, project installation and operation/maintenance, prices, taxes, resolutions, estimates. In addition, since the project starting date was not correctly defined, DNV was not able	~~CAR3~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				to confirm that the input parameters used in the investment analysis are reasonable and adequately represent the economic situation of the project in the date of the decision of investment.		
B.5.22	How were the investment costs assessed? Were the data available and valid at the time of decision?	/1/ /6/ /14/ /39/	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 *Provide details on how the output price was validated:* Project participants did not present on section B.5 of version 1 of the PDD detailed investment analysis, presenting the costs related to the equipment, insurance, project installation and operation/maintenance, prices, taxes, resolutions, estimates. In addition, since the project starting date was not correctly defined, DNV was not able to confirm that the input parameters used in the investment analysis are reasonable and adequately represent the economic situation of the project in the date of the decision of investment.	~~CAR3~~	OK.
B.5.23	How were the O&M costs assessed? Were the data available and valid at the time of decision?	/1/ /14/ /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 *Provide details on how the output price was validated:*	~~CAR3~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Project participants did not present on section B.5 of version 1 of the PDD detailed investment analysis, presenting the costs related to the equipment, insurance, project installation and operation/maintenance, prices, taxes, resolutions, estimates. In addition, since the project starting date was not correctly defined, DNV was not able to confirm that the input parameters used in the investment analysis are reasonable and adequately represent the economic situation of the project in the date of the decision of investment.		
B.5.24	Describe the assessment of the other input parameters. Were the data available and valid at the time of decision?	/1/	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 *Provide details on how the output price was validated:* Project participants did not present on section B.5 of version 1 of the PDD detailed investment analysis, presenting the costs related to the equipment, insurance, project installation and operation/maintenance, prices, taxes, resolutions, estimates. In addition, since the project starting date was not correctly defined, DNV was not able to confirm that the input parameters used in the investment analysis are reasonable and adequately represent the economic situation of the project in the date of the decision of investment.	~~CAR3~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.25	Was the financial calculation spreadsheet verified and found to be correct?	/1/	DR	The IRR calculations were provided in a spreadsheet and verified by DNV. However, DNV was not able to confirm that the assumptions used in the calculations were deemed to be correct while related CAR3 are not properly answered and closed.	~~CAR4~~ CAR4	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	A sensitivity analysis was performed by decreasing and increasing in 10% the investments costs, plant load factor, operation and maintenance costs and electricity price. As per the CDM Executive Board: "Guidelines on *the Assessment of Investment Analysis"*, the sensitivity analysis must include the variables that represent 20% of either total project costs or total project revenues. These parameters must be subject to reasonable variations, i.e.: the sensitivity of variables where it would reach the benchmark value needs to be considered. In addition, project participants are requested to justify why these variations are not reasonable. In the Sensitivity Analysis of version 1 of the PDD, it is not clear of what is the "price" varied.	~~CAR5~~ ~~CL18~~CAR5	OK.
B.5.27	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/	DR	A sensitivity analysis was performed by decreasing and increasing in 10% the investments costs, plant load factor, operation and maintenance costs and electricity price. As per the CDM Executive Board: "Guidelines on *the Assessment of Investment Analysis"*, the sensitivity analysis must include the variables that represent 20% of either total project costs or total project revenues. These parameters must be subject to reasonable variations, i.e.: the	~~CAR5~~ ~~CL18~~CAR5	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				sensitivity of variables where it would reach the benchmark value needs to be considered. In addition, project participants are requested to justify why these variations are not reasonable. In the Sensitivity Analysis of version 1 of the PDD, it is not clear of what is the "price" varied.		
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/	DR	A sensitivity analysis was performed by decreasing and increasing in 10% the investments costs, plant load factor, operation and maintenance costs and electricity price. As per the CDM Executive Board: "Guidelines on *the Assessment of Investment Analysis"*, the sensitivity analysis must include the variables that represent 20% of either total project costs or total project revenues. These parameters must be subject to reasonable variations, i.e.: the sensitivity of variables where it would reach the benchmark value needs to be considered. In addition, project participants are requested to justify why these variations are not reasonable. In the Sensitivity Analysis of version 1 of the PDD, it is not clear of what is the "price" varied.	~~CAR5~~ ~~CL18~~CAR5	OK.
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 as barrier analysis was not applied for the proposed project.		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 as barrier analysis was not applied for the proposed project.		OK.
B.5.31	How does CDM alleviate the investment barriers?	/1/	DR	Not applicable as barrier analysis was not applied		OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				for the proposed project.		
B.5.32	Is the project activity prevented by the investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Not applicable as barrier analysis was not applied for the proposed project.		OK.
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 as barrier analysis was not applied for the proposed project.		OK.
B.5.34	How does CDM alleviate the technological barriers?	/1/	DR	Not applicable as barrier analysis was not applied for the proposed project.		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 as barrier analysis was not applied for the proposed project.		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 as barrier analysis was not applied for the proposed project.		OK.
B.5.37	How does CDM alleviate the barriers due to prevailing practise?	/1/	DR	Not applicable as barrier analysis was not applied for the proposed project.		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 as barrier analysis was not applied for the proposed project.		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 as barrier analysis was not applied for the proposed project.		OK.
B.5.40	How does CDM alleviate the other barriers?	/1/	DR	Not applicable as barrier analysis was not applied for the proposed project.		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 as barrier analysis was not applied for the proposed project.		OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Common practice analysis (VVM para 119-121)						
B.5.42	What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR	The common practice analysis is limited to the State of Rio de Janeiro, in Brazil. The project participants determined the scope based on the extension of area, hydrological characteristics and regulatory, technological, financing and investment environments. Figure 5 of version 1 of the PDD states that the Southern region of Brazil is not presented in the chart. However, Porto Alegre is the capital of Rio Grande do Sul, a state from the Southern region of Brazil. In the Common Practice Analysis of version 1 of the PDD, it is not clear what are the links for each project presented as CDM or PROINFA.	~~CL17~~ ~~CL20~~	OK.
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/	DR	The applicable output range was calculated considering the individual installed capacity of 9.97 MW (SHPP Caju), 8.27 MW (SHPP Santo Antônio) and 13.36 MW (SHPP São Sebastião do Alto) and also the combined capacity of the three SHPPs, 31.6 MW. However, only small hydro power plants were considered (1 MW < SHPP < 30 MW), therefore only projects hydro projects between 4.13 MW and 30 MW of installed capacity were taken into consideration.		OK.
B.5.44	What is the data source(s) used for the common practice analysis?	/1/ /51/	DR	Bank of Information of Generation in Brazil and UNFCCC's home page of CDM Project Activities are used to analyse other small hydro power plants.		OK.

