



VALIDATION REPORT

RIO GRANDE DO NORTE AND CEARÁ WIND ENERGY COMPLEX PROJECT ACTIVITY IN BRAZIL

REPORT No. 2011-1624

REVISION No. 01A

DET NORSKE VERITAS



VALIDATION REPORT

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Approved by Edwin Aalders	Organisational unit: DNV KEMA Energy & Sustainability Accredited Climate Change Services	
Client: MS Participações Societárias S/A	Client ref.: Andressa Cesario	

Summary:

Project Name: Rio Grande do Norte and Ceará Wind Energy Complex Project Activity

Country: Brazil

Methodology: ACM0002

Version: 12.3.0

GHG reducing Measure/Technology: Power generation from renewable resources

ER estimate: 75 707 tCO₂e 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

This validation report summarizes the findings of the validation. The only changes made to this version of the validation report compared to the validation report rev. 01 dated 16 April 2012 referred to in the letter of approval of the DNA of Brazil are linked to the status of issuance of the letter of approval by the DNA of Brazil.

In summary, it is DNV's opinion that the project activity "Rio Grande do Norte and Ceará Wind Energy Complex Project Activity" in Brazil, as described in the PDD, version 2 of 10 April 2012, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0002, version 12.3.0. Hence DNV requests the registration of the project as a CDM project activity.

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Abbreviations

ANEEL	National Electric Energy Agency
BM	Build margin
BNDES	Brazilian Development Bank
CAR	Corrective Action Request
CCEE	Electric Energy Commercialization Chamber
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CIMGC	Interministerial Commission on Global Climate Change – DNA of Brazil
CL	Clarification request
CM	Combined margin
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CONAMA	National Council for the Environment
DNA	Designated National Authority
DNV	Det Norske Veritas
EB	Executive Board
FAR	Forward Action Request
FGV	Getúlio Vargas Foundation
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IDEMA	Rio Grande do Norte Sustainable Development Institute
IPCA	Amplified Consumer Price Index
IPCC	Intergovernmental Panel on Climate Change
IPEA	Advanced Economic Research Institute
LI	Installation License
LoA	Letter of approval
ODA	Official Development Assistance
OM	Operating margin
ONS	National Operator System
PASEP	Public Server Patrimony Formation Program
PDD	Project Design Document
PIS	Social Integration Program
PPA	Power Purchase Agreement
PROINFA	Program of Incentive to Alternative Sources of Electric Energy
SEMACE	Ceará State Environment Superintendence
SIN	National Integrated System – Electricity Grid of Brazil
SUDENE	Superintendence of Northeast Development
tCO ₂ e	Tonnes of CO ₂ equivalents
TFSEE	Surveillance Tax for Electricity Services
TUST	Tariffs on the Use of Transmission Lines
UNFCCC	United Nations Framework Convention on Climate Change
WACC	Weighted Average Cost of Capital
WEC	Wind Energy Converter
WTG	Wind Turbine Generator



1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity “Rio Grande do Norte and Ceará Wind Energy Complex Project Activity” in Brazil. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host Party criteria, 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. There is no Annex I Party identified yet.

The project correctly applies the baseline and monitoring methodology ACM0002, version 12.3.0 Consolidated baseline methodology for grid-connected electricity generation from renewable sources.

The project activity is a wind power project of four wind farms that total to 94.5 MW of installed capacity. By generating electricity from wind power and displacing electricity from the grid that is partly generated from fossil fuels, the project results in reductions of CO₂ emissions 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 75 707 tCO₂e per year over the selected 10 year fixed 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 “Rio Grande do Norte and Ceará Wind Energy Complex Project Activity” in Brazil, as described in the PDD, version 2 dated 10 April 2012, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology ACM0002, version 12.3.0. Hence, DNV requests the registration of the project as a CDM project activity.

Rio de Janeiro and Oslo, 05 October 2012

Juliana Scalón
CDM Validator
DNV Rio de Janeiro, Brazil

Edwin Aalders
Approver,
DNV Climate Change Services AS



2 INTRODUCTION

MS Participações Societárias S/A has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the Rio Grande do Norte and Ceará Wind Energy Complex Project Activity project in Brazil (hereafter called “the project”). This report summarises the preliminary 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 /1/ 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 12.3.0 /43/. The validation was based on the recommendations in the Validation and Verification Manual /42/.

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



3 METHODOLOGY

The validation consisted of the following three phases:

- I a desk review of the project design documents
- II follow-up interviews with project stakeholders
- III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk review of the project design documentation

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

3.1.1 Documentation provided by the project participants

- /1/ Ecopart Assessoria em Negócios Empresariais Ltda.: *CDM-PDD for project activity "Rio Grande do Norte and Ceará Wind Energy Complex Project Activity" in Brazil*, version 1 dated 15 September 2011 and version 2 of 10 April 2012.
- /2/ Ecopart Assessoria em Negócios Empresariais Ltda.: *CERs calculation spreadsheet* Version 3 dated 21 March 2012.
- /3/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Benchmark calculation spreadsheet*, version 3 dated 22 March 2012.
- /4/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Financial analysis spreadsheet Embuaca*, Version 3 dated 26 March 2012.
- /5/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Financial analysis spreadsheet Icarai*, Version 3 dated 26 March 2012.
- /6/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Financial analysis spreadsheet Areia Branca*, Version 3 dated 26 March 2012.
- /7/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Financial analysis spreadsheet Mar e Terra*, Version 3 dated 26 March 2012.
- /8/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Premises spreadsheet on the calculation of insurance and transmission and energy charges* dated 2 March 2012.
- /9/ Suzlon Energy Limited: *Aerogenerator Characteristics – S88 – 2.1 MW*. Available at: <http://www.suzlon.com/products/12.aspx?l1=2&l2=9>
- /10/ Suzlon Energy Limited: *Aerogenerator Characteristics – S95 – 2.1 MW*. Available at: <http://www.suzlon.com/products/13.aspx?l1=2&l2=44&l3=127>
- /11/ National Electric Energy Agency (ANEEL): *Embuaca, Icarai, Areia Branca and Mar e Terra – authorization for energy generation*.
 - Mar e Terra: <http://www.aneel.gov.br/cedoc/prt2010867mme.pdf> dated 25 October 2010;
 - Areia Branca: <http://www.aneel.gov.br/cedoc/prt2010741mme.pdf> dated 19 August 2010;
 - Embuaca: <http://www.aneel.gov.br/cedoc/prt2010732mme.pdf> dated 17 August 2010;
 - Icarai: <http://www.aneel.gov.br/cedoc/prt2010601mme.pdf> dated 30 June 2010.



- /12/ Electric Energy Commercialization Chamber (CCEE): *Bid conditions and resulted electricity prices for Embuaca, Icaraí, Areia Branca and Mar e Terra* (2nd Brazilian Auction of Reserve Energy - Auction n° 03/2009).
<http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=ec41d74d98114210VgnVCM1000005e01010aRCRD>
- /13/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Stakeholder consultation - Receipts filled by postal service when delivering mail (invitation to stakeholder's consultation) to recipients* dated 15 September 2011.
- /14/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Calculation of Operating Margin, Build Margin and Combined Margin grid emission factors* for years 2008, 2009 and 2010.
- /15/ National Operator System (ONS): *Daily report of the interconnected system operation. Energy generation by source and other system information* for years 2008, 2009 and 2010.
- /16/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Funding request to SUDENE from Wind Parks Areia Branca, Mar e Terra, Embuaca and Icaraí based on the signed EPC contracted values*. 13 July 2011.
- /17/ Garrad Hassen Ibérica S.L.U.: *Certificates of Wind Measurements and of Production of Energy, certificate for wind farms Mar e Terra, Areia Branca and Icaraí, about the plants gross load factors of the wind farms*, dated 22 November 2011.
- /18/ Garrad Hassen Ibérica S.L.U.: *Certificates of Wind Measurements and of Production of Energy, certificate for wind farm Embuaca, about the plant gross load factor of the wind farm*, dated 19 September 2011.
- /19/ IDEMA: *Environmental licenses:*
Preliminary Licenses:
 - Mar e Terra: Preliminary License #2008-024722/TEC/LP-0174, issued on 28 September 2009 and valid until 28 September 2011.
 - Areia Branca: Preliminary License #2008-024720/TEC/LP-0173, issued on 28 September 2009 and valid until 28 September 2011.*Installation Licenses:*
 - Mar e Terra: Installation License #2011-042389/TEC/LI-0008, issued on 12 May 2011 and valid until 12 May 2015.
 - Areia Branca: Installation License #2011-042391/TEC/LI-0009, issued on 12 May 2011 and valid until 12 May 2015.
SEMAE: *Environmental licenses:*
Preliminary Licenses:
 - Embuaca: Preliminary License #61/2010, issued on 15 December 2010 and valid until 15 December 2011.
 - Icaraí: Preliminary License #243/2009, issued on 8 October 2009 and valid until 8 October 2010.*Installation Licenses:*
 - Embuaca: Installation License #404/2011, issued on 11 October 2011 and valid until 10 October 2013.
 - Icaraí: Installation License #514/2011, issued on 26 December 2011 and valid until 25 December 2013.



- /20/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Power purchase agreement for Areia Branca wind farm*, dated 13 October 2010.
- /21/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Power purchase agreement for Mar e Terra wind farm*, dated 12 January 2011.
- /22/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Power purchase agreement for Embuaca wind farm*, dated 13 October 2010.
- /23/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Power purchase agreement for Icarai wind farm (project starting date)*, dated 20 August 2010.
- /24/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Notification form*, submitted to UNFCCC Secretariat for Prior Consideration of CDM and confirmed by UNFCCC on 16 March 2010.
- /25/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Notification form*, submitted to DNA of Brazil for demonstration and assessment of prior consideration of the CDM and confirmed by DNA on 16 March 2010.
- /26/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Engineering, Procurement and Construction (EPC) contracts for each wind farms and transmission lines of Mar e Terra, Areia Branca, Embuaca and Icarai* dated 30 November 2010.
- /27/ Ecopart Assessoria em Negócios Empresariais Ltda.: *First amendment of EPC contracts in order to adjust to each wind farms new configuration at Mar e Terra, Areia Branca, Embuaca and Icarai* dated 4 November 2011.
- /28/ Suzlon Energia Eólica do Brasil Ltda.: *Wind turbine suitability reports demonstrating and attesting the turbines lifetime of 20 years* dated 23 January 2012.
- /29/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Common Practice Analysis for Rio Grande do Norte and Ceará Wind Energy Complex Project Activity*, version 2 dated 23 December 2011.
- /30/ Ecopart Assessoria em Negócios Empresariais Ltda.: *BNDES weight of debt for long term loans in Brazil for wind projects*, 2009.
- /31/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Photographic evidences on the land areas at the commencement of validation*, December 2011.
- /32/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Land rental and cession agreement for Mar e Terra wind farm*, dated 20 October 2008.
- /33/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Land rental and cession agreement for Areia Branca wind farm*, dated 3 June 2008.
- /34/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Land rental and cession agreement for Embuaca wind farm*, dated 8 September 2008.
- /35/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Land rental and cession agreement for Icarai wind farm*, dated 1 July 2008.
- /36/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Demonstration of diesel consumption, equipment characteristics and estimation of project emission due to fossil fuel combustion*, dated 2 March 2012.
- /37/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Alternate financial analysis spreadsheet with the new wind farms configuration (a sensitivity analysis) considering the electricity generation estimated by the Wind study for Mar e Terra, Areia Branca, Embuaca and Icarai*, version 1 dated 23 March 2012.



- /38/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Monthly report to ANEEL on the progress of construction and implementation of Mar e Terra, Areia Branca, Embuaca and Icaraí*, dated November 2011.
- /39/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Request for installed capacity addition to ANEEL*, dated July 2011.
- /40/ Ecopart Assessoria em Negócios Empresariais Ltda.: *Detailed costs and official letter of funding approval by SUDENE for all wind farms*, dated 28 July 2011.

3.1.2 Letters of approval

- /41/ Interministerial Commission on Global Climate Change (DNA of Brazil): *Letter of approval*, dated 24 September 2012..

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

- /42/ CDM Executive Board: *Validation and Verification Manual*, version 1.2, adopted at EB 55 Annex 1.
- /43/ CDM Executive Board: *Baseline and monitoring methodology ACM0002 – Consolidated baseline methodology for grid-connected electricity generation from renewable sources*, version 12.3.0 adopted at EB66.
- /44/ CDM Executive Board: *Tool for the demonstration and assessment of additionality*, version 6.0.0 adopted at EB65 Annex 21.
- /45/ CDM Executive Board: *Tool to calculate the emission factor for an electricity system*, version 2.2.1 adopted at EB63 Annex 19.
- /46/ CDM Executive Board: *Glossary of CDM Terms*, version 5.
- /47/ CDM Executive Board: *Guidelines on the demonstration and assessment of prior consideration of the CDM*, version 4 adopted at EB62 Annex 13.
- /48/ CDM Executive Board: *Guidelines on the Assessment of Investment Analysis*, version 5 adopted at EB62 Annex 5.
- /49/ CDM Executive Board: *Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion*, version 2 adopted at EB41 Annex 11.
- /50/ CDM Executive Board: *Guidelines on the Reporting and Validation of Plant Load Factors*, version 1 adopted at EB48 Annex 11.