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/ /51/	DR	DNV was not able to confirm CDM information about SHPP Santa Fé I - mentioned in version 1 of the PDD to be both PROINFA and CDM - *in the CDM Project* Activities home. "N_{all}" was calculated as 5, because 6 projects were identified considering the range between 4.13 MW and 30 MW and but one having started commercial operations before the project starting date (16 September 2009). SHPP Pirapetinga, which is part of the CDM Project "Goiandira, Pedra do Garrafão, Pirapetinga and Sítio Grande Small Hydropower Plants Project Activity", was excluded.	~~CL7~~	OK.
B.5.46	How were possible essential distinctions between the project activity and similar activities assessed?	/1/ /51/	DR	DNV was not able to confirm CDM information about SHPP Santa Fé I - mentioned in version 1 of the PDD to be both PROINFA and CDM - *in the CDM Project* Activities home. "N_{diff}" was calculated as 4, because SHPP Bonfante, SHPP Monte Serrat, SHPP Santa Rosa II and SHPP Calheiros benefit from PROINFA /51/. Factor F was calculated as: $F=1-N_{diff}/N_{all}$ wich results in 0.2.	~~CL7~~	OK.
B.5.47	What is the conclusion of the common practice analysis?	/1/	DR	DNV was not able to confirm CDM information about SHPP Santa Fé I - mentioned in version 1 of the PDD to be both PROINFA and CDM - *in the CDM Project* Activities home.	~~CL7~~	OK.
Conclusion						
B.5.48	What is the conclusion with regard to the additionality of the project activity?	/1/	DR	No conclusion can be made before related findings are answered and closed.		OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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 Cap_{BL} parameter available at validation verified?	/1/	DR	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero. The "global warming potential of methane" (GWPCH4) and the "default emission factor from reservoirs" (EFRES) were not included in section B.6.2 of version 1 of the PDD.	~~CL8~~	OK.
B.6.2	How was the A_{BL} parameter available at validation verified?	/1/	DR	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2) of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero. The "global warming potential of methane" (GWPCH4) and the "default emission factor from reservoirs" (EFRES) were not included in section B.6.2 of version 1 of the PDD.	~~CL8~~	OK.
	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/	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 *"Tool to calculate the emission factor for an electricity system"* for the renewable 7 years crediting period. Baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in	~~CL3~~CL 3	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				tCO_2/MWh) times the net electricity supplied by each plant of the project activity to the grid ($EG_{facility,y}$ in MWh). The annual electricity generated by the three SHHPs as per the PDD is expected to be 159 257 MWh and the annual electricity delivered to the National Interconnected System (SIN) is expected to be 156 103 MWh. Annual electricity generated and the annual electricity delivered in version 1 of the PDD are not clearly explained.		
B.6.4	Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Annual electricity generated and the annual electricity delivered in version 1 of the PDD are not clearly explained.	~~CL3~~CL 3	OK.
B.6.5	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Annual electricity generated and the annual electricity delivered in version 1 of the PDD are not clearly explained.	~~CL3~~CL 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	Project emissions for power density of a plant being between 4 and 10 W/m^2, emissions from reservoir (EF_{Res}) are per default 90 $kgCO_2e$/MWh and shall be accounted as project emissions (PE_y), which are calculated as the emissions from reservoir (EF_{Res}) times total energy generated (TEG_y) divided by 1000. The annual project emissions estimates, are: Caju – 4 812 tCO_2, Santo Antônio – 3 827 tCO_2 and São Sebastião do Alto – 5 692 tCO_2. However, to confirm these values, Documental evidences of	~~CL2~~ ~~CL16~~CL2	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				the areas of the reservoirs were not presented. It is not clear in tables A.4.4 and B.6.4 of version 1 of the PDD what is the total emission reduction for the crediting period.		
B.6.7	Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Documental evidences of the areas of the reservoirs were not presented.	~~CL2~~CL 2	OK.
B.6.8	Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Documental evidences of the areas of the reservoirs were not presented.	CL2 ~~CL2~~CL 2	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/ /24/	DR	As per *ACM0002*, version 12.2.0 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/ /24/	DR	As per *ACM0002*, version 12.2.0 no leakage has to be considered for the proposed project activity.		OK.
B.6.11	Are uncertainties in the leakage emission estimates properly addressed?	/1/ /24/	DR	As per *ACM0002*, version 12.2.0 no leakage has to be considered for the proposed project activity.		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.	/1/	DR	The emission reduction (ER_y) by the project activity during the crediting period is 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	~~CL2~~ ~~CL3~~CL 2 CL3 ~~CL10~~	OK.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
• 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.			in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the net electricity supplied by eacho plant of the project activity to the grid ($EG_{facility,y}$ in MWh). 2) Project emissions: Emissions from water reservoirs of hydro power plants (PE_y) as the proposed project is a hydropower project with power density greater than 4 W/m^2 and less than 10 W/m^2 are the product of the default emission factor for emissions from reservoirs (EF_{Re}) and the total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (TEG_y). The annual project emissions estimates, as per PDD are: Caju – 4 812 tCO_2, Santo Antônio – 3 827 tCO_2 and São Sebastião do Alto – 5 692 tCO_2. However, to confirm these values, Documental evidences of the areas of the reservoirs were not presented. 3) Leakage: No leakage has to be considered for the proposed project activity. 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"* for the renewable 7 years crediting period.		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			The Brazilian grid emission factor has been recently published by the DNA of Brazil. The calculations are based on electricity generation data provided by the National Operator System (ONS) for the electricity generated in the grid in the year 2009. This is the most recent electricity generation data by the time the PDD version 1 was received. DNV can confirm the data source is reliable, and the calculation and result are correct. The system boundary for the grid electricity system affected by the project is defined as the system of the Brazilian grid (SIN). The grid emission factor of the SIN is determined *ex-post* for the renewable 7 years crediting period following *"Tool to calculate the emission factor for an electricity system"*, based on the most recent information available. 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. The OM is calculated as a generation weighted average for each month for the year 2009 as 0.2476 tCO_2e/MWh. The BM is calculated to be 0.0794 tCO_2e/MWh. The resulting combined margin emission factor is 0.1635 tCO_2e/MWh. The annual electricity generated by the three SHHPs as per the PDD is expected to be 159 257 MWh and the annual electricity delivered to the National Interconnected System (SIN) is expected to be 156 103 MWh.		