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

- /51/ Ministry of Environment, *Resolution CONAMA n° 001*, of 23 January 1986 about *Environmental Impact Assessment*. Available at:
<http://www.mma.gov.br/port/conama/res/res86/res0186.html>
- /52/ BNDES: *Spread - remuneration for energy projects*, available at:
http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/conhecimento/bnset/Set2901.pdf
- /53/ BNDES: *Maximum credit risk rate*, available at:
http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/meio_ambiente.html
- /54/ National Operator System - *Grid Procedures*, available at:



- www.ons.org.br/procedimentos/index.aspx
- /55/ Ministry of Environment: *Renewable Sources of Energy in Brazil*, dated 2003.
- /56/ ANEEL *Decrees, Dispatches and Notes on Tariffs*:
- Normative Resolution n° 77 about discount in tariff for alternative sources, dated 18 August 2004;
 - Decree n° 2410, dated 28 November 1997, creating the TFSEE tariff;
 - Dispatch n° 4774, 22 December 2009 about the values of the TFSEE tariff.
- /57/ ANEEL: *Dispatch on transmission costs TUST #907 dated 10 November 2009*. Available at:
http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/032009-Resolu%C3%A7%C3%A3o_%20Homologat%C3%B3ria_Edital03-2009_.pdf
- /58/ ANEEL: *Bank of Information of Generation*, the capacity of electricity generation in Brazil, from 2001 to 2011. Available at:
<http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp>
- /59/ Intergovernmental Panel on Climate Change (IPCC): *Guidelines 2006, Volume 2, Chapter 1, Table 1.4 – “Default CO₂ emission factors for combustion”*.
- /60/ Brazilian Ministry of Economy: *Income Tax Regulations - Brazilian Assumed Profit regulations*, dated 31 December 2010. Available at:
<http://www.receita.fazenda.gov.br/Publico/perguntao/dipj2011/CapituloXIII-IRPJ-LucroPresumido2011.pdf>
and dated June 2004, available at:
<http://www.receita.fazenda.gov.br/PessoaJuridica/DIPJ/2005/PergResp2005/pr517a555.htm>
- /61/ Brazilian Treasury Department: *Normative Instruction n° 247, dated 21 November 2002. About PIS/PASEP and Cofins taxes*, available at:
<http://www.receita.fazenda.gov.br/legislacao/ins/2002/in2472002.htm>
- /62/ Brazilian National Treasury: *Note 517 for information on legislation about presumed profit companies*, available at:
<http://www.receita.fazenda.gov.br/PessoaJuridica/DIPJ/2005/PergResp2005/pr517a555.htm>
- /63/ Brazilian National Treasury: *Article 22 of Law n° 10684 and Article 3 of Law n° 11727, for social contribution on net profit*, available at:
<http://www.receita.fazenda.gov.br/aliquotas/ContribCsll/Default.htm>
- /64/ *Global Stakeholder Consultation Process of Rio Grande do Norte and Ceará Wind Energy Complex Project Activity*: from 12 November 2011 to 11 December 2011.
<http://cdm.unfccc.int/Projects/Validation/DB/5HW9MII7J2PLNA6ADH58HAYX577LPO/view.html>
- /65/ Damodaran: *US Treasury Yield risk free rate, Annual Returns on Stock, T.Bonds and T.Bills-1928-2010 and beta in US market for January 2010*, available at:
<http://pages.stern.nyu.edu/~adamodar/>
- /66/ US Federal Reserve: *TIPS Yields for 10 years*. Available at:
<http://www.federalreserve.gov/econresdata/researchdata.htm>
- /67/ Central Bank of Brazil: *Target inflation in Brazil*. Available at:
<http://www.bcb.gov.br/pec/metas/inflationtargetingtable.pdf>



- /68/ Advanced Economic Research Institute (IPEA): *Country risk premium (EMBI+Brazil)*. Select macroeconomic data, then “source JP Morgan”. Available at:
<http://www.ipeadata.gov.br/>
- /69/ Superintendence of Northeast Development (SUDENE): *Description of State Company that administrates a funding program from Brazilian Government*. Available at:
<http://www.sudene.gov.br/site/menu.php?idioma=ptbr&cod=202>
- /70/ Getúlio Vargas Foundation: *Cost of Capital to Small Hydroelectric Power Plants in the Clean Development Mechanism Context*, dated November 2010.
- /71/ Brazilian National Treasury: *Interest rates*, from 1995 to 2011, available at:
<http://www.receita.fazenda.gov.br/pagamentos/jrselic.htm>
- /72/ ANEEL: *Decree #5 177 of 12 August 2004*: regulation about the CCEE operations and the contribution from associated energy producers (CCEE charge). Available at:
<http://www.aneel.gov.br/cedoc/bdec20045177.pdf>
- /73/ ANEEL: *Law #9 648 of 27 May 1998*: regulation about the ONS operations and the contribution from associated energy producers (ONS charge). Available at:
<http://www.aneel.gov.br/cedoc/blei19989648.pdf>
- /74/ BNDES: *A Panorama of the industry related to Wind energy*, dated April 2009. Available at:
http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/conhecimento/bnset/Set2907.pdf
- /75/ US Department of Defense: *American Military Standard and tables for Inspection by Attributes (MIL-STD-105E)* dated 10 May 1989.
- /76/ International Electrotechnical Commission: *Normative IEC 61 400-1 and 61 400-22 - IEC system for conformity testing and certification of wind turbines*, ed. 2, 1999.
- /77/ Brazilian Geography and Statistics Institute: *Amplified Consumer Price Index (IPCA)*:
http://www.ibge.gov.br/home/estatistica/indicadores/precos/inpc_ipca/ipca-inpc_201202_1.shtm
- /78/ Itron Inc.: *Quantum Q1000 electricity meter*. Available at:
<http://www.atlanticmeter.com/Sales/Catalog/Meters/Electric/Itron/quantum.html>
- /79/ BNDES: *Long Term Interest Rate*, 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
- /80/ Interministerial Commission on Global Climate Change (DNA of Brazil): notes and information on the calculation of the grid emission factor for Brazil:
<http://www.mct.gov.br/index.php/content/view/72764.html>

3.2 Follow-up interviews with project stakeholders

The project is a newly built wind power plant. Through the documents which the project participant provided, DNV could confirm the project design, construction, operation and monitoring plan and all baseline scenario information.

The representatives of the project owner MS Participações Societárias S/A and project participants from Ecopart Assessoria em Negócios Empresariais Ltda. were interviewed on 16 December 2011 at Ecopart Assessoria em Negócios Empresariais Ltda. office in São Paulo



city, São Paulo State, by DNV auditors Juliana Scalon, Luis Filipe Tavares, Linh Huynh and Robin Weldy, to resolve the issues identified during the desk review.

During the desk review, the relevant documents including the PDD /1/, the ER calculation spreadsheet /2/, the benchmark calculation /3/, the IRR spreadsheets /4/-/7/, the notification to UNFCCC and its confirmation /42/, the preliminary and installation licenses /19/, the wind studies /17/-/18/, the receipts of delivery of mail to stakeholders /13/, land rental contracts /32/-/35/ and the contracts of PPA /20/-/23/. The physical implementation of the project had started only the foundations inspections and construction for Mar e Terra and Areia Branca wind farms as can be verified through the monthly reports sent to ANEEL regarding the progress of the project implementation /38/. Hence, DNV can justify that a physical site visit for this project was not required during the validation stage.

	Date	Name	Organization	Topic
/81/	16 December 2011	Miguel Lobo	MS Participações Societárias S/A	• Project Design and adopted technology
/82/		Andressa Cesario	MS Participações Societárias S/A	• Determination of baseline scenario
/83/		Bruna Luiza Marigheto	Ecopart Assessoria em Negócios Empresariais Ltda.	<ul style="list-style-type: none"> • Demonstration of additionality • Emission reduction calculations • Application of monitoring methodology as well as design and application of the monitoring plan
/84/		Karollyne Machado	Santander Group	<ul style="list-style-type: none"> • Assessment of environmental impacts, environmental licenses and legal compliance • Stakeholders consultation process

3.3 Resolution of outstanding issues

The objective of this phase of the validation is to resolve any outstanding issues which need 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 "Rio



Grande do Norte and Ceará Wind Energy Complex Project Activity” 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.

During validation, 15 CARs and 10 CLs were raised concerning additionality and methodology application. All were satisfactorily closed.



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 will undergo 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

<i>Role</i>	<i>Last Name</i>	<i>First Name</i>	<i>Country</i>	<i>Type of involvement</i>						
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 1.2 competence	Financial expertise
Team leader (Validator)	Scalon	Juliana	Brazil	✓	✓	✓	✓			
Validator	Tavares	Luis Filipe	Brazil	✓	✓	✓	✓		✓	
Assessor under training	Weldy	Robin	United States	✓	✓	✓			✓	
Assessor under training	Huynh	Linh	United States	✓	✓	✓			✓	
Expert	Rosas	Frederico	Brazil	✓						✓
Technical reviewer	Shome	Sharmistha	India					✓	✓	

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 validation findings relate to the project design as documented and described in the PDD, version 2 dated 10 April 2012.

4.1 Participation requirements

The project participants are Eólica Mar e Terra Geração e Comercialização de Energia S.A., Eólica Bela Vista Geração e Comercialização de Energia S.A., Embuaca Geração e Comercialização de Energia S.A., Eólica Icarai Geração e Comercialização de Energia Ltda and Ecopart Assessoria em Negócios Empresariais Ltda. of host Party of Brazil. The host Party (Brazil) and meets all relevant participation requirements. No Annex I Party is identified yet.

A letter of approval (LoA) /41/ was issued by the DNA of Brazil on 24 September 2012, authorizing Eólica Mar e Terra Geração e Comercialização de Energia S.A., Eólica Bela Vista Geração e Comercialização de Energia S.A., Embuaca Geração de Energia S.A., Eólica Icarai Geração e Comercialização de Energia Ltda and Ecopart Assessoria em Negócios Empresariais Ltda. Of host Party of Brazil as project participants and confirming that the project assists in achieving sustainable development.

The letter of approval was received from the project participants. DNV does not doubt the authenticity of the letter of approval. DNV considers the letter is in accordance with paragraphs 45- 48 of the VVM /42/.

The project does not involve any public funding from an Annex I Party, 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.

4.2 Project design

The Rio Grande do Norte and Ceará Wind Energy Complex Project Activity in Brazil is composed by four greenfield grid-connected wind power plants: Mar e Terra, Areia Branca, Embuaca and Icarai. The location details of each wind farm are in the table below. The main geographical coordinates of the proposed project activity are listed in Table 1 as confirmed in documents from the National Agency on Electric Energy (ANEEL) authorizing the energy production of each wind farm /11/. The PDD states the coordinates for each turbine which can be confirmed by the certificates of wind measurements /17/. DNV has checked the coordinates in Google Earth application declared in the wind certificates, and they are found to be correct.

Table 1: Project geographical coordinates:

<i>Mar e Terra wind farm</i>		
<i>City Areia Branca, Rio Grande do Norte State</i>		
Equipment	W longitude	S latitude
Turbine S95 – 01	36.9164	4.9629
Turbine S88 – 02	36.9169	4.9652



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Turbine S88 – 03	36.9174	4.9676
Turbine S88 – 04	36.9179	4.9699
Turbine S88 – 05	36.9187	4.9722
Turbine S88 – 06	36.9187	4.9746
Turbine S88 – 07	36.9197	4.9769
Turbine S88 – 08	36.9199	4.9792
Turbine S88 – 09	36.9206	4.9816
Turbine S88 - 10	36.9212	4.9842
Turbine S88 - 11	36.9215	4.9866
<i>Areia Branca wind farm</i>		
<i>City Areia Branca, Rio Grande do Norte State</i>		
Equipment	W longitude	S latitude
Turbine S95 – 01	36.9024	4.9626
Turbine S95 – 02	36.9028	4.9651
Turbine S95 – 03	36.9030	4.9672
Turbine S95 – 04	36.9042	4.9703
Turbine S95 – 05	36.9042	4.9726
Turbine S95 – 06	36.9042	4.9748
Turbine S95 – 07	36.9136	4.9773
Turbine S95 – 08	36.9038	4.9797
Turbine S88 – 09	36.9040	4.9822
Turbine S88 – 10	36.9041	4.9846
Turbine S88 – 11	36.9043	4.9870
Turbine S88 – 12	36.9046	4.9919
<i>Embuaca wind farm</i>		
<i>City of Trairi, Ceará State</i>		
Equipment	W longitude	S latitude
Turbine S95 – 01	39.3280	3.2054
Turbine S95 – 02	39.3287	3.2076
Turbine S95 – 03	39.3289	3.2095
Turbine S95 – 04	39.3292	3.2119
Turbine S95 – 05	39.3299	3.2175
Turbine S88 – 06	39.3301	3.2195
Turbine S88 – 07	39.3302	3.2216
Turbine S88 – 08	39.3307	3.2244
Turbine S88 – 09	39.3310	3.2269
Turbine S88 – 10	39.3313	3.2290
Turbine S88 – 11	39.3318	3.2326
Turbine S88 – 12	39.3320	3.2348
Turbine S88 – 13	39.3325	3.2372
<i>Icarai wind farm</i>		
<i>City of Amontoada, Ceará State</i>		



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Equipment	W longitude	S latitude
Turbine S88 – 01	39.6231	3.0329
Turbine S88 – 02	39.6228	3.0312
Turbine S88 – 03	39.6232	3.0297
Turbine S88 – 04	39.6231	3.0278
Turbine S88 – 05	39.6289	3.0269
Turbine S88 – 06	39.6286	3.0248
Turbine S88 – 07	39.6347	3.0244
Turbine S88 – 08	39.6348	3.0228

The project is a wind power project which involves installation and operation of 45 WECs (Suzlon S88 2.1 MW model /9/ and Suzlon S95 2.1 MW model /10/). The installed capacity of each turbine is 2.1 MW thus, constituting a total installed capacity of 94.5 MW. The configuration of each wind farm is demonstrated in **Table 2**:

The wind turbines were manufactured by Suzlon Energy Limited /9/ /10/, which is an industrial wind energy company, specialized in the development and manufacturing of large wind power equipment and related main components in three different continents. It has been cross-checked by DNV through the manufacturer product specifications /9/ /10/ that the project design engineering uses the megawatt-class, three-bladed, variable speed wind turbines, which is deemed to reflect good practices.

Table 2: Wind farms configuration.