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Annual electricity generated and the annual electricity delivered in version 1 of the PDD are not clearly explained. "Tool to calculate project or leakage CO2 emissions from *fossil fuel combustion" was mentioned in section B.1 of version 1* of the PDD but was not used in the calculation of the project emissions. As per ACM0002 version 12.2.0 the *"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"* is used in the calculation of the project emissions if there are fossil fuel sources in the project site and they represent more than 1% or emission reductions. Project participants did not justify in the PDD if there are emissions from fossil fuel gensets, that these are not exceeding 1% of emission reductions and did not clarify how this can be ensured during the crediting period. It is not clear in tables A.4.4 and B.6.4 of version 1 of the PDD what is the total emission reduction for the crediting period.		
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/ /24/	DR	Yes. The means of monitoring described in the plan comply with *ACM0002* version 12.2.0.		OK.
B.7.2	Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	The parameters monitored *ex-post* are the total electricity generation (TEG_y), the net electricity generation from each plant of the proposed project activity ($EG_{facility,y}$), the operating margin (EF_{OM}), build margin (EF_{BM})and combined margin (EF_{CM}) emission factors, the area of the	~~CL9~~ ~~CAR6~~	OK.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			reservoir measured in the surface of the water (A_{PJ}), after the implementation of the project activity, when the reservoir is full and the installed capacity of the hydro power plant after the implementation of the project activity (Cap_{PJ}). The Brazilian grid emission factor has been recently published by the DNA of Brazil. The calculations are based on electricity generation data provided by the National Operator System (ONS) for the electricity generated in the grid in the year 2009. This is the most recent electricity generation data by the time the PDD version 1 was received. DNV can confirm the data source is reliable, and the calculation and result are correct. The system boundary for the grid electricity system affected by the project is defined as the system of the Brazilian grid (SIN). The grid emission factor of the SIN is determined *ex-post* for the renewable 7 years crediting period following *"Tool to calculate the emission factor for an electricity system"*, based on the most recent information available. 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. The OM is calculated as a generation weighted average for each month for the year 2009 as 0.2476 tCO_2e/MWh. The BM is calculated to be 0.0794 tCO_2e/MWh. The resulting combined margin emission factor is 0.1635 tCO_2e/MWh.		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			The parameters "total electricity generation" (TEGy), "operating margin" (OM) and "build margin" (BM) -the latter two published by the DNA of Brazil – were not included in section B.7.1 of version 1 of the PDD. The electricity supplied to the grid will be measured hourly by two bi-directional meters (principal and backup) installed at the local substation and recorded on a monthly basis. In addition, the electricity sales receipts will be provided for data quality control and cross check. Energisa Geração Rio Grande will calibrate the meters once each two years with an entity certified by the Brazilian Calibration Net, as the CCEE (Chamber of Electric Energy Commercialization) demands. All data will be kept for two years after the end of the crediting period. The version 1 of the PDD does not specify the accuracy of the electricity meters located at the substation. In addition, detailed information (type of electricity meter and accuracy, calibration frequency) regarding the equipment used for the total electricity generation monitoring were not included in the monitoring plan. Details of data to be collected, format and location to be filed are correctly described. According to the *"Tool to calculate the emission factor for an electricity system",* the dispatch data analysis OM method was considered for the determination of the operating margin (OM).		

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Thus, 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. The calculations are based on electricity generation data provided by the National Operator System (ONS) for the electricity generated in the grid in the year 2009. This is the most recent electricity generation data by the time the PDD version 1 was webhosted (i.e. 5 November 2010). DNV can confirm the data source is reliable, and the calculation and result are correct.		
B.7.3	In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.	~~CAR7~~	OK.
B.7.4	In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG	~~CAR7~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.		
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	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.	~~CAR7~~	OK.
B.7.6	Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.	~~CAR7~~	OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.7.7	Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.	~~CAR7~~	OK.
	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	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.	~~CAR7~~	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	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data	~~CAR7~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.		
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	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.	~~CAR7~~	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	As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding	~~CAR7~~	OK.