Wind farm	Number of WEC model S88	Number of WEC model S95	Installed capacity (MW)	Assured Energy (MW)	Capacity factor (%)
Mar e Terra	10	1	23.1	8.09	35.0
Areia Branca	4	9	27.3	11.90	43.6
Embuaca	8	5	27.3	10.65	39.0
Icaraí	8	0	16.8	7.81	46.5
Total	30	15	94.5	38.45	-

The starting date of the proposed project activity was defined as 20 August 2010, which represents the signature of the Power Purchase Agreement of Icaraí wind farm, in which the energy is contracted /23/. The starting date of a project activity, as defined in *Glossary of CDM Terms* /46/, should be the earliest date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. DNV assessed the signed PPAs between the project participants Rio Grande do Norte and Ceará Wind Energy Complex Project Activity and the power utilities /20/-/23/, and was able to confirm that this is the earliest commitment to financial expenditure as it obliges the PP to sell the amount of electricity accorded in the auction /12/. The penalty of not providing this electricity to the grid equals the expected revenues of the project. Before the PPA date, the only signed agreements were the land rentals /32/-/35/, which cannot be considered as a



starting date, since the contracts can be cancelled in case the wind farms are not implemented for any other reason. Therefore, DNV considers the starting date adequate.

The current configuration (quantity and model of the WTGs expressed in **Table 2**) was changed from the investment decision date (also project starting date 20 August 2010 /23/), to the latest wind study available /17/ /18/. When the PPAs were signed /20/-/23/, the project participants expected a different availability of wind in the land areas. Back then, the Engineering, Procurement and Construction (EPC) contracts were signed /26/. With a more recent wind study based on higher quantity of historical data available, prepared by consultancy Garrad Hassen Ibérica S.L.U., an independent third party /17/ /18/, the project participant realized that the original wind farms configuration could not deliver the amount of electricity contracted in the PPAs (324 120 MWh/year) /20/-/23/ corresponding an estimated average plant load factor of 44.25% /11/ through project's lifetime /28/. Hence, project participants had decided to rearrange the wind farms configuration in a manner to obtain a safe electricity production to fulfil the PPAs committed amounts. An amendment of the EPC contracts was signed in order to adjust costs to the new configuration of the wind farms /27/.

The actual annual net electricity delivered to the National Interconnected System (SIN) is expected to be 336 822 MWh, corresponding the current estimated average plant load factor of 41% sourced from the "*Certificates of Wind Measurements and of Production of Energy*" prepared by consultancy Garrad Hassen Ibérica S.L.U., an independent third party /17/ /18/ (**Table 2**).

Nevertheless, as explained above, this was not the load factor initially available at the time of the investment decision /23/ of the project, when the signature of the first Power Purchase Agreement took place. By that time, the plant load factors were evaluated and approved by the National Electric Energy Agency (ANEEL) and declared in the authorization for energy generation /11/. The most recent wind report from Garrad Hassen Ibérica S.L.U was made on 22 November 2011 /17/ for Mar e Terra, Areia Branca and Icarai wind farms, and on 19 September 2011 for Embuaca wind farm /18/ – thus after the decision date – to confirm the generation of the wind park and the load factor was adjusted. The initial average plant load factor was 44.25% and 90 MW of installed capacity /11/. This change in the total installed capacity from 90 MW to 94.5 MW was already communicated to ANEEL /39/ and since this increment was done in order to deliver the contracted electricity in the PPAs, no regulatory impact is expected. Moreover, this change did not modify the additionality of the project, as it is demonstrated in the additionality analysis.

Being a renewable electricity project, the project activity will generate greenhouse gas (GHG) emission reductions by avoiding the CO₂ emissions from the electricity generation by fossil fuel power projects.

The project's system boundaries are clearly defined as the project site and the National Interconnected System (SIN), the grid of Brazil.

The project lifetime is 20 years, which corresponds to equipment (WECs lifetime). The design specifications for the Suzlon equipment /28/ is according to International Electrotechnical Commission (IEC) standard on turbine design class II-A /76/ for a lifetime of 20 years and also coincides with the PPAs period of energy contracted /20/-/23/. Therefore the period of 20 years is considered adequate.

A 10-year fixed crediting period has been chosen for the project, starting on 1 January 2013 or the registration date. The chosen crediting starting date is deemed to be reasonable. The



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emission reductions are estimated to be 75 707 tCO₂e per year and 757 070 tCO₂e over the ten-year fixed crediting period /2/.

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 version 12.3.0 /43/.

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

- The project activity is the installation of a grid-connected and greenfield wind power plant which was verified through the environmental licences /19/ and authorization by National Electric Energy Agency (ANEEL) for wind energy production /11/;
- Being a wind farm project, it does not involve any switching from fossil fuel to renewable energy at the project site, which could be verified by DNV through the follow-up interview /81/-/84/ and the environmental licences /19/;
- The project is connected to the 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 ANEEL /58/.

The assessment of the project's compliance with the applicability criteria of ACM0002 version 12.3.0 are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

DNV has concluded that the application of the baseline methodology is transparent and conservative.

4.4 Project boundary

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 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 Rio Grande do Norte and Ceará Wind Energy Complex Project Activity is clearly defined in accordance with applicable guidelines of ACM0002 version 12.3.0 /43/, the "Tool for the demonstration and assessment of additionality" /44/ and the "Tool to calculate the emission factor for an electricity system" /45/.

Emission sources and gases included in the project boundary are:

	<i>GHGs involved</i>	<i>Description</i>
Baseline emissions	CO ₂	The baseline emission factor for the project is determined <i>ex-post</i> as a combined margin (CM), consisting of combination of the operating margin (OM) and build margin (BM) of the National Interconnected System (SIN), the



		electricity grid of Brazil.
Project emissions	N/A	Project emission is regarded as zero as the project is a renewable energy (wind source) project.
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 12.3.0) /43/.

4.5 Baseline identification

The project activity is the installation of a new grid-connected wind power project. Since the project is additional, cf. Section 4.6, the baseline is in accordance with ACM0002 (version 12.3.0) /43/ 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”* /45/.

According to ACM0002 (version 12.3.0) /43/ baseline emissions are equal to power generated by the project delivered to the SIN, multiplied by the baseline emission factor. The grid emission factor is determined *ex-ante* 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 was calculated by the project participant /14/. The calculations are based on electricity generation data provided by the National Operator System (ONS) for the electricity generated in the grid /15/. The weighting of the OM and BM is set to be 75% and 25% respectively, which are the default values stipulated for wind farm projects by *“Tool to calculate the emission factor for an electricity system”* /45/.

As the project activity is a new grid-connected wind 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 12.3.0

4.6 Additionality

As required by ACM0002 version 12.3.0 /43/, the additionality of the proposed project is demonstrated by applying the *“Tool for the demonstration and assessment of additionality”* /44/.



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

Project start date:

The starting date of the project activity was defined as 20 August 2010, which represents the signature of the Power Purchase Agreement of Icarai wind farm, in which the electricity generation facility Icarai had its electricity contracted /23/. The starting date of a project activity, as defined in *Glossary of CDM Terms* /46/, should be the earliest date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. DNV assessed the signed PPAs between the project participants Rio Grande do Norte and Ceara Wind Energy Complex Project Activity and the power utilities /20/-/23/, and was able to confirm that this is the earliest commitment to financial expenditure as it obliges the PP to sell the amount of electricity accorded in the auction /12/. The penalty of not providing this electricity to the grid equals the expected revenues of the project. Before the PPA date, the only signed agreements were the land rentals /32/-/35/, which cannot be considered as a starting date, since the contracts can be cancelled in case the wind farms are not implemented for any other reason. The EPC contract has been signed on 30 November 2010 /26/. Therefore, DNV considers the starting date adequate.

Serious consideration of CDM and efforts to secure CDM status:

In accordance with the “*Guidelines on the demonstration and assessment of prior consideration of the CDM*” /47/, the proposed project is a newly built wind farm and the starting date of the project activity (20 August 2010) is after 2 August 2008. Thus, the notification letter for the proposed project was sent by the project participant to the Brazilian DNA and confirmed on 16 March 2010 /25/. In parallel to this the project participants sent the prior consideration of the CDM Form to UNFCCC, which was confirmed by UNFCCC on 16 March 2010 /24/. Both confirmations are before the project activity starting date i.e. 20 August 2010. CDM was therefore seriously considered in the decision to proceed with the project activity.

The project participants started the global stakeholder consultation on 12 November 2011 /64/. To the consideration of DNV, this shows sufficient actions 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 the guidance on prior consideration of CDM /47/.

4.6.2 Identification of alternatives to the project activity

The project activity is the installation of a new grid-connected renewable power plant, thus according to the methodology ACM0002, version 12.3.0 /43/, the baseline scenario for the project activity is defined as follow:

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”.

In accordance with the paragraph 105 of VVM /42/, the approved methodology ACM0002 version 12.3.0 /43/ that is selected by the proposed project activity has prescribed the baseline scenario as shown above, thus the only alternative to the project activity undertaken without the CDM registration. Hence, the two scenarios listed by the project participant are:



- Scenario 1: continuation of the current situation (baseline scenario) and
- Scenario 2: the proposed project activity undertaken without being registered as a CDM project activity.

Both alternatives are consistent with mandatory regulations. To generate electricity with wind source is not mandatory in Brasil, which can be confirmed observing the different types of energy generation in the national grid /58/ and the installation of the proposed project is also in compliance with national and local regulation, as confirmed by the authorization for electricity generation granted by the by the National Electric Energy Agency (ANEEL) /11/ and the environmental licenses /19/.

DNV considers the listed alternatives to be credible and complete

4.6.3 Investment analysis

Choice of approach

The scenario 1 is the continuation of the current situation (baseline scenario) and therefore does not involve any investment. For scenario 2, the project generates financial and economic benefits other than CDM related income through the sales of electricity, and hence the selected benchmark analysis for conducting the investment analysis is found to be appropriate.

Benchmark selection

The selected benchmark is calculated based on weighted average costs of capital (WACC) which is appropriate benchmark for the project activity and complies with the “*Guidelines on the Assessment of Investment Analysis*” version 5/48/, as per the guidelines the project benchmark needs to be calculated based on bond rates. The nominal post tax WACC, uses data before 20 August 2010 as the investment decision was made in 20 August 2010.

Cost of equity is calculated based in the Capital Asset Pricing Model (CAPM) as per the option 6 (a) presented in the additionality tool as follows:

$$K_e = ((1+R_f)/(1+I)-1) + \beta * (R_m - R_f) + R_c$$

Where:

- R_f (risk free rate): calculated as 3.45%, based on the 10-year US Treasury Yield on August 2010 /65/. The project lifetime is of 20 years /28/. A 10-years treasury note presents lower returns in comparison to 30 year treasury yield of 4.35%, leading to a lower benchmark when comparing the other available period of 30-years. This represents a conservative approach when calculating the benchmark in order to compare with the project IRR;
- R_m (equity risk premium) is calculated as 6.58%, based on the historical difference between the S&P 500 returns and the long term US bonds returns for the period 1980-2009/65/. DNV cross-checked the values presented with the Damodaran website /65/ and confirmed that this value is appropriate for the time of the investment decision with support of the financial expert of DNV and is thus accepted;
- R_c (estimated country risk premium): calculated as 2.58%, based on Brazilian Risk Premium on a 5-year average until August 2010 /68/;
- β (Adjusted industry beta) is considered to be 2.91%, based on the covariance of the daily return of electric industries listed on S&P500. Beta when relevered used the conditions of Presumed (or Assumed) Profit regime, where the tax rate is zero. The



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power industry type companies were selected for calculation of beta /65/. DNV cross-checked the values presented with the Damodaran's website and confirmed that this value is appropriate for the time of the investment decision with support of the financial expert and is thus correct;

- I (US expected inflation) is considered to be 1.96% based on a ten-year Treasury notes minus ten-year TIPS /66/.

Thus, K_e is calculated to be 23.20%.

The calculation of the cost of debt K_d is given by the formula:

$$K_d = (1 + (a + b + c) * (1 - t)) / ((1 + d) - 1)$$

Where:

- a is the financial cost considered as 6.44% based on the long term interest rate given by the BNDES on a 5-year average range /80/;
- b is the spread calculated as 0.90% based on the BNDES spread, as per the credit policy for power generation activities /52/;
- c is the credit risk rate calculated as 3.57%. The reference value used is the maximum credit risk defined by BNDES /53/;
- d is the inflation forecast in Brazil, calculated as 4.5% /67/;
- t is the marginal tax rate assumed as zero since the project IRR calculation is based on assumed profit, according to Brazilian tax regulation, is not applicable. The *Assumed Profit* is applicable to companies that have gross revenues below 48 million BRL per year. /60/.

Thus, the cost of debt is calculated to be 6.14%.

The weighted average cost of capital is calculated as follows:

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

Where:

- K_e (return on equity) is calculated as 23.35% as per indicated above;
- K_d (cost of debt financing) is calculated as 6.14% as per indicated above;
- W_e (weight of equity) and W_d (weight of debt) are 32.3% and 67.7%. The share of 67.7% is the average financing granted by BNDES for wind farms from year 2003 to 2009 /30/.

Thus, WACC is calculated to be 11.65% /3/.

This benchmark is not specific to the project, since it was calculated based on public data considering the risks faced by any 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 re-levered beta for condition of a presumed (or assumed) profit regime, for which tax rate is zero in re-levering.

DNV also compared the benchmark demonstrated in the PDD /1/ with a benchmark estimated by Getúlio Vargas Foundation (FGV) for the Cost of Capital to Small Hydroelectric Plants /70/. 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 (BNDES, Ibbotson) and specific literature. The benchmark estimated by Getúlio Vargas Foundation can be compared



to wind farm projects since the economic environment and players are similar to small hydro power projects in Brazil. The values obtained for a theoretical hydro power plant of up to 50 MW in Brazil are 14.7% in the year of 2005, 13.66% in 2006, 12.52% in 2007, 11.45% in 2008 and 11.88% in 2009 /70/. All these values are higher than the value of the benchmark calculated by the project participant (11.65%) and this lower value is in accordance with an observed tendency of decrease, since interest rates have been constantly falling in Brazil in the past recent years /71/.

DNV confirmed that the assumptions taken, formulas and the values considered for the benchmark calculation are reasonable, according to statement from independent financial expert Frederico Rosas.

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

Input parameters

Rio Grande do Norte and Ceará Wind Energy Complex Project Activity is composed of four wind farms with a total of 45 WTGs, installed capacity of 94.5 MW, average plant load factor of 41% and the annual electricity delivered to the National Interconnected System (SIN) is expected to be 336 822 MWh /17/ /18/. This is different from the configuration of the date of investment decision on 20 August 2010 /23/, used in the investment analysis, which had 41 WTGs, installed capacity of 90 MW, average plant load factor of 44.25% and annual electricity delivered to the grid of 324 120 MWh /11/ /20/-/23/.

The configuration available at the time of decision making (with 41 WTGs, yearly generation of 324 120 MWh at a plant load factor of 44.25% /11/) was used in the investment analysis. The second configuration (with 45 WTGs, yearly generation of 336 822 MWh at an average plant load factor of 41% /17/ /18/) was used in the *ex-ante* estimation of the emission reductions.

At the decision making, the 41 WTGs configuration was the only available and therefore it was used as basis for the investment analysis. The modified configuration, which presents a higher number of WTGs, was also analysed in terms of IRR in a way to assess its additionality in the sensitivity analysis.

The input parameters used in the financial analysis of this project are taken from the values stated in the funding request letters /16/ sent to financing institution SUDENE /69/ and cross-checked with EPC contracts for each wind farm and transmission lines /26/. The values expressed in the letters sent to SUDENE were deflated to the investment decision date, 20 August 2010, /23/ using Amplified Consumer Price Index (IPCA) for the corresponding period between reference dates and investment decision date /77/. The IPCA index is considered appropriate for the type of activity.

Project participant has presented financial analysis for each wind farm. The wind farms are not entirely physically interdependent since they have common transmission lines and substations, but each wind farm has its own PPA /20/-/23/, EPC contract /26/-/27/, environmental license /19/ and authorization for electricity generation /11/. Hence, it is clear that the presented project is a bundle of independent projects.

DNV compared the input parameters used in the financial analysis /4/-/7/ included in the PDD with the values stated in the funding request letters /16/ sent to financing institution SUDENE /69/ and cross checked the parameters stated in the EPC contracts /26/. Values used reflect the



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original configuration of the wind farms and therefore DNV is able to confirm that the values applied are consistent with the investment decision date /23/.

Investment costs:

The total investment is BRL 424 845 361. Since the costs included in the investment are taken from the SUDENE letter /16/ are dated of 13 July 2011 (after the investment decision of 20 August 2010 /23/) values were deflated by IPCA /77/ to the investment decision date, resulting in BRL 396 372 000. From this amount:

- BRL 103 246 743 (or BRL 96 327 000 after deflation by IPCA to the investment decision date) corresponds to the investment in the original 11 WTGs model S88 and construction services evidenced from SUDENE funding request /16/ and were cross checked with EPC contracts /26/ and costs from funding approvals from SUDENE /40/ of Mar e Terra wind farm /7/;
- BRL 122 842 540 (or BRL 114 610 000 after deflation by IPCA to the investment decision date) corresponds to the investment in the original 13 WTGs model S88 and construction services evidenced from SUDENE funding request /16/ and were cross checked with EPC contracts /26/ and costs from funding approvals from SUDENE /40/ of Areia Branca wind farm /6/;
- BRL 90 089 965 (or BRL 101 383 000 after deflation by IPCA to the investment decision date) corresponds to the investment in the original 12 WTGs model S88 and construction services evidenced from SUDENE funding request /16/ and were cross checked with EPC contracts /26/ and costs from funding approvals from SUDENE /40/ of Embuaca wind farm /4/, and
- BRL 108 666 113 (or BRL 84 052 000 after deflation by IPCA to the investment decision date) corresponds to the investment in the original 7 WTGs model S88 and construction services evidenced from SUDENE funding request /16/ and were cross checked with EPC contracts /26/ and costs from funding approvals from SUDENE /40/ of Icaraí wind farm /5/.

DNV concludes that the total investments for the proposed project are reasonable for wind power plants.

Operation and Maintenance Expenses:

The value of BRL 5 129 116.41 for the operation and maintenance expenses for 2 years was extracted from the EPC contract /26/. Values were deflated /77/ to the investment decision date /23/ and yearly divided resulting in total of BRL 2 511 108 per year. From this amount:

- BRL 522 590 for Mar e Terra wind farm /7/ each year;
- BRL 616 473 for Areia Branca wind farm /6/ each year;
- BRL 864 915 for Embuaca wind farm /4/ each year, and
- BRL 507 130 for Icaraí wind farm /5/ each year.

Other yearly expenses, as transmission charges, land rental and grid connection fees, which include:

- Transmission charges were calculated following regulatory decree /57/ and vary on the production of energy, totalling around BRL 6 382 000 for the first year of full operation;

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- Insurance fees were calculated as percentage of the total investment. The insurance is composed for three different parts: legal responsibility, construction and operation. Project participant has presented an average calculation according to each wind farm, which resulted in 0.66% of total investment for Mar e Terra, 0.61% for Areia Branca, 0.64% for Embuaca and 0.71% for Icarai, totalling around BRL 2 641 000 for the first year of full operation onwards. Values are based on experience of other projects and confirmed by financing institution. Calculations and descriptions were provided to DNV /8/ and are found to be correct.
- Property lease is 1.7% of the annual gross income for Mar e Terra /32/ and Areia Branca /33/ wind farms and 1.5% of the annual gross income for Embuaca /34/ and Icarai /35/ wind farms, as per contract with land owners, totalling each year BRL 187 482 for Mar e Terra, BRL 257 770 for Areia Branca, BRL 225 120 for Embuaca and BRL 143 267 for the first year of full operation;
- The CCEE charge is estimated since it is yearly calculated by the Electric Energy Commercialization Chamber based on the amount and share of energy delivered to the grid by all the country's energy producers /72/. It is an estimated cost per yearly energy produced as 0.11 BRL/MWh for Mar e Terra and Areia Branca wind farms, 0.1 BRL/MWh for Embuaca and 0.07 BRL/MWh for Icarai /8/;
- The ONS fee is also estimated since it is yearly calculated by the National Operator System based on the charges of the transmission system for the associated producers /73/. It is an estimated cost per installed capacity as 0.69 BRL/kW for Mar e Terra, 0.59 BRL/kW for Areia Branca and Embuaca and 0.91 BRL/kW for Icarai /8/.

Total annual estimate O&M represents 3.44% of the total investment for Mar e Terra and Areia Branca wind farms, 3.20% for Embuaca and 2.51% for Icarai.

DNV concludes that the operational expenses are reasonable for wind power plants.

The values for the O&M expenses used by in the financials have been cross checked by comparing with simulations presented in the book from the Ministry of Environment *Renewable Sources of Energy in Brazil* /55/, the latest public reliable source of information at the project's investment decision date, which considered values of operational expenses ranging from 1% to 4%. DNV considers the costs of the project reasonable.

Annual power generation:

According to the PDD /1/ and *Certificates of Wind Measurements and of Production of Energy* from Garrad Hassen /17/ /18/, it is expected that the proposed project will supply to SIN approximately 336 822 MWh at an average plant load factor of 41%. However, as previously explained, the project design at the time of decision making /23/ estimated a yearly generation of 324 120 MWh at an average plant load factor of 44.25%, and this configuration was used in the investment analysis. The *"Guidelines on the Reporting and Validation of Plant Load Factors"* /50/ gives instruction for validation of plant load factor for renewable energy. One option is to use 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 authorization for energy production issued by ANEEL is an official government document in which the plant load factors were evaluated and approved by ANEEL /11/. Such documents are according to current CDM regulation, and



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the cross-checking with the values should be considered sufficient for validation of plant load factor. Nevertheless, according to BNDES the typical range of plant load factor in Brazil is from 30% to 60% /74/ and according to *Renewable Sources of Energy in Brazil*, the average plant load factor of a wind park in Brazil is 40% /55/.

DNV confirmed that the values of the parameters were the latest available at the time of the investment decision (signature of the Power Purchase Agreement of Icaraí wind farm /23/), including the expected start of operation for each wind farm (1 July 2012 expressed in the PPAs) and concludes that the assumed annual power generation from the authorization for energy production by government institution ANEEL /11/ is appropriate and acceptable.

Power tariff:

In Brazil, the auctions for reserve energy follow the inverted auctions model, in which the smallest price offered by the producer in the bid wins the slot. In the 2nd Brazilian Auction of Reserve Energy - Auction 03/2009 /12/, the project participants offered the best lowest prices for the four wind farms of Rio Grande do Norte and Ceará Wind Energy Complex Project Activity, thus winning these slots. The price offered for the four wind farms was 152.64 BRL/MWh for Mar e Terra, 152.63 BRL/MWh for Areia Branca, 151.07 BRL/MWh for Embuaca and 151.08 BRL/MWh for Icaraí /12/. In this auction, the average price for the 753 slots was 148.39 BRL/MWh and presented a range of 131.00 BRL/MWh to 153.07 BRL/MWh. Project participant has applied inflation to the PPAs values (as per determined in the contracts), since tariff values were determined during the auction /12/, on January 2010. Hence, the tariffs were corrected to the investment decision date /23/ by IPCA /77/, resulting in 157.37 BRL/MWh for Mar e Terra, 157.36 BRL/MWh for Areia Branca, 155.75 BRL/MWh for Embuaca and 155.76 BRL/MWh for Icaraí. The tariff corrected to the investment decision date has been used for the project IRR analysis /4/-/7/.

The PPA period is 20 years, and the price will only vary according to the inflation during the period /20/-/23/.

Taxes and depreciation:

DNV could also confirm that the special purpose societies formed for the project are eligible for the presumed (or assumed) profit regime, in accordance to the national fiscal legislation, where is applicable to companies that have gross revenues below 48 million BRL per year /60/. Value of 8% /60/ at an income rate basis of 25% is applied. Also, rate of 0.65% for the PIS/PASEP tax /61/ and 3% for the Cofins tax /61/ were applied. The social contribution (CSLL) is applied on the net income as a 9% rate over a basis of 12% of revenues /63/. Depreciation was not presented since in the presumed profit regime, depreciation has no impact in the project's internal rate of return. In this case, tax rates are calculated over revenues and not over gross profits /62/. DNV confirmed that the regulations and values of taxes used in the project are the latest available in the time of the investment decision (signature of the Power Purchase Agreement of Icaraí wind farm /23/) and are correct.

Calculation and conclusion

The IRR calculations were provided for each wind farm in spreadsheets /4/-/7/ and verified by DNV. The assumptions and calculations were verified and found to be correct by DNV. The IRR is post-tax and the assessment period of 20 years is equivalent to the lifetime of the



project /28/, in which the nominal IRR without CDM revenues is 3.79% for Mar e Terra, 6.13% for Areia Branca, 8.81% for Embuaca and 5.16% for Icarai. Considering the project assets will be completely depreciated during the 20 years of operation there is no fair value at the end of the project activity, which is in accordance to the Brazilian legal requirements /60/. This confirms that the project in the absence of CDM benefits and compared to the benchmark of 11.65% is not financially attractive /3/.

Sensitivity analysis

A sensitivity analysis has been carried out for parameters contributing more than 20% to the revenues or costs in order to check the robustness of the financial analysis. Reasonable variations of the electricity tariff, energy generation, operation and maintenance costs, and capital expenditures were checked by calculating the variation necessary to reach the benchmark and then discussing the likelihood for that to happen. None of the parameters in the sensitivity analysis are considered to have any significant positive correlation. DNV was able to verify that the project IRR will reach the benchmark only if the above mentioned parameters change by values as mentioned in Table 3. The operation and maintenance costs were not evaluated to the IRR reaches the benchmark in Table 3 since even when they are taken to zero, the IRR does not reach the benchmark. Operation and maintenance costs variations are discussed further in the text.

Table 3: Sensitivity analysis where the IRR equals the benchmark:

Key Indicators	Mar e Terra	Areia Branca	Embuaca	Icarai
	Variation (%) of the parameter indicator needed to reach the benchmark of 11.65%			
Electricity tariff	+ 55.90	+ 36.15	+ 15.80	+ 46.20
Total investment	- 42.70	- 31.65	- 16.10	- 35.50
Electricity delivered to the grid	+ 55.95	+ 36.15	+ 15.80	+ 46.20

- 1. Electricity price:** To equal to the benchmark of 11.65%, power tariffs must increase at least by 15.80% above inflation, considering the smallest variation necessary at Embuaca price of 151.08 BRL/MWh, among the four wind farms. This is not likely to happen. Observing results from the bid, the highest price offered was 153.07 BRL/MWh, which is still below the price needed by Embuaca wind farm to equal the benchmark (a variation of 15.80% would result in a price of 174.95 BRL/MWh). In addition to that, in Brazil, the tariffs are strictly set by ANEEL in the time of the auction and cannot be changed during the period of the PPA (other than inflation correction), determined as 20 years in the rules of the auction /12/. DNV can confirm the information by the PPAs contracted conditions /20/-/23/.
- 2. Investment costs:** According to the PDD, the project investment should not be subject to variations since the equipment purchase and wind farms construction will be done through an EPC contract with Suzlon /26/. DNV has checked the EPC contracts and it is confirmed that the values are not subject to corrections.