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				the management system including QA/QC procedures were not included in the PDD.		
	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	Neither *ACM0002*, version 12.2.0, nor the DNA of Brazil requires collection and archiving of relevant data concerning environmental, social and economic impacts.		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	Neither *ACM0002*, version 12.2.0, nor the DNA of Brazil requires collection and archiving of relevant data concerning environmental, social and economic impacts.		OK.
B.7.14	Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	Neither *ACM0002*, version 12.2.0, nor the DNA of Brazil requires collection and archiving of relevant data concerning environmental, social and economic impacts.		OK.
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/ /6/	DR	The starting date of the project activity is defined in section C.1.1 of version 1 of the PDD as 8 July 2008, the date in which ANEEL authorized Energisa Soluções S.A. to explore the hydro potential of the SHPP Caju, SHPP Santo Antonio, and SHPP São Sebastião do Alto. According to the "Glossary of CDM terms", "*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 (...) the start date shall be considered to be the date on which the project participant has*	~~CAR1~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				committed to expenditures related to the implementation or related to the construction of the project activity". Project proponents did not provide documental evidence of the starting date of the project as the earliest of implementation, construction and real action in line with the definition in the CDM EB *"Glossary of CDM Terms"*. In addition, section C.1.1 of version 1 of the PDD does not present the evidence available to support this date.		
C.1.3	Is the stated expected operational lifetime of the project activity reasonable?	/1/ /12/	DR	The expected operational lifetime of the project activity is 30 years and it is deemed reasonable.		OK.
C.1.4	Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/ /13/	DR	A 7-year renewable crediting period has been chosen for the project. The chosen crediting period starting date, on 1 July 2012 or the registry date of the project activity at the CDM-UNFCCC, whichever is later. It is deemed to be reasonable and is matching the beginning of the PPA. The project crediting period defined in version 1 of the PDD is before the date of possible registration, what is not feasible.	~~CL5~~CL 5 CL5 CL5 CL5 CL5 CAR5 CAR5 CL5	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/ /31/	DR	Yes, there is a federal resolution: *Resolution CONAMA nº 001*, of 23 January 1986 about Environmental Impact Assessments. An Environmental Impact Assessment (EIA) has been conducted according to Brazilian law & regulation. DNV was able to verify that the	~~CL11~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				project activity has granted all applicable Environmental Licenses required by the state environmental agency (INEA). Although no significant environmental impacts are expected from the project activity, the potential environmental impacts that the project may cause and actions implemented to their mitigation were not identified in version 1 of the PDD.		
D.1.2	Does the project comply with environmental legislation in the host country?	/1/ /9/	DR	Yes, the project complies with Brazilian environmental legislation. DNV verified that the hydro plants were granted the Environmental Operation Licence issued by the INEA and are valid.		OK.
D.1.3	Will the project create any adverse environmental effects?	/1/ /9/	DR	Although no significant environmental impacts are expected from the project activity, the potential environmental impacts that the project may cause and actions implemented to their mitigation were not identified in version 1 of the PDD.	~~CL11~~	OK.
D.1.4	Have identified environmental impacts been addressed in the project design?	/1/ /9/	DR	Although no significant environmental impacts are expected from the project activity, the potential environmental impacts that the project may cause and actions implemented to their mitigation were not identified in version 1 of the PDD.	~~CL11~~	OK.
D.1.5	Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/ /9/	DR	Although no significant environmental impacts are expected from the project activity, the potential environmental impacts that the project may cause and actions implemented to their mitigation were not identified in version 1 of the PDD.	~~CL11~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
D.1.6	Are transboundary environmental impacts considered in the analysis?	/1/ /9/	DR	Although no significant environmental impacts are expected from the project activity, the potential environmental impacts that the project may cause and actions implemented to their mitigation were not identified in version 1 of the PDD.	~~CL11~~	OK.
E Stakeholder Comments (VVM para 128-130)						
E.1.1	Have relevant stakeholders been consulted?	/1/ /10/ /56/	DR	Local stakeholders, such as the municipal governments and city councils, federal and state attorney, the environmental state and local agencies, the Brazilian forum of NGOs and local communities associations, were invited on 12 to 30 August 2010 to comment on the project - in accordance with the requirements of Resolution 7 (5 March 2008) of the DNA of Brazil. The PDD, version 1 dated 11 August 2010, was made publicly available on the CDM website http://sites.google.com/site/consultadcp/ and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period, from 5 November 2010 to 4 December 2010. Although DNV considers the local stakeholder consultation was carried out adequately, section E.1 of the version 1 of the PDD is mentioning the old Resolution 1 of the DNA, which was replaced by Resolution 7 from 5 March 2008. Stakeholder consultation was carried out adequately as per DNA of Brazil Resolution 7 for stakeholder consultation. However, the link used	~~CL12~~ ~~CL14~~ ~~CL15~~	OK.

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				to access the PDD in Portuguese is not stated in version 1 of the PDD, published for global stakeholder consultation. Additionally it is not clear if the link was already operational when the PDD was published for global stakeholder consultation. It is not clear in sections E.2 and E.3 of version 1 of the PDD if comments from stakeholders were received and how due account was taken of any comments received.		
E.1.2	Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	Yes, DNV checked all the invitation letters and the postal service mail receipts.		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	Refer to E.1.1.		OK.
E.1.4	Is a summary of the stakeholder comments received provided?	/1/	DR	No comments were received for the proposed project during the local and the global stakeholder consultations.		OK.
E.1.5	Has due account been taken of any stakeholder comments received?	/1/	DR	DNV considers the local and global stakeholder consultation was carried out adequately.		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
CAR1 The starting date of the project activity is defined in section C.1.1 of version 1 of the PDD as 8 July 2008, the date in which ANEEL authorized	B.5.5 C.1.2	PPs define the starting date of the project activity as 16 September 2009, when the long-term Financing Contract was signed with the Brazilian Development Bank (from	DNV assessed the EPC contracts /14/ and confirmed that the clause 12.2.(iv) generates a conditional situation to the validity of the contract, stating that only

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Energisa Soluções S.A. to explore the hydro potential of the SHPP Caju, SHPP Santo Antonio, and SHPP São Sebastião do Alto. According to the *"Glossary of CDM terms",* "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 (…) the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity". Project proponents did not provide documental evidence of the starting date of the project as the earliest of implementation, construction and real action in line with the definition in the CDM EB *"Glossary of CDM Terms"*. In addition, section C.1.1 of version 1 of the PDD does not present the evidence available to support this date.		the Portuguese Banco Nacional de Desenvolvimento Econômico e Social – BNDES). Nevertheless, the EPC Contract was signed on 24 October 2008 agreement cannot be considered the project starting date, since it a safeguard clause (12.2.(iv)) that conditions the EPC contract validity to long-term Financing Contract signature (the EPC contract, only with the safeguard clause pages follows attached due confidentiality constrains). Thus, the signature of the Financing Contract was defined as the project starting date because all three power plants (Caju, Santo Antônio and São Sebastião do Alto) presented a low Internal Rate of Return (IRR) and depended on a subsided financing agreement in order to guarantee the project's attractiveness. Furthermore, BNDES' financial approval is essential to guarantee the financial-economic balance of the Investment as well as to improve the project profitability. The project depended on the carbon credits revenue; the lowest construction cost possible; and a long term loan that could enhance the project's leverage without reducing its feasibility, since interest rates for local currency financing are significantly higher than USA Dollar rates. Brazilian credit market is dominated by shorter maturities and long-term credit lines that are available only for the strongest	after financing was granted, the contract would be valid. Therefore the starting date of the project is defined as 16 September 2009, in accordance to "*Glossary of CDM terms"* /23/. Therefore this CAR is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		corporate borrowers and for special government initiatives. Credit is restricted to the short-term in Brazil or the long-term in dollars offshore. Therefore, the only alternative to PP was obtaining an agreement with BNDES. Besides, the financial conditions provided by BNDES such as: an amortization in 168 payments; an interest rate of 8.05% per year, which is lower than the WACC and the cost of equity; and a six months grace period, which adds high value to the project's cash flow, loan facilities essentials to the financial-economic balance of the project. In addition, the investment costs also have a decisive role in the project´s feasibility. Project Proponent's experience has shown that the average implementing cost of SHPP have being steadily increasing in the last five years. In this context, the EPC contract had to be signed as early as possible in order to freeze the investment cost. Therefore, even though the EPC contract was settled before the BNDES's Financing Contract was signed, the project still depended on BNDES's approval. Since, PP could still give up the project, once the EPC contract posses a safeguard clause (12.2.(iv)), project starting date was revised and also, section C.1.1 was revised accordingly. Please, refer to the revised version of the PDD.	