3. **Annual output delivered to the grid:** To equals the IRR to the 11.65% benchmark, electricity generation must increase at least by 15.80% (Icaraí wind farm). The assured energy is determined by the PPAs /20/-/23/. The PPAs state that any additional energy generation to the amount negotiated is not allowed to be sold, and this is strictly managed by the Electric Energy Commercialization Chamber (CCEE). The CCEE only administrate the PPAs agreement. Also, according to the bid conditions, if any additional electricity is produced, this amount is “stored” in the database of CCEE as a reserve (from the bid’s name /12/) for the own producers in the case of production shortages in the future, to complement the yearly negotiated energy. Therefore, the own bid conditions does not allow any additional revenues;
4. **Operation and maintenance costs:** When the operation and maintenance costs are taken to zero, the project IRR is 4.62% for Mar e Terra, 6.86% for Areia Branca, 9.96 for Embuaca and 6.04 for Icaraí. None of them reached the benchmark of 11.65%.

Nonetheless, project participant has presented an sensitivity analysis with the new wind farms configuration (Table 1), where the *Certificates of Wind Measurements and of Production of Energy* from Garrad Hassen /17/ /18/ states that it is expected the proposed project will supply to SIN approximately 336 822 MWh at an average plant load factor of 41%. Project participant has presented a sensitivity analysis with the information from the wind study, and adjusting the investment and O&M costs with IPCA index to the date of the certificates /17/ /18/, and the IRR resulted for Mar e Terra is 4.18%, for Areia Branca is 7.64%, for Embuaca is 8.34% and for Icaraí 7.06% /37/. With this modified investment analysis, project participant has varied the same input values in order to equals the IRR to the benchmark of 11.65% (Table 4):

Table 4: Sensitivity analysis where the IRR equals the benchmark for the wind farms new configuration:

Key Indicators	Mar e Terra	Areia Branca	Embuaca	Icaraí
	Variation (%) of the parameter indicator needed to reach the benchmark of 11.65%			
Electricity tariff	+ 53.05	+ 24.90	+ 18.95	+ 33.15
Total investment	- 40.85	- 23.55	- 18.70	- 25.80
Electricity delivered to the grid	+ 53.10	+ 24.90	+ 19.00	+ 30.00

The operation and maintenance costs were not evaluated to the IRR reaches the benchmark in Table 4 since even when they are taken to zero, the IRR does not reach the benchmark. The operation and maintenance costs were also corrected with the IPCA index to the date of the certificates of wind measurements /17/ /18/ (to reflect the new configuration) and variations were applied. When the operation and maintenance costs are taken to zero, the project IRR is 4.99% for Mar e Terra, 8.33% for Areia Branca, 9.50 for Embuaca and 7.89 for Icaraí. None



of them reached the benchmark of 11.65%. Therefore it is possible to conclude that even smaller operation and maintenance costs to the original values expressed in the EPC contract /26/ would not turn the wind farms financially feasible.

The sensitive analysis above shows that very unrealistic favourable circumstances would be needed for the IRR 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 /44/* 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 output range of +/-50% was calculated considering the installed capacity of 23.1MW of Mar e Terra, 27.3MW of Areia Branca, 27.3MW of Embuaca and 16.8MW of Icarai as per the EB *“Tool for the demonstration and assessment of additionality”*. Therefore only wind projects between 8.4MW and 40.95 MW of installed capacity were taken into consideration. Also regarding the three plant together sum 94.5MW, projects of installed capacity between 47.25 and 141.75MW were also considered.

The geographical scope for common practice analysis was determined to be Brazil, since all power plants connected to the national grid have been analysed.

DNV was able to confirm that despite the available high technical potential for wind energy utilization in Brazil; only less than 1.5% of electricity in Brazil is generated from wind farms /58/.

Following the steps of the *“Tool for the demonstration and assessment of additionality” version 6.0.0 /44/*, N_{all} and N_{diff} have been calculated. According to ANEEL database (2001-2011) /58/ there are 10 wind power plants between 8.4MW and 40.95MW and 5 wind power plants between 47.25MW and 141.75MW, resulting in $N_{all} = 15$. From these 15 wind power plants only one has not received government incentives, such as PROINFA, therefore N_{diff} equals to 14 /29/.

Finally, calculating F as $1 - N_{diff}/N_{all}$; which equals to 0.0067 and $N_{all} - N_{diff}$ which equals to 1, it is possible to conclude that the development of wind farm Rio Grande do Norte and Ceará Wind Energy Complex Project Activity 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



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12.3.0 /43/. The selected monitoring methodology is applicable for the project activity as it involves grid-connected renewable power generation using wind 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 environmental impacts are considered minor and will be monitored by the local environmental authority during the project lifetime.

The project monitoring plan is in compliance with the monitoring methodology ACM0002 version 12.3.0.

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 the operating margin CO₂ emission factor in year *y* ($EF_{\text{grid,OM-adj},y}$) and the build margin CO₂ emission factor in year *y* ($EF_{\text{grid,BM}}$) and the combined margin CO₂ emission factor for grid connected power generation in year *y* ($EF_{\text{grid,CM}}$). Since the choice of the emission factor for the proposed project is *ex-ante*, it is not possible to use the national grid emission factors made available by the Brazilian DNA, which are calculated *ex-post* by the dispatch method /80/, as per “*Tool to calculate the emission factor for an electricity system*” version 2.2.1 /45/. Therefore the emission factors were calculated by the project participants and presented to DNV /14/.

Operating margin:

The *ex-ante* option was chosen for the calculation of the operating margin emission factor is according to the tool “*Tool to calculate the emission factor for an electricity system*” version 2.2.1, which determines to use a 3-year generation-weighted average, based on the most recent data available at the time of the PDD /1//64/ submission to DNV for validation. Since the PDD was published for global stakeholder process on 12 November 2011, the latest electricity generation data published by the National Operator System (ONS) for 2008, 2009 and 2010 years was available at the time of validation /15/. Therefore the project used the average of three years data for operating margin emission factor, resulting is 0.2609 tCO₂/MWh. The *ex-ante* operating margin emission factor was calculated with the simple adjusted method. Calculations were provided by the project participant in a spreadsheet /14/.

DNV has checked the calculations and generation of electricity raw data published by ONS for the calculations of the operating margin. The IPCC default values at the lower limit of uncertainty at a 95% confidence interval as per Chapter 1 of Volume 2 of IPCC 2006 Guidelines on National GHG Inventories /59/ were used for the CO₂ emission factor of fossil fuel type used in power unit *m* in year *y* ($EF_{\text{CO}_2,m,i,y}$). The values chosen are different for each fuel type and power unit used in the calculation spreadsheet of the grid emission factor.

The net electricity generated by power plant/unit *m* or *k* in year *y* ($EG_{m,y}$ and $EG_{k,y}$) was obtained by the project participant directly with the National Operator System (ONS), which is the institution responsible for operating and managing the entire interconnected electric system in Brazil. Information is provided by the project participant to DNV in different daily reports obtained with ONS /15/.

Since the values from ONS are the daily energy generation for more than 170 energy production facilities, one year produces more than 62 000 records. Considering the simple adjusted operating margin method in which demands a period of three years of calculation, the total sample size is 186 000 data inputs to be cross-checked by DNV. DNV used a sampling procedure to cross-check the data in the emission factor calculation spreadsheet



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developed by the project participant against the raw data obtained in the ONS energy generation reports. Sampling procedure was based on the American Military Standard and tables for Inspection by Attributes (MIL-STD-105DE) Level II /75/, single sample for normal inspection. Since data size is higher than 1 200, the sample size should be 100. The sampling was randomly performed, for 100 numbers checked by DNV within the 3 years of data. No error was identified.

The average net energy conversion efficiency of power unit m or k in year y ($\eta_{m,y}$) was obtained by the project participant directly with the National Operator System (ONS), which is the institution responsible for operating and managing the entire interconnected electric system in Brazil. Information is provided by the project participant to DNV in different daily reports obtained with ONS /15/. The values were included in the cross-checking performed by DNV. No error was identified.

Build margin:

The *ex-ante* build margin emission factor was calculated by the project participant as per the “Tool to calculate the emission factor for an electricity system” version 2.2.1 /45/, with step 5 of the tool. Calculations were provided by the project participant in a spreadsheet. The resulting value is 0.1166 tCO₂/MWh and will be used for the entire crediting period.

The option 1 of the “Tool to calculate the emission factor for an electricity system” version 2.2.1 was chosen, i.e., the most recent information available at the time of the PDD submission to DNV for validation /64/, the year 2010. The build margin emission factor was calculated as the weighted average emissions (in tCO₂e/MWh) of recent capacity additions of the system generation, where generation additions are defined as the greater (in MWh) of most recent 20% of existing plants (93 183 936 MWh) excluding the CDM project activities, or the 5 most recent plants (662 143 MWh). For the build margin, the 20% most recently installed plants generation has been chosen in terms of electricity generation. Following the tool, from the 20% most recently installed plants, the oldest plant which started to supply electricity to the grid was in January 1998, hence, the power units supplying energy to the grid more than 10 years ago were excluded, and the CDM project activities were included back to the set of power units from the most recent until the generation reaches the 20% (AEG_{SET-sample-CDM}). The energy generation including the units with CDM project activities reaches 74 902 471 MWh (AEG_{SET-sample-CDM}). Since the value did not reach the original 20% (93 183 936 MWh), the power units that started to supply electricity to the grid more than 10 years ago were re-inserted in the set of plants again until it reaches the 20% (steps *e* and *f* of the tool, set called SET_{sample-CDM>10yrs}) resulting in an energy generation used for calculation as 94 545 640 MWh. DNV has checked the calculations and they are correct /14/.

The weighting is set to be 75% and 25% respectively, which are the default values stipulated for wind projects by “Tool to calculate the emission factor for an electricity system” version 2.2.1. Thus, the combined margin emission factor is 0.2248 tCO₂/MWh.

4.7.2 Parameters monitored ex-post

The parameter monitored *ex-post* is the net electricity generation from the proposed project activity. The net electricity dispatched will be measured through the metering equipment at the point of connection of electricity generation of each wind farm to the correspondent substation. In each point of connection, there will be a main and a back-up meter /78/



exclusively for the wind farm, in which technical specifications are defined by the National Operator System (ONS) /54/. The accuracy is 0.2% of maximum permissible error.

The power exported to and imported from the SIN will be monitored and recorded continuously by the main and back-up meters installed exclusively for the project activity wind power plants, aggregated each 15 minutes and consolidated on a monthly basis. In addition, the electricity generated is managed by CCEE online available to the project operator and will be provided for data quality control and cross check. All meters will be calibrated every two years by a qualified third party.

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

4.7.3 Management system and quality assurance

Detailed outline of the management system has been presented in the PDD section B.7.2. The responsibility of monitoring parameters is clearly described, as well as frequency of reporting and calibration. Data quality control and the training programme were presented. A project manager will be assigned and responsibilities and training for each staff will be defined. Internal audits will be conducted in order to guarantee quality of data management.

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.

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:

- 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 the project activity to the grid (EG_y in MWh).
- 2) Project emissions: there are no emissions from the project activity which is a renewable wind energy project.
- 3) Leakage: no leakage has to be considered for the proposed project activity. Project is greenfield wind farms and also no equipment transfer will take place.

The annual electricity delivered to the SIN was estimated based on the wind farms new configurations, as per to be 336 822 MWh /2/, according to the current estimated average plant load factor of 41% sourced from the “*Certificates of Wind Measurements and of Production of Energy*” prepared by consultancy Garrad Hassen Ibérica S.L.U., an independent third party /17/ /18/ (Table 2).

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 75 707 tCO_2e per year for the selected crediting period.



All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline 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 /55/) a Simplified Environmental Report (RAS) is required to grant the installation license of electricity generation projects with more than 10 MW of installed capacity. As stated in the PDD, a Simplified Environmental Report (RAS) has been conducted according to Brazilian law and regulation. DNV was able to verify that the wind power plants Mar e Terra, Areia Branca have received the Installation License from the environmental agency of the State of Rio Grande do Norte IDEMA and the wind power plants Embuaca and Icarai have received the Installation license from the environmental agency of the State of Cear  SEMACE /19/.

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 15 September 2011 /13/ to comment on the project visiting the website <http://sites.google.com/site/consultadcp/>. Invitation letters were sent in accordance with the requirements of Resolution 7 (5 March 2008) of the Brazilian DNA.

DNV has checked all the invitation letters and the mail receipts /13/. One comment was received by the Federal Prosecution stating that despite of the project relevance, the Federal Prosecution is forbidden to provide consultancy activities, and therefore they cannot analyse the project. No further action was needed. DNV considers the local stakeholder consultation carried out adequately.

4.11 Comments by Parties, stakeholders and NGOs

The PDD, version 1 dated 15 September 2011, was made publicly available on the CDM website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 12 November 2011 to 11 December 2011 /64/.

No comment was received.

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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.	Kyoto Protocol Art.12.2	Ok. No participating Annex I Party is yet identified.
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK.
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	OK.
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	OK. Table 2, Section A.2.
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 project does not involve any public funding from an Annex I Party, 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.
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 Comissão Interministerial de Mudança Global do Clima.
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK. Brazil has ratified the Kyoto Protocol on 23 August 2002.