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR2 According to the *"Glossary of CDM terms"* and following the timeline provided in section B.5 of the version 1 of the PDD, the project starting date was supposed to be defined as 24 October 2008, which corresponds to the date of signature of the EPC contract. Thus, in accordance with the guidance from the "*Glossary of CDM terms",* the proposed project is a newly built hydro project and the starting date of the project activity (24 October 2008) is after 2 August 2008. However, documental evidence was not provided in order to confirm that the CDM Secretariat and the DNA of Brazil have been informed about the CDM project as per *"Guidelines on the demonstration and assessment of prior consideration of the CDM"*.	B.5.5 B.5.6	As explained in CAR 1, the project starting date was defined as 16 September 2009, date in which the Financing contract was signed between Energisa and BNDES. Once the project´s starting date is after 2 August 2008, PPs have forwarded the Prior Consideration of the CDM Form (F-CDM-Prior consideration) both for the Brazilian Designated National Authority and to the UNFCCC secretariat on 2 September 2009 in order to demonstrate that the CDM was considered in the project implementation decision. Please, refer to the website (available at http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html), in order to check the information provided. Also, find attached the emails sent by Ecopart Assessoria em Negócios Empresariais Ltda. to the UNFCCC secretariat and DNA of Brazil regarding the Prior Consideration of the CDM as well as the confirmation receipt of both entities.	DNV assessed the EPC contracts /14/ and the financing contract /6/ and confirmed that the starting date of the project is defined as 16 September 2009, as this is the the date of signature of the financing contract between Energisa and BNDES /6/. With the date defined in accordance to "*Glossary of CDM terms"* /23/, DNV confirmed that the communication with the Secretariat /8/ (on 2 September 2009) and the DNA of Brazil /9/ (9 September 2009) were correctly performed in accordance to *"Guidelines on the demonstration and assessment of prior consideration of the CDM"* /27/. Therefore this CAR is closed.
CAR3 Project participants did not present on section B.5 of version 1 of the PDD detailed investment analysis, presenting the costs related to the equipment, insurance, project installation and operation/maintenance, prices, taxes, resolutions, estimates. In addition, since the project starting date was not correctly defined, DNV was not able to confirm that the input parameters used in the	B.5.7 B.5.8 B.5.21 to B.5.24	The investment analysis data are not based on the parameters at the project starting date. The input parameters used in the investment analysis are in accordance with the ones presented at the time of the project implementation decision. According to PPs, the date of the project implementation decision is 17 July 2008, date in which Energisa Soluções S.A. Board's meeting	DNV assessed the report of the meeting of the Board /5/ of Energisa Geração Rio Grande S.A. and confirmed that the date of decision of investment is 17 July 2008. Energisa Soluções S.A. is the owner of Energisa Geração Rio Grande S.A., as confirmed through documents "Amendment SHPP Caju.pdf", "Amendment SHPP Santo Antônio.pdf" and "Amendment SHPP São

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
investment analysis are reasonable and adequately represent the economic situation of the project in the date of the decision of investment.		approved the implementation of SHPP Caju, São Sebastião do Alto, and Santo Antônio.	Sebastião do Alto.pdf" /17/. DNV assessed the revised PDD, the revised financial analysis calculation spreadsheets /4/, contracts /14/ /15/ /17/, and benchmark calculation spreadsheet /3/ and parameters /42/ /43/ /44/ /45/ /46/ /47/ /48/ /49/ /50/ and confirmed that they were all valid for the date of investment decision with the support of an independent financial expert /55/. Therefore this CAR is closed.
CAR4 The IRR calculations were provided in a spreadsheet and verified by DNV. However, DNV was not able to confirm that the assumptions used in the calculations were deemed to be correct while related CAR3 are not properly answered and closed.	B.5.16 B.5.25	The investment analysis was carried out, based on PP experience, it is worth mentioning that the project's Total Investment cost is highly depend on the time of the SHPP implementation (the investment cost have been continuously raising), and the project´s specifics characteristics (terrain, local assessment, local hydrology, etc.). Moreover, the investment analysis undertaken at the time of the investment decision was conservative regarding the actual project´s implementation cost.	DNV, with the support of an independent financial expert /55/, assessed the revised PDD, the revised financial analysis calculation spreadsheets /4/ and contracts /14/ /15/ /17/ and cross-checked all values, confirming that the assumptions and calculations are correct. Therefore this CAR is closed.
CAR5 A sensitivity analysis was performed by decreasing and increasing in 10% the investments costs, plant load factor, operation and maintenance costs and electricity price. As per the CDM Executive Board: *"Guidelines on the Assessment of Investment Analysis"*, the	B.5.26 to B.5.28	According to the "Guidelines on the assessment of investment analysis" (Annex 58, EB 51), "the sensitive analysis should at least cover a range of + 10% and – 10%", as is stated in the PDD. As the sensitive analysis considering the IRR of Caju, Santo Antônio and São Sebastião do Alto SHPPs do not surpass the benchmark (15.86%)	DNV, with the support of an independent financial expert /55/, assessed the revised PDD, the revised financial analysis calculation spreadsheets /4/, contracts /14/ /15/ /17/ and cross-checked all values, confirming that the sensitivity analysis is correctly performed, varying until the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
sensitivity analysis must include the variables that represent 20% of either total project costs or total project revenues. These parameters must be subject to reasonable variations, i.e.: the sensitivity of variables where it would reach the benchmark value needs to be considered. In addition, project participants are requested to justify why these variations are not reasonable.		presented in the investment analysis. Nevertheless, PP conducted a simulation to verify possible scenarios where the IRR of each SHPP would be equal the benchmark. The identified scenarios are not likely to happen according to the explanation presented in the PDD. Please, refer to the third version of the document.	benchmark is reached. Therefore this CAR is closed.
CAR6 The version 1 of the PDD does not specify the accuracy of the electricity meters located at the substation. In addition, detailed information (type of electricity meter and accuracy, calibration frequency) regarding the equipment used for the total electricity generation monitoring were not included in the monitoring plan.	B.7.2	Information regarding the electricity meters was included in the PDD. Please, refer to the revised version of the PDD	DNV assessed the revised PDD and verified that the required items in the monitoring plan were correctly added. Data and parameters to be monitored, compilation of the monitored data and dealing with errors, QA/QC procedures, training plan, calibration and record keeping were described. Therefore this CAR is closed.
CAR7 As stated in the version 1 of the PDD, Energisa Soluções S.A. will be responsible for the maintenance of the monitoring equipment; for dealing with possible monitoring data adjustments and uncertainties; for review of reported results/data; for internal audits of GHG project compliance with operational requirements and for corrective actions; organizing and training, as appropriate, the staff in the appropriate monitoring, measurement and reporting techniques. However, details regarding the management system including QA/QC procedures were not included in the PDD.	B.7.3 to B.7.11	The PDD was revised, also including the QA/QC procedures.	DNV assessed the revised PDD and verified that the required items in the monitoring plan were correctly added. Data and parameters to be monitored, compilation of the monitored data and dealing with errors, QA/QC procedures, training plan, calibration and record keeping were described. Therefore this CAR is closed.
CL1	A.4.1	The Geographic coordinates were revised	DNV assessed the revised PDD, the

<table>
<tr><th>Corrective action and/ or clarification requests</th><th>Reference to Table 2</th><th>Response by project participants</th><th>Validation conclusion</th></tr>
<tr><td>The geographical coordinates of the SHPPs in version 1 of the PDD do not represent the correct position of the projects.</td><td></td><td>accordingly. Please, refer to section A.4.1.4. of the revised version of the PDD.</td><td>environmental licences /9/ and ANEEL’s authorization to establishment as an independent producer of electrical energy /33/ and confirmed that the coordinates demonstrated in the PDD are correct.
Therefore this CL is closed.</td></tr>
<tr><td>CL2
Documental evidences of the areas of the reservoirs were not presented.</td><td>B.6.6 to B.6.8
B.6.12</td><td>PP presented as documental evidence of the areas of the reservoir the ANEEL Report contained the resume of the projects including the reservoir area. Please, refer to ANEEL’s information system (SIGEL - From portuguese Sistema de Informações Georreferenciadas do Setor Elétrico, available at http://sigel.aneel.gov.br/. First check the item “Geração”, than check on the subitem “PCH”. Subsequently, click on the item represented by a binoculars, and choose “Pesquisa por nome”.)</td><td>DNV assessed the environmental licences /9/ and ANEEL’s authorization to establishment as an independent producer of electrical energy /33/ and confirmed that the areas of the reservoirs are correctly demonstrated in the PDD.
Therefore this CL is closed.</td></tr>
<tr><td>CL3
Annual electricity generated and the annual electricity delivered in version 1 of the PDD are not clearly explained.</td><td>B.6.3 to B.6.5
B.6.12</td><td>As requested, the total annual electricity generation (TEGy) and the annual electricity delivered to the grid ($EG_{facility,y}$) were revised. It is important to mention that the TEGy is based on the assured energy determined by ANEEL Resolution n°1, dated 14 January 2010, as it is shown in the table below:
<table>
<tr><td></td><td>Caju SHPP</td><td>Santo Antônio SHPP</td><td>São Sebastião do Alto SHPP</td></tr>
</table>
</td><td>DNV assessed the revised PDD, the revised emission reduction calculation spreadsheet /2/ and ANEEL’s authorization to establishment as an independent producer of electrical energy /33/ and confirmed that estimates of the total annual electricity (TEGy) and estimates of the annual electricity delivered to the grid ($EG_{facility,y}$) are correctly demonstrated in the PDD.
Therefore this CL is closed</td></tr>
</table>