Requirement	Reference	Conclusion
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK. No participating Annex I Party is yet identified.
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	OK. No participating Annex I Party is yet identified.
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
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. According to Brazilian environmental law (Federal Resolution CONAMA 001/86 /55/) for power plants larger than 10 MW an Environmental Impact Assessment (EIA) and the respective Environmental Impact Report (RIMA) are required to grant the Preliminary License and the subsequent Installation License and Operation License. The wind power plants Mar e Terra and Areia Branca have received the Installation License from the environmental agency of the State of

Requirement	Reference	Conclusion
		Rio Grande do Norte /19/. The wind power plant Embuaca has received the Installation License from the environmental agency of the State of Ceará, and Icarai have the Preliminary License /19/.
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. 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 15 September 2011 to comment on the project. Invitation letters were sent in accordance with the requirements of Resolution 7 (5 March 2008) of the Brazilian DNA /13/.
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. The PDD, version 1 dated 15 September 2011, was made publicly available on the CDM website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 12 November 2011 to 11 December 2011. No comment was received /64/.
Other		
15. The baseline and monitoring methodology shall be previously	CDM Modalities and	OK. The project applies the approved

Requirement	Reference	Conclusion
approved by the CDM Executive Board.	Procedures §37e	baseline and monitoring methodology ACM0002 <i>Consolidated baseline methodology for grid-connected electricity generation from renewable sources</i> version 12.3.0.
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. Table 2, section B.4.
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	<input checked="" type="checkbox"/> Clearly identifiable title of the project activity <input checked="" type="checkbox"/> Version number of the PDD is included <input checked="" type="checkbox"/> 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	<input checked="" type="checkbox"/> Yes <i>If no, list where the PDD is not in accordance:</i>		OK
A.2 Description of the project activity (VVM para 58-64)					
A.2.1 How was the design of the project assessed?	/1/	DR I	<i>What type is the project?</i> <input type="checkbox"/> Project in existing facility or utilizing existing equipment(s) <input type="checkbox"/> Project is either a large scale project or a small scale project with emission reductions exceeding 15 000 tCO ₂ e per year. In this case, a site visit must be performed. <input type="checkbox"/> Project is a bundled small scale project, with each project in the bundle with emission reductions not exceeding 15 000 tCO ₂ e 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. <input type="checkbox"/> The project is an individual small		OK

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

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>scale project activity with emission reductions not exceeding 15 000 tCO₂e per year. In this case, DOE may not conduct a physical site visit as appropriate.</p> <p><input checked="" type="checkbox"/> Greenfield project</p> <p><i>How was the design of the project assessed?</i></p> <p><input type="checkbox"/> Physical site inspection</p> <p><input checked="" type="checkbox"/> Reviewing available designs and feasibility studies</p> <p>The project is a newly built wind farm project; through the documents which the project participant provided, DNV can confirm the project design, construction, operation and monitoring plan and all baseline scenario information.</p> <p>The representatives of the project owner MS Participações Societárias S/A and project participants from Ecopart Assessoria em Negócios Empresariais Ltda. were interviewed on 16 December 2011 at Ecopart Assessoria em Negócios Empresariais Ltda. office in São Paulo city, São Paulo State, by DNV auditors Juliana Scalon, Luis Filipe Tavares, Linh Huynh and Robin Weldy, to resolve the issues identified during the desk review.</p> <p>During the desk review, the relevant documents including the PDD /1/, the ER calculation spreadsheet /2/, the benchmark calculation /3/, the IRR spreadsheets /4/-/7/, the preliminary environmental license /19/, the receipts of</p>		

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

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.								
				delivery of mail to stakeholders /13/, the contracts of PPA /20/-/23/ have been assessed. The physical implementation of the project had not started yet, as stated by the project participant during site visit. Evidence on the site conditions at the time of commencing of validation is needed.	CL4									
A.2.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/	DR I	The physical implementation of the project had not started yet, as stated by the project participant during site visit. Evidence on the site conditions at the time of commencing of validation is needed.	CL4	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 ₂ e 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/ /9/ /11/	DR	<div>The Rio Grande do Norte and Ceará Wind Energy Complex Project Activity in Brazil is composed by four newly built grid-connected wind power plants: Embuaca, Icaraí, Areia Branca and Mar e Terra. The location details of each wind farm are in the table below. The geographical coordinates of the proposed project activity are listed in the table as confirmed in documents from the National Agency on Electric Energy (ANEEL) authorizing the energy production of each wind farm.</div> <table><tr><th>Wind Farm</th><th>City</th><th>State</th><th>Geographic al Coordinates</th></tr><tr><td>Embuaca</td><td>Trairi</td><td>Ceará</td><td>3.2182 S</td></tr></table>	Wind Farm	City	State	Geographic al Coordinates	Embuaca	Trairi	Ceará	3.2182 S		OK
Wind Farm	City	State	Geographic al Coordinates											
Embuaca	Trairi	Ceará	3.2182 S											

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

Checklist Question	Ref	MoV	Assessment by DNV				Draft Concl.	Final Concl.
						39.3294 W		
			Icaraí	Amont oada	Ceará	3.0177 S 39.6292 W		
			Areia Branca	Areia Branca	Rio Grande do Norte	4.9772 S 36.9034W		
			Mar e Terra	Areia Branca	Rio Grande do Norte	4.9736 S 36.9177 W		
			<p>The wind turbines were manufactured by Suzlon Energy Limited, which is an industrial wind energy company, specialized in the development and manufacturing of large wind power equipment and related main components in three different continents. It has been cross-checked by DNV through the manufacturer product specifications that the project design engineering uses the megawatt-class, three-bladed, variable speed wind turbines, which is deemed to reflect good practices.</p> <p>The project is a wind power project which involves installation and operation of 44 wind turbines. The project information must be coherent throughout the PDD and supporting documents. The number of WTGs in the project considered in the investment analysis and in the estimation of emission reduction is not explained. The installed capacity of each turbine is 2.1 MW thus, constituting a total installed capacity of 92.4 MW.</p>				CAR-1	

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Checklist Question	Ref	MoV	Assessment by DNV				Draft Concl.	Final Concl.
			Project Name	Installed capacity (MW)	Assured Energy (MW)	Capacity factor (%)		
			Areia Branca	27.30	11	39.4		
			Mar e Terra	23.10	8	32.6		
			Embuaca	25.20	11	35.6		
			Icarai	16.8	7	46.1		
			Total	92.4	37			
			The signed PPAs for each wind complex is guaranteeing the commercialization of energy related to the assured annual energy generation of 324 120 MWh. However, the electricity generation of the project considered in the financial analysis is smaller. Project participants did not consider the total sales of the electricity covered by the PPAs.				CAR-3	
			The annual net electricity delivered to the National Interconnected System (SIN) is expected to be 306 806 MWh, corresponding to an average plant load factor of 38.4%. Plant load factors and energy generation (and how they were calculated) needs to be clearly identified in the project with no hidden formulas. Project participants have not clearly reasoned the differences in the plant load factors and energy generation for the investment analysis and the estimation of emission reductions presented in the project.				CAR-2	

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				<p>The starting date of the proposed project activity was defined as 20 August 2011, which represents the signature of the Power Purchase Agreement of Icarai wind farm, in which the energy is contracted. The starting date of a project activity, as defined in <i>Glossary of CDM Terms</i>, should be the earliest date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. Clarification and evidence are necessary so the PPA can be adequate to the starting date definition.</p> <p>Being a renewable electricity project, the project activity will generate greenhouse gas (GHG) emission reductions by avoiding the CO₂ emissions from the electricity generation by fossil fuel power projects.</p> <p>The project's system boundaries are clearly defined as the project site and the National Interconnected System (SIN), the grid of Brazil.</p>	CAR-7	
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/ /11/	DR	No, it is a greenfield project that will utilize new equipment. The project activity is the installation of a greenfield wind power plant that is connected to the national grid, as confirmed in the ANEEL's authorization for independent power producer.		OK
A.2.6	Does the project design engineering reflect current good practices?	/1/ /9/ /10/	DR CC	It was cross-checked by DNV through the manufacturer's product specifications that the project design engineering uses the megawatt-class, three-bladed, variable speed wind turbines, which is deemed to reflect good		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				practices.		
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/ /9/ /10/	DR	Technology used in the project is already commonly used in similar projects in Brazil. The wind turbines were manufactured by Suzlon Energy Limited, which is an industrial wind energy company, specialized in the development and manufacturing of large wind power equipment and related main components in three different continents.		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 project participants are MS Participações Societárias S/A and Ecopart Assessoria em Negócios Empresariais Ltda. of host Party of Brazil. The host Party (Brazil) and meets all relevant participation requirements. No Annex I Party is identified yet.		OK
		Brazil (host)				
a) Party has ratified the Kyoto Protocol		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
b) Party has designated a Designated National Authority		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
c) The assigned amount has been determined		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
A.3.2	Do the letters of approval meet the following requirements?	/1/ /41/	DR	A letter of approval (LoA) /41/ was issued by the DNA of Brazil on 24 September 2012, authorizing Eólica Mar e Terra Geração e Comercialização de Energia S.A., Eólica Bela Vista Geração e Comercialização de Energia S.A., Embuaca Geração e Comercialização de Energia S.A., Eólica Icarai Geração e Comercialização de Energia Ltda and Ecopart Assessoria em Negócios Empresariais Ltda. Of host Party of Brazil as project participants and confirming that the project assists in achieving		OK

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

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				sustainable development.		
				Brazil (host)		
a) LoA confirms that Party has ratified the Kyoto Protocol		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No		
b) LoA confirms that participation is voluntary		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No		
c) The LoA confirms that the project contributes to the sustainable development of the host country?		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No		
d) The LoA refers to the precise project activity title in the PDD		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No		
e) The LoA is unconditional with respect to (a) to (d) above		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No		
f) The LoA is issued by the respective Party's DNA		<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/> No		
g) The LoA was received directly by the DNA or the PP		<input type="checkbox"/>	DNA	<input checked="" type="checkbox"/> 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		There was no doubt that the letter of approval is authentic.				
A.3.3	Have all private/public project participants been authorized by an involved Party?	/1/	DR	A letter of approval (LoA) /41/ was issued by the DNA of Brazil on 24 September 2012, authorizing Eólica Mar e Terra Geração e Comercialização de Energia S.A., Eólica Bela Vista Geração e Comercialização de Energia S.A., Embuaca Geração e Comercialização de Energia S.A., Eólica Icarai Geração e Comercialização de Energia Ltda and Ecopart Assessoria em Negócios Empresariais Ltda. Of host Party of Brazil as project participants and confirming that the project assists in achieving sustainable development.		OK
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 Rio Grande do Norte and Ceará Wind Energy Complex Project Activity in Brazil is		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.																				
			<p>composed by four newly built grid-connected wind power plants: Embuaca, Icaraí, Areia Branca and Mar e Terra. The location details of each wind farm are in the table below. The geographical coordinates of the proposed project activity are listed in the table as confirmed in documents from the National Agency on Electric Energy (ANEEL) authorizing the energy production of each wind farm.</p> <table><tr><th>Wind Farm</th><th>City</th><th>State</th><th>Geographic Coordinates</th></tr><tr><td>Embuaca</td><td>Trairi</td><td>Ceará</td><td>3.2182 S 39.3294 W</td></tr><tr><td>Icaraí</td><td>Amont oada</td><td>Ceará</td><td>3.0177 S 39.6292 W</td></tr><tr><td>Areia Branca</td><td>Areia Branca</td><td>Rio Grande do Norte</td><td>4.9772 S 36.9034W</td></tr><tr><td>Mar e Terra</td><td>Areia Branca</td><td>Rio Grande do Norte</td><td>4.9736 S 36.9177 W</td></tr></table>	Wind Farm	City	State	Geographic Coordinates	Embuaca	Trairi	Ceará	3.2182 S 39.3294 W	Icaraí	Amont oada	Ceará	3.0177 S 39.6292 W	Areia Branca	Areia Branca	Rio Grande do Norte	4.9772 S 36.9034W	Mar e Terra	Areia Branca	Rio Grande do Norte	4.9736 S 36.9177 W		
Wind Farm	City	State	Geographic Coordinates																						
Embuaca	Trairi	Ceará	3.2182 S 39.3294 W																						
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Mar e Terra	Areia Branca	Rio Grande do Norte	4.9736 S 36.9177 W																						
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	/1/ /16/ /69/	DR I	The project does not involve any public funding from an Annex I Party, 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		OK																				

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Parties?				Brazil. The project is applying for SUDENE funding, which is a State Company that administrates a funding program from Brazilian Government.		
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/ /43/	DR	The project applies the approved baseline and monitoring methodology ACM0002 <i>Consolidated baseline methodology for grid-connected electricity generation from renewable sources</i> version 12.3.0.		OK
B.1.2	If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/1/ /44/ /45/ /49/	DR	Yes. Are also applicable the following: <ul style="list-style-type: none"> • <i>Tool for the demonstration and assessment of additionality</i> version 6.0.0; • <i>Tool to calculate the emission factor for an electricity system</i> version 2.2.1. • <i>Tool to calculate project or leakage CO2 emissions from fossil fuel combustion</i> version 2. 		OK
B.2 Applicability of methodology (and tools) (VVM para 65-76)						
B.2.1	How was it validated that project complies with the following applicability criteria: The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit?	/1/ /11/	DR CC	The project activity is the installation of a grid-connected and greenfield wind power plants hence does not involve capacity addition, retrofit or replacement, which was verified through the energy generation authorization by ANEEL for independent power producer.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.2.2	How was it validated that project complies with the following applicability criteria: in the case of capacity additions, retrofits or replacements, the existing plant started commercial operations prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity?	/1/ /11/	DR CC	The project activity is the installation of a grid-connected and greenfield wind power plants hence does not involve capacity addition, retrofit or replacement, which was verified through the energy generation authorization by ANEEL for independent power producer.		OK
B.2.3	Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/ /43/	DR	The project is connected to the 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 National Electric Energy Agency (ANEEL). Therefore, it is deemed that the approved methodology ACM0002 version 12.3.0 is applicable to the project activity.		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/ /43/ /45/	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 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 Rio Grande do Norte and Ceará Wind Energy Complex Project Activity is clearly defined in accordance with applicable guidelines of both ACM0002 and the "Tool to calculate the		OK

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

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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	<i>emission factor for an electricity system</i> ". The 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.		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/ /43/	DR	The PDD does not present evidenced calculations that 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 12.3.0, as per <i>Validation and Verification Manual</i> , version 1.2, paragraph 77.	CAR-8	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/ /43/ /45/	DR	The baseline is in accordance with ACM0002 version 12.3.0 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 " <i>Tool to calculate the emission factor for an electricity system</i> ".		OK
B.4.2	How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR	Not applicable, as ACM0002 version 12.3.0 prescribes the baseline scenario.		OK
B.4.3	What is the baseline scenario?	/1/	DR	Refer to B.4.1.		OK