<table>
<tr><th>Corrective action and/ or clarification requests</th><th>Reference to Table 2</th><th>Response by project participants</th><th>Validation conclusion</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Assured Energy (MW_{avg})</td><td>5.86</td><td>4.81</td><td>7.15</td></tr>
<tr><td>EG_y (MWh/yr)</td><td>51 334</td><td>42 136</td><td>62 634</td></tr>
</table>
However, the assured energy defined by ANEEL does not count internal loads and transmission losses, which consequently infer in the total electricity delivered to the grid. Thus, considering an average of 2% in internal loads (please refer to the attached spreadsheet) and transmission losses, the total annual electricity delivered to the grid, as well as the assured energy considering the internal loads and transmission losses are showed in the table below:
<table>
<tr><td></td><td>Caju SHPP</td><td>Santo Antônio SHPP</td><td>São Sebastião do Alto SHPP</td></tr>
<tr><td>Assured Energy (MWavg)</td><td>5.98</td><td>4.91</td><td>7.29</td></tr>
<tr><td>TEGy (MWh/yr)</td><td>52 385</td><td>43 012</td><td>63 860</td></tr>
</table>
Please, refer to the revised version of the PDD and the spreadsheet to verify revised information.
</td><td></td></tr>
<tr><td>CL4
The expected operational lifetime of the project</td><td>A.2.4</td><td>According to the Study of Economic Lifetime and Depreciation Rate (from the</td><td>DNV assessed the revised PDD, the revised financial analysis calculation spreadsheets</td></tr>
</table>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
activity is 30 years. Project participants did not provide documental evidence in order to confirm the expected operational lifetime of the project activity.	B.5.17	Portuguese Estudo de Vida Útil Econômica e Taxa de Depreciação) developed by Escola Federal de Itajubá and Centro de Estudos em Recursos Naturais e Energia (CERNE), the lifetime of a turbine and a generator is expect to be 40 and 30 years, respectively. Please, find attached to this response the file "Vida útil gerador e turbine.pdf".	/4/. Cross-checking the information presented with relevant legislation /12/, DNV confirmed that the depreciation rate of 3.3% per year is in accordance to ANEEL's *Lifetime and depreciation of Turbines and Generators* and that in the lifetime of the proposed project, 30 years, the assets would present residual value, which is included in the last year of the assessment period. DNV also confirmed that each SHPP eligible as presumed profit companies and to its regulations /42/. Being registered in this fiscal regimen, a company cash-flow is not impacted by depreciation. Therefore, this CL is closed.
CL5 The project crediting period defined in version 1 of the PDD is before the date of possible registration, what is not feasible.	C.1.4	PP revised the start date of the crediting period. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD and confirmed that the revised starting date of the crediting period, 1 July 2012 or on the date of registration of the CDM project activity, whichever is later, is appropriate. Therefore, this CL is closed.
CL6 As the project activity is composed of three new grid-connected small hydro power plants, the baseline scenario is already defined by the methodology and properly stated in section B.4 of version 1 of the PDD. However, the *"Combined tool to identify the baseline scenario and demonstrate additionality"* mentioned in section B.1 of the PDD was not used.	B.5.1	Section B.1 was revised accordingly. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD and confirmed that the "*Combined tool to identify the baseline scenario and demonstrate additionality"* was correctly removed from section B.1. Therefore this CL is closed.
CL7	B.5.45 to	PP revised the information regarding SHPP	DNV assessed the revised PDD, the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
DNV was not able to confirm CDM information about SHPP Santa Fé I - mentioned in version 1 of the PDD to be both PROINFA and CDM - in the CDM Project Activities home.	B.5.47	Santa Fé I and concluded that SHPP Santa Fé I located in Comendador Levy Gasparian municipality, Rio de Janeiro state is not a CDM project. Please refer to the revised version of the PDD to verify revised information.	common practice analysis /18/ and ANEEL's Bank of Generation /51/ and confirmed that the common practice analysis presented in the PDD is correct. Therefore, this CL is closed.
CL8 The "global warming potential of methane" ($GWPCH_4$) and the "default emission factor from reservoirs" (EF_{RES}) were not included in section B.6.2 of version 1 of the PDD.	B.6.1 to B.6.3	PP included $GWPCH_4$ anf EF_{RES} in section B.6.2. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD and confirmed that "global warming potential of methane" ($GWPCH_4$) and the "default emission factor from reservoirs" (EF_{RES}) were correctly included in the PDD. Therefore, this CL is closed.
CL9 The parameters "total electricity generation" (TEGy), "operating margin" (OM) and "build margin" (BM) -the latter two published by the DNA of Brazil – were not included in section B.7.1 of version 1 of the PDD.	B.7.2	The parameters TEGy, operating margin (OM) and build margin (BM) were included in section B.7.1. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD and confirmed that "total electricity generation" (TEGy), "operating margin" (OM) and "build margin" (BM) were correctly included in the PDD. Therefore, this CL is closed.
CL10 "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" was mentioned in section B.1 of version 1 of the PDD but was not used in the calculation of the project emissions. As per ACM0002 version 12.2.0 the *"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"* is used in the calculation of the project emissions if there are fossil fuel sources in the project site and they represent more than 1% or emission reductions. Project participants did not justify in the PDD if there are emissions from fossil fuel gensets, that	B.3.3 B.6.12 B.6.6 B.6.7 B.6.12	Project participants clarify that there will be a diesel generator located at each small hydropower plant, summing there diesel generators. In order to demonstrate that the diesel generators emissions will not surpass 1% of the overall expected average annual emission reductions, it was considered the average electricity generated by month by the generators according to information provided by Energisa. The calculation of the expected emissions of the three generators is presented in the file "Emissão	DNV assessed the calculation of estimate emissions due to the use of diesel generators /19/ and considered it will not reach 1% of the yearly ERs during the crediting period; therefore there is no need to be monitored. Additionally, DNV assessed the revised PDD and confirmed that the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"* was correctly removed from section B.1. Therefore this CL is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
these are not exceeding 1% of emission reductions and did not clarify how this can be ensured during the crediting period.		Gerador a Diesel. xls" also attached to this response.	
CL11 Although no significant environmental impacts are expected from the project activity, the potential environmental impacts that the project may cause and actions implemented to their mitigation were not identified in version 1 of the PDD.	D.1.1 D.1.3 to D.1.6	Please refer to the projects' environmental licenses and programs (attached). As can be verified all three SHPP were analysed by the Environmental State Agency, and the proper environmental mitigation actions implemented.	DNV assessed the revised PDD and confirmed that environmental impacts registered in the environmental licences /9/ were correctly included in the PDD. Therefore, this CL is closed.
CL12 Although DNV considers the local stakeholder consultation was carried out adequately, section E.1 of the version 1 of the PDD is mentioning the old Resolution 1 of the DNA, which was replaced by Resolution 7 from 5 March 2008.	E.1.1	Section E.1 was revised accordingly. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD and confirmed that the correct version of the DNA's resolution about stakeholder consultation (Resolution 7 of 5 March 2008) /37/ was correctly applied in the PDD. Therefore, this CL is closed.
CL13 Project participants did not present the construction contract.	A.2.2	The construction contract can be found attached to this response. Please, refer to the attached file "Construction Contract_EPC.pdf".	DNV received and assessed the EPC contracts, between Energisa Geração Rio Grande S.A. and WEG Energy, MEK Engineering and Consulting Ltda., EMPA Services of Engineering, ENGECON Constructers Engineers Ltda., Engineering SERCCOM Ltda. (the EPC contractors) for the acquisition of the equipment, civil works, electromechanical assembling, executive project and management of integrated works during the construction of the SHPPs /14/. DNV confirmed that these contracts' values were correctly used in the sensitivity analysis. Therefore, this CL is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CL14 Stakeholder consultation was carried out adequately as per DNA of Brazil Resolution 7 for stakeholder consultation. However, the link used to access the PDD in Portuguese is not stated in version 1 of the PDD, published for global stakeholder consultation. Additionally it is not clear if the link was already operational when the PDD was published for global stakeholder consultation.	E.1.1	The link used to access the PDD in Portuguese was included in the PDD. Also, the link used to access the PDD in Portuguese was available before the GSP, since the PDD in Portuguese was published on 6 October 2010 and the GSP started on 5 November 2010. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD and accessed the link https://sites.google.com/site/consultadcp/Inicio/projetos-pchs-energisa, confirming it was available for consultation from 6 October 2010, as requested on DNA's Resolution 7 /37/. Therefore, this CL is closed.
CL15 It is not clear in sections E.2 and E.3 of version 1 of the PDD if comments from stakeholders were received and how due account was taken of any comments received.	E.1.1	In fact, Energisa Rio Grande SHPPs project activity did not receive comments from the local consultation and from the global stakeholder consultation (GSP). Also, Section E.2 and E.3 were revised. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD and confirmed that it correctly states that there were no comments received from stakeholders /56/. Therefore, this CL is closed.
CL16 It is not clear in tables A.4.4 and B.6.4 of version 1 of the PDD what is the total emission reduction for the crediting period.	A.2.4 B.5.20 B.6.6 B.6.12	As requested, the table in Section A.4.4 and in section B.6.4 were revised. Please, refer to the revised version of the PDD.	DNV assessed the revised PDD, the revised emission reduction calculation spreadsheet /2/ and ANEEL's authorization to establishment as an independent producer of electrical energy /33/ and confirmed that the estimate of total emission reduction for the crediting period are correctly demonstrated in the PDD. Therefore this CL is closed
CL17 Figure 5 of version 1 of the PDD states that the Southern region of Brazil is not presented in the chart. However, Porto Alegre is the capital of Rio Grande do Sul, a state from the Southern region of Brazil.	B.5.42	The description of Figure 5 was revised to "(...) except the Southeast region (...)". In fact, PP intend to show the variation in the average precipitation in the 5 five different regions of Brazil. Furthermore, Figure 4 presentes the average precipitation in Rio de Janeiro state (Southeast region)m where	DNV assessed the revised PDD and confirmed that data for Porto Alegre was removed from figure 5 of the PDD. Therefore this CL is closed

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		the SHPPs are located. Please, refer to the revised version of the PDD.	
CL18 In the Sensitivity Analysis of version 1 of the PDD, it is not clear of what is the "price" varied.	B.5.26 to B.5.28	The "Price" corresponds to the Electricity Tariff. Please, refer to the revised version of the PDD in order to check the revised information.	DNV assessed the revised PDD and confirmed that it satisfactorily explains that the price mentioned is the price for electricity. Therefore this CL is closed
CL19 In the Investment Analysis of version 1 of the PDD, it is not clear if the WACC is nominal or real.	B.5.14	The WACC value applied in the investment analysis is the nominal value, i.e., considering the inflation through the years. This information was included in the PDD. Please, refer to the revised version of the document.	DNV assessed the revised PDD and confirmed that it satisfactorily explains that the WACC is nominal. Therefore this CL is closed
CL20 In the Common Practice Analysis of version 1 of the PDD, it is not clear what are the links for each project presented as CDM or PROINFA.	B.5.42	The links presented for CDM and PROINFA were included in the common practice spreadsheet. Please, refer to the file "Prática Comum_RiodeJaneiro_revisada2011.12.21.xls". In addition, this section of the PDD was revised following the new version of the "Tool for the demonstration and assessment of additionality", version 6.0.0 approved by the EB in its 65th meeting. The new version of the tool included the procedures established in the "Guidelines on Common Practice", recently approved by the board in the 63rd meeting. Please, refer to the revised version of the PDD to check provided information.	DNV assessed the revised PDD, the common practice analysis /18/ and ANEEL's Bank of Generation /51/ and confirmed that the common practice analysis presented in the PDD is correct. Therefore, this CL is closed.

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
No FAR was identified in this validation.		

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APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Andrea Leiroz

Mrs. 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.

Luis Filipe Tavares

Mr. Luis Filipe Tavares holds a Technician's Degree in Chemistry and Bachelor's Degree in Metallurgical Engineering. Having an overall experience of thirty tree years.

Prior to joining DNV having around twenty tree years experience in steel production industry covering utilities (water, steam, wastewater treatment), environment control (atmosphere emissions, water emission and waste dumping).

His experience also covers the development of nitrification biological wastewater station as well as other activities as head of Utilities and Environmental Laboratory control.

He has also been actively involved in implementation of Management Systems such as ISO 9001 standard on coke oven department of steel industry as well as the ISO 140001 standard in all steel plant (the second steel company certified in the world) for more than three years.

He has experience of around 8 years in validation and verification of numerous CDM projects in DNV, both in Brazil & South America.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in Iron and Steel; Metal production; Oil and Gas industry, CMM recovery and use; Generation from renewable energy sources; Waste handling and disposal and Animal waste management.

Gabriel Baines

Gabriel Baines holds a Bachelor's Degree in Environmental Engineering. He has an overall work experience of 6 years. Prior to joining DNV, has had two and a half years experience in the aluminium industry covering the areas of production and environment. His experience

also covers the fields of environmental management and management systems such as ISO 14001.

He has experience of around 2 years in validation and verification of numerous CDM projects in DNV, both in Brazil and abroad.

His qualification and experience in CDM demonstrate his sufficient sectoral competence Renewable Energies and Swine Manure.

Frederico Rosas

Frederico holds a Bachelor Degree in Management and a specialization in Business Administration.

He is professor at Fundação Getúlio Vargas, where he teaches financing, costs management, price management, investment analysis and controllership.

He has working experience of more than 15 years in companies of the area of finances, mining and cosmetics.

Zhang Lei, Lucas

Mr. Zhang Lei, Lucas holds a Bachelor Degree in Applied Chemistry. Prior to joining DNV, having four years and seven months experience in coal gasification industry covering the process of coke production, quality assurance and wastewater treatment. His experience also covers the fields of environmental management and environmental impact assessment. He has experience of around two years in validation and verification of CDM projects in DNV, in China.
His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in "Energy Generation from Renewable Energy Sources", “Coke Manufacturing”and “Waste Handling and Disposal”.

Edwin Aalders

Mr Aalders has nearly 20 years of experience as an assessor in Environmental Auditing and accreditation and started his career in SGS in 1992 were he quickly became involved in the development of new environmental certification & control services. In 2004 he became the Director of the International Emission Trading Association (IETA) which he held till 2009. In addition to his role as Director in IETA he held between November 2007 and October 2008 the role of Acting CEO for the Voluntary Carbon Standard Association (VCSa). In 2009 Mr Aalders became a Partner with IDEAcarbon before joining DNV as Approver/ Service Line Responsible - CDM at the Climate Change and Sustainable Development Department in 2011. Throughout his career he lived and worked throughout the developing and developed

countries and been involved in developing new environmental markets. Mr Aalders is an elected member of roster of experts for the Methodology Expert of the CDM & JI and on the AFOLU Steering Committee of the Verified Carbon Standard Association (VCSa)