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

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/	DR	The baseline determination is in line with ACM0002, version 12.3.0.		OK
B.4.5	Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	This is not applicable as the baseline is directly determined as per ACM0002, version 12.3.0.		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/	DR	This is not applicable as the baseline is directly determined as per ACM0002, version 12.3.0.		OK
B.4.7	Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	This is not applicable as the baseline is directly determined as per ACM0002, version 12.3.0.		OK
B.4.8	Is the baseline determination adequately documented in the PDD? <ul style="list-style-type: none"> 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/ /45/	DR	The baseline determination has been adequately documented in the PDD: The baseline determination has been adequately documented in the PDD: <ul style="list-style-type: none"> 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?	/1/ /44/	DR	As required by ACM0002, the additionality of the proposed project is demonstrated by applying the “ <i>Tool for the demonstration and assessment of additionality</i> ” version 6.0.0.		OK
B.5.2	Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR	It is not specified in the PDD the regulatory requirements in which the proposed project	CL-5	OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				activity is consistent and complies with, according to the “ <i>Tool for the demonstration and assessment of additionality</i> ” version 6.0.0.		
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/ /14/ /47/	DR	In accordance with the guidance from the CDM Executive Board “ <i>Guidelines on the demonstration and assessment of prior consideration of the CDM</i> ”, the proposed project is four newly built wind farms and the starting date of the project activity (20 August 2010) is after 2 August 2008. Thus, the notification letter for the proposed project was sent by the project participant to the Brazilian DNA and to the UNFCCC secretariat. No evidence was provided on the notification letters.	CL-2	OK
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/ /47/	DR	In accordance with the guidance from the CDM Executive Board “ <i>Guidelines on the demonstration and assessment of prior consideration of the CDM</i> ”, the proposed project is four newly built wind farms and the starting date of the project activity (20 August 2010) is after 2 August 2008. Thus, the notification letter for the proposed project was sent by the project participant to the Brazilian DNA and to the UNFCCC secretariat. No evidence was provided on the notification letters.	CL-2	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)						
B.5.7	What initiatives were 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 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 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 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 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 project generates financial and economic benefits other than CDM related income through the sales of electricity, a benchmark analysis was selected for conducting the investment analysis.		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 electricity other than CDM-related income, a benchmark analysis is correctly selected as the analysis method.		OK
B.5.14	Is the benchmark/discount rate the latest available at the time of decision?	/1/ /48/	DR	According to the <i>Guidelines on the Assessment of Investment Analysis</i> version 5, Input values	CAR-4	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. The PDD statements do not clearly state the event and correspondent date of the investment decision.		
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/ /48/ /52/ /67/	DR CC	<p>The selected benchmark is a project benchmark calculated based in bond rates. The benchmark was calculated to be 8.94% by Ecopart Assessoria em Negócios Empresariais Ltda. based on paragraph 12 of the “Guidelines on the Assessment of Investment Analysis” version 5 /48/: “weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR”. The WACC was calculated as per the option 6 (a) presented in the additionality tool as follows:</p> $WACC = K_e * W_e + K_d * W_d$ <p>Where:</p> <ul style="list-style-type: none"> - K_e (cost of equity) is calculated as 17.95% as per indicated below; - K_d (cost of debt) is calculated as 4.63% as per indicated below; - W_d (weight of debt) is 67.7%, which is the maximum financing granted by BNDES for wind farms for the period of August 2003 to August 2009. Evidence presented by the project participant cannot be assessed and confirmed by DNV; - W_e (weight of equity) is 32.3%, as the 		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>remaining of the W_d explained above;</p> <p>The calculation of the cost of equity K_e is given by the formula:</p> $K_e = ((1+R_f)/(1+I)-1) + \beta * (R_m - R_f) + R_c$ <p>Where:</p> <ul style="list-style-type: none"> - R_f (risk free rate) is calculated as 3.52%, based on the US Treasury Yield for 10 years, on July 2010 /65/. The application of a 10-years treasury note does not correspond to the project period of investment (and lifetime), which is 20 years. Period of time chosen needs to be justified; - R_m (equity risk premium) is calculated as 6.58%, based on the highest historical returns on equity. DNV cross-checked the values presented with the Damodaran home page /65/; - R_c (estimated country risk premium) is Brazilian country risk calculated as 2.50%. The PDD states that the value is for a 5-year average, however, the calculation in the spreadsheet is not according to the statement; - β (Adjusted industry beta) is considered to be 2.11%, based on the market weighted average beta US power Co. re-levered to Brazilian leverage. Beta when relevered used the conditions of 		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>Presumed (or Assumed) Profit regime, which tax rate is zero when releveraging beta. The selection of companies by industry for the beta calculation is not clearly stated and does not allow to be reproduced;</p> <ul style="list-style-type: none"> - I (US expected inflation) is considered to be 1.94% based on a ten-year Treasury notes minus ten-year TIPS /66/; <p>Thus, K_e is calculated to be 17.95%.</p> <p>The calculation of the cost of debt K_d is given by the formula:</p> $K_d = (1+(a+b+c)*(1-t)) / ((1+d) - 1)$ <p>Where:</p> <ul style="list-style-type: none"> - a is the financial cost considered as 6.44% based on the long term interest rate given by the BNDES on a 5-year average range. The PDD states that the value is for a 5-year average, however, the calculation in the spreadsheet is not according to the statement; - b is the spread calculated as 0.90% based on the BNDES spread, as per the credit policy for power generation activities; - c is the credit risk rate calculated as 2% given by the BNDES. The use of 2%, according to the reference given in the PDD, is not clearly evidenced and justified; - d is the inflation forecast in Brazil, calculated as 4.5% ; 		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<ul style="list-style-type: none"> - t is the marginal tax rate assumed as zero since the project IRR calculation is based on assumed profit, according to Brazilian tax regulation, is not applicable /60/. <p>Hence, regarding the benchmark calculation, the outstanding issues need clarification:</p> <ul style="list-style-type: none"> • W_d (weight of debt) is 67.7%, which is the maximum financing granted by BNDES for wind farms for the period of August 2003 to August 2009. Evidence presented by the project participant cannot be assessed and confirmed by DNV; • The application of a 10-years treasury note does not correspond to the project period of investment (and lifetime), which is 20 years. Period of time chosen is not justified; • R_c (estimated country risk premium) is Brazilian country risk calculated as 2.50%. The PDD states that the value is for a 5-year average, however, the calculation in the spreadsheet is not according to the statement; • The selection of companies by industry for the beta calculation is not clearly stated and does not allow to be reproduced; • c is the credit risk rate calculated as 2% given by the BNDES. The use of 2%, according to the reference given in the 	CL-3	

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>PDD, is not clearly evidenced and justified.</p> <p>Thus, the cost of debt is calculated to be 4.63% and the WACC is calculated to be 8.94%.</p> <p>During site visit, the project participant has presented the values of investment and operation and maintenance costs approved in the request for funding from SUDENE as evidence for the investment analysis. Considering that a financing was granted to the project, a clarification is needed to the the financial indicator choice.</p>	CAR-5	
B.5.16 Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/	DR	See B.5.14.	CAR-4	
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/ /60/	DR	<p>Yes, depreciation is being taken into account. However the income taxes are based on the <i>Assumed Profit</i> and consequently depreciation will not impact in internal rate of return.</p> <p>As per <i>Assumed Profit</i> regulations taxes are calculated over the gross revenues and not gross profits of each year. The <i>Assumed Profit</i> is applicable to companies that have gross revenues below 48 million BRL per year.</p>		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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/ /60/	DR	The PDD states that the period of investment analysis is according to the project and equipment lifetime. It is not possible to evidence equipment lifetime. Depreciation is 5% per year therefore the salvage value will be zero at the end of the project activity.	CL-4	OK
B.5.19	When a feasibility study report or similar approved by the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?	/1/ /69/	DR	According to the <i>Guidelines on the Assessment of Investment Analysis</i> version 5, Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. The PDD statements do not clearly state the event and correspondent date of the investment decision. The PDD states that the values applied in the investment analysis are from supplier's quotation when in fact the values used as the basis in the analysis are the values presented to the government institution SUDENE for project funding. The vales applied are not consistent throughout the PDD and supporting documents and are not properly evidenced to correspond to the investment decision date.	CAR-4 CAR-6	OK
B.5.20	How was the amount of output (e.g. sales of electricity) assessed?	/1/ /2/ /50/	DR	<input type="checkbox"/> 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 <input checked="" type="checkbox"/> The plant load factor determined by a third party contracted by the project participants (e.g.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>an engineering company)</p> <p><input type="checkbox"/> Other approach.</p> <p>The annual net electricity delivered to the National Interconnected System (SIN) is expected to be 306 806 MWh, corresponding to an average plant load factor of 38.4%. Plant load factors and energy generation (and how they were calculated) needs to be clearly identified in the project with no hidden formulas. Project participants have not clearly reasoned the differences in the plant load factors and energy generation for the investment analysis and the estimation of emission reductions presented in the project.</p>	CAR-2	
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/ /12/	DR	<p><input checked="" type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices)</p> <p><input type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants</p> <p>In Brazil, the auctions for reserve energy follow the inverted auctions model, in which the smallest price charged by the producer in the bid wins the slot. In the 2nd Brazilian Auction of Reserve Energy - Auction n° 003/2009. The price offered for the four wind farms were BRL 152.63 for Areia Branca, BRL 152.64 for Mar e Terra, BRL 151.07 for Embuaca and BRL 151.08 for Icaraí. In this auction, the average price for the 753 slots was BRL 148.39 and present a range of R\$ 131.00 to R\$ 153.70.</p> <p>It is not clear in the PDD the period of contract</p>	CL-6	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			and assured energy defined in the auction and followed by the PPA.		
B.5.22 How were the investment costs assessed? Were the data available and valid at the time of decision?	/1/ /69/	DR	<input type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input type="checkbox"/> Review of feasibility reports, public announcements, contracts and annual financial reports related to the project and the project participants The PDD states that the values applied in the investment analysis are from supplier's quotation when in fact the values used as the basis in the analysis are the values presented to the government institution SUDENE for project funding. The vales applied are not consistent throughout the PDD and supporting documents and are not properly evidenced to correspond to the investment decision date.	CAR-6	OK
B.5.23 How were the O&M costs assessed? Were the data available and valid at the time of decision?	/1/ /69/	DR	<input type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices) <input type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants The PDD states that the values applied in the investment analysis are from supplier's quotation when in fact the values used as the basis in the analysis are the values presented to the government institution SUDENE for project funding. The vales applied are not consistent throughout the PDD and supporting documents and are not properly evidenced to correspond to the investment decision date.	CAR-6	OK

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Checklist Question		Ref	MoV	Assessment by DNV					Draft Concl.	Final Concl.												
B.5.24	Describe the assessment of the other input parameters. Were the data available and valid at the time of decision?	/1/	DR	<div><input type="checkbox"/> Cross-check against third-party or publicly available sources (e.g. invoices or price indices)</div> <div><input type="checkbox"/> Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants</div> <div>The costs related to the insurance, property lease, taxes, resolutions presented in the investment analysis are not evidenced, referenced and listed in the PDD.</div>					<div>CAR-9</div>	OK												
B.5.25	Was the financial calculation spreadsheet verified and found to be correct?	/1/	DR	See B.5.21 to B.5.24					<div>CL-6</div> <div>CAR-9</div>	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 has been carried out for the electricity tariff, energy generation and capital expenditures. In the PDD and in the financial analysis, it is not clear if the parameters chosen contribute to more than 20% to the revenues or costs as per the <i>Guidelines on the Assessment of Investment Analysis</i> version 5.					<div>CAR-10</div>	OK												
B.5.27	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/ /67/	DR	<div>Reasonable variations of the electricity tariff, energy generation and capital expenditures were checked by calculating the variation necessary to reach the benchmark and then discussing the likelihood for that to happen.</div> <div>DNV was able to verify that the project IRR will reach the benchmark only if the above mentioned parameters change by values as mentioned below:</div> <table><tr><th>Key Indicators</th><th colspan="5">Variation of the parameter indicator needed to reach the benchmark of 8.94%</th></tr><tr><td>Wind farm</td><td>Mar</td><td>Areia</td><td>Embu</td><td>Icarai</td><td></td></tr></table>					Key Indicators	Variation of the parameter indicator needed to reach the benchmark of 8.94%					Wind farm	Mar	Areia	Embu	Icarai			OK
Key Indicators	Variation of the parameter indicator needed to reach the benchmark of 8.94%																					
Wind farm	Mar	Areia	Embu	Icarai																		

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Checklist Question	Ref	MoV	Assessment by DNV					Draft Concl.	Final Concl.
				e Terra	Branc a	aca			
			Energy price	43%	22.05 %	12.55 %	30.5 %		
			Energy assured (PLF)	43%	- 22.75 %	- 14.25 %	29.05 %		
			Total investments	-38%	22.05 %	12.55 %	30.5 %		
			<p>1) Electricity tariff: To reach the 8.94% benchmark, power tariffs must increase by 14.25% above inflation, which is not likely to happen. In Brazil, the tariffs are strictly set by ANEEL in the time of the auction and cannot be changed during the period of the PPA, determined as 20 years in the rules of the auction.</p> <p>2) Annual output delivered to the grid: Project participant utilize other study developed by a third party to discuss the likelihood of generating more energy than expected. However, it is not clear if the study represents a conservative approach in terms of more energy generation.</p> <p>3) Total investment: According to the PDD, the project investment should not be subject to variations since the equipment purchase and wind farms construction will be done through an EPC contract with. The sensitivity analysis did not evaluate the resulting values of the sensitivity analysis against the EPC contracts recently signed for the wind parks.</p>					CL-7	
								CAR-11	

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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	See B.5.27.	CL-7 CAR-11	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	Barrier analysis was not applied for the proposed project.		OK
B.5.30	How were the <u>investment barriers</u> assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	Barrier analysis was not applied for the proposed project.		OK
B.5.31	How does CDM alleviate the investment barriers?	/1/	DR	Barrier analysis was not applied for the proposed project.		OK
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	Barrier analysis was not applied for the proposed project.		OK
B.5.33	How were the <u>technological barriers</u> assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR	Barrier analysis was not applied for the proposed project.		OK
B.5.34	How does CDM alleviate the technological barriers?	/1/	DR	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	Barrier analysis was not applied for the proposed project.		OK
B.5.36	How were the <u>barriers due to prevailing practise</u> assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants?	/1/	DR	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	Barrier analysis was not applied for the proposed project.		OK
B.5.38	Is the project activity prevented by the barriers due to	/1/	DR	Barrier analysis was not applied for the proposed		OK

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	prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?			project.		
B.5.39	How were the <u>other barriers</u> assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/	DR	Barrier analysis was not applied for the proposed project.		OK
B.5.40	How does CDM alleviate the other barriers?	/1/	DR	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	Barrier analysis was not applied for the proposed project.		OK
Common practice analysis (VVM para 119-121)						
B.5.42	What is the geographical scope of the common practice analysis? Is this justified?	/1/ /44/	DR	According to the EB <i>“Tool for the demonstration and assessment of additionality”</i> 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 to be the entire country, based on the same potential to generate wind energy all over Brazil. Regarding the scale, a range installed capacity from 8.4MW to 40.5MW (50% lower than Icarai installed capacity, and 50% higher than the Areia Branca installed capacity). Also, since the total installed capacity of the four wind farms is 92.4MW, a range between 46.2 MW and 138.6MW is included in the common practise analysis.		OK

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			<p>Regarding the regulatory framework, it was considered wind power plants that started operations from March 2004, since it is the date when the new regulatory framework has been implemented in Brazil in order to boost the investments in the sector.</p> <p>The wind farms considered within this range criteria were implemented under some sort of incentive: PROINFA or CDM. The only exception is Eólica de Prainha. PDD states that one wind farm was implemented without any kind of incentive. The common practice analysis provided by project participant is not clear regarding the exclusion of this wind farm.</p> <p>It is not clear in the PDD what type of incentive PROINFA is, and why the base information on wind farms is taken from 2009 since the validation started on November 2011.</p>	<p>CL-10</p> <p>CL-8</p>	
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/ /56/	DR	<p>The scope of technology was based on the size of the wind farms, where a range installed capacity from 8.4MW to 40.5MW (50% lower than Icarai installed capacity, and 50% higher than the Areia Branca installed capacity). Also, since the total installed capacity of the four wind farms is 92.4MW, a range between 46.2 MW and 138.6MW is included in the common practise analysis.</p> <p>The criteria adopted for the 50% range applied in the installed capacity of the project in order to narrow down the scenario assessed in the common practice analysis is not clearly evidenced.</p>	CL-9	OK
B.5.44 What is the data source(s) used for the common practice	/1/	DR	The wind farms considered within this range		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
analysis?				criteria were all implemented under some sort of incentive: PROINFA or CDM. It is not clear in the PDD what type of incentive PROINFA is, and why the base information on wind farms is taken from 2009 since the validation started on November 2011.	CL-8	
B.5.45	How many similar non-CDM-projects exist in the region within the scope?	/1/	DR	PDD states that one wind farm was implemented without any kind of incentive. The common practice analysis provided by project participant is not clear regarding the exclusion of this wind farm.	CL-10	OK
B.5.46	How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR	PDD states that one wind farm was implemented without any kind of incentive. The common practice analysis provided by project participant is not clear regarding the exclusion of this wind farm.	CL-10	OK
B.5.47	What is the conclusion of the common practice analysis?	/1/	DR	<p>The criteria adopted for the 50% range applied in the installed capacity of the project in order to narrow down the scenario assessed in the common practice analysis is not clearly evidenced.</p> <p>The wind farms considered within this range criteria were all implemented under some sort of incentive: PROINFA or CDM. It is not clear in the PDD what type of incentive PROINFA is, and why the base information on wind farms is taken from 2009 since the validation started on November 2011.</p> <p>PDD states that one wind farm was implemented without any kind of incentive. The common practice analysis provided by project participant is not clear regarding the exclusion of this wind</p>	CL-9 CL-10 CL-8	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				farm.		
Conclusion						
B.5.48	What is the conclusion with regard to the additionality of the project activity?	/1/	DR	The project additionality will be confirmed after the resolution of the outstanding issues raised during the validation process.	CL-2 CL-3 CL-4 CL-5 CL-6 CL-7 CL-8 CL-9 CL-10 CAR-3 CAR-4 CAR-5 CAR-6 CAR-7 CAR-9 CAR-10 CAR-11	OK
B.6 Calculations of GHG emission reductions						
Data and parameters that are available at validation and that are not monitored (VVM para 199-203)						
B.6.1	How was the build margin CO ₂ emission factor in year y (EF _{grid,BM}) available at validation verified?	/1/ /14/ /43/ /45/	DR	The <i>ex-ante</i> build margin emission factor was calculated by the project participant as per the <i>Tool to calculate the emission factor for an electricity system</i> version 2.2.1, with step 5 of the tool. Calculations were provided by the project participant in a spreadsheet. The resulting value is 0.2609 tCO ₂ /MWh and will be used for the entire crediting period.		OK
B.6.2	How was the simple adjusted operating margin CO ₂ emission	/1/	DR	The <i>ex-ante</i> operating margin emission factor		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	factor in year y ($EF_{grid,OM-adj,y}$) available at validation verified?	/14/ /43/ /45/		was calculated by the project participant as per the <i>Tool to calculate the emission factor for an electricity system</i> version 2.2.1, with the simple adjusted method. Calculations were provided by the project participant in a spreadsheet. The resulting value is 0.1166 tCO ₂ /MWh and will be used for the entire crediting period.		
B.6.3	How was the combined margin CO ₂ emission factor for grid connected power generation in year y ($EF_{grid,CM}$) available at validation verified?	/1/ /14/ /43/ /45/	DR	It is not clear in the PDD is the combined emission factor will be monitored <i>ex-ante</i> and <i>ex-post</i> .	CAR-12	OK
B.6.4	How was the CO ₂ emission factor of fossil fuel type used in power unit m in year y ($EF_{CO2,m,i,y}$) available at validation verified?	/1/ /14/ /43/ /45/	DR	The IPCC default values at the lower limit of uncertainty at a 95% confidence interval as per Chapter 1 of Volume 2 of IPCC 2006 Guidelines on National GHG Inventories. The values chosen are different for each fuel type and power unit used in the calculation spreadsheet of the grid emission factor.		OK
B.6.5	How was the net electricity generated by power plant/unit m or k in year y ($EG_{m,y}$ and $EG_{k,y}$) available at validation verified?	/1/ /14/ /15/ /43/ /45/	DR	The net electricity generated by each power plant/unit connected to the grid was obtained by the project participant directly with the National Operator System (ONS), which is the institution responsible for operating and managing the entire interconnected electric system in Brazil. Information is provided by the project participant to DNV in different daily reports obtained with ONS. Since the values from ONS are the daily energy generation for more than 170 energy production facilities, one year produces more than 62 000 records. Considering the simple adjusted operating margin method in which demands a		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>period of three years of calculation, the total sample size is 186 000 data inputs. DNV used a sampling procedure to cross-check the data in the emission factor calculation spreadsheet developed by the project participant against the raw data obtained in the ONS energy generation reports. Sampling procedure was based on the American Military Standard and tables for Inspection by Attributes (MIL-STD-105DE) Level II, single sample for normal inspection. Since data size is higher than 1 200, the sample size should be 100. The sampling was randomly performed, for 100 numbers checked by DNV within the 3 years of data. No error was identified.</p>		
<p>B.6.6 How was the average net energy conversion efficiency of power unit m or k in year y ($\eta_{m,y}$) available at validation verified?</p>	<p>/1/ /14/ /43/ /45/</p>	<p>DR</p>	<p>The conversion efficiency of each power plant/unit connected to the grid was obtained by the project participant directly with the National Operator System (ONS), which is the institution responsible for operating and managing the entire interconnected electric system in Brazil. Information is provided by the project participant to DNV in different daily reports obtained with ONS.</p> <p>Since the values from ONS are the daily energy generation for more than 170 energy production facilities, one year produces more than 62 000 records. Considering the simple adjusted operating margin method in which demands a period of three years of calculation, the total sample size is 186 000 data inputs. DNV used a sampling procedure to cross-check the data in the emission factor calculation spreadsheet</p>		<p>OK</p>

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			developed by the project participant against the raw data obtained in the ONS energy generation reports. Sampling procedure was based on the American Military Standard and tables for Inspection by Attributes (MIL-STD-105DE) Level II, single sample for normal inspection. Since data size is higher than 1 200, the sample size should be 100. The sampling was randomly performed, for 100 numbers checked by DNV within the 3 years of data. No error was identified.		
Baseline emissions (VVM para 89-93)					
B.6.7 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /43/ /45/	DR	<p>The baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) times the electricity supplied by the project activity to the grid ($EG_{facility,y}$ in MWh).</p> <p>The project involves wind power generation, which partly displaces fossil fuel based power from the SIN grid in Brazil.</p> <p>Emissions from electricity generation in fossil fuel-fired power plants belonging to the SIN are displaced due to the project activity. The baseline emission factor for the project is determined <i>ex-ante</i> as a combined margin (CM), consisting of combination of the operating margin (OM) and build margin (BM) of the National Interconnected System (SIN), the electricity grid of Brazil. For the <i>ex-ante</i> estimation of emissions reduction, the annual average electricity generated is estimated to be 306 806 MWh.</p>		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>According to ACM0002 version 12.3.0, baseline emissions are equal to the power generated by the project delivered to the SIN, multiplied by the baseline emission factor. The grid emission factor will be determined <i>ex-ante</i> as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM) emission coefficient for the project.</p> <p>Operating Margin: the <i>ex-ante</i> option was chosen for the calculation of the emission factor, according to the tool “<i>Tool to calculate the emission factor for an electricity system</i>” version 2.2.1, which determines to use a 3-year generation-weighted average, based on the most recent data available at the time of the PDD submission to DNV for validation. Since the PDD was published for global stakeholder process on 12 November 2011, the latest electricity generation data published by the National Operator System (ONS) for 2008, 2009 and 2010 years was available at the time of validation. Therefore the project used the average of three years data for operating margin emission factor, resulting in 0.2609 tCO₂/MWh.</p> <p>Build Margin: the <i>ex-ante</i> option was chosen for the calculation of the build margin emission factor. The option 1 of the “<i>Tool to calculate the emission factor for an electricity system</i>” version 2.2.1 was chosen, i.e., the most recent information available at the time of the PDD submission to DNV for validation, the year 2010. The build margin emission factor was calculated as the weighted average emissions (in</p>		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			<p>tCO₂e/MWh) of recent capacity additions of the system generation, where generation additions are defined as the greater (in MWh) of most recent 20% of existing plants (93 183 936 MWh) excluding the CDM project activities, or the 5 most recent plants (662 143 MWh). For the build margin, the 20% most recently installed plants generation has been chosen in terms of electricity generation. Following the tool, from the 20% most recently installed plants, the oldest plant which started to supply electricity to the grid was in January 1998, hence, the power units supplying energy to the grid more than 10 years ago were excluded, and the CDM project activities were included back to the set of power units from the most recent until the generation reaches the 20% (AEG_{SET-sample-CDM}). The energy generation including the units with CDM project activities reaches 74 902 471 MWh (AEG_{SET-sample-CDM}). Since the value did not reach the 20% (93 183 936 MWh), the power units that started to supply electricity to the grid more than 10 years ago need to be re-inserted in the set again until it reaches the 20% (steps <i>e</i> and <i>f</i> of the tool, set called SET_{sample-CDM>10yrs}). According to the PDD section B.6.3, the steps <i>e</i> and <i>f</i> were applied. However, the calculation of the resultant set SET_{sample-CDM>10yrs}, is not demonstrated in build margin emission factor spreadsheet.</p> <p>The weighting is set to be 75% and 25% respectively, which are the default values stipulated for wind projects by “Tool to</p>	CAR-13	

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				<i>calculate the emission factor for an electricity system” version 2.2.1. Thus, the combined margin emission factor is 0.2248 tCO₂/MWh.</i>		
B.6.8	Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Refer to B.6.8.	CAR-13	OK
B.6.9	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Refer to B.6.8.	CAR-13	OK
Project emissions (VVM para 89-93)						
B.6.10	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	The PDD does not present evidenced calculations that 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 12.3.0.	CAR-8	OK
B.6.11	Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Refer to B.6.7.	CAR-8	OK
B.6.12	Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Refer to B.6.7.	CAR-8	OK
Leakage (VVM para 89-93)						
B.6.13	Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	No leakage has to be considered for the proposed project activity.		OK
B.6.14	Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	No leakage has to be considered for the proposed project activity.		OK
B.6.15	Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	No leakage has to be considered for the proposed project activity.		OK
Emission Reductions (VVM para 89-93)						
B.6.16	Algorithms and/or formulae used to determine emission	/1/	DR	The project is a wind power project which	CAR-1	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
<p>reductions:</p> <ul style="list-style-type: none"> • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration. 	/43/		<p>involves installation and operation of 44 wind turbines. The project information must be coherent throughout the PDD and supporting documents. The number of WTGs in the project considered in the investment analysis and in the estimation of emission reduction is not explained. The installed capacity of each turbine is 2.1 MW thus, constituting a total installed capacity of 92.4 MW.</p> <p>The annual net electricity delivered to the National Interconnected System (SIN) is expected to be 306 806 MWh, corresponding to an average plant load factor of 38.4%. Plant load factors and energy generation (and how they were calculated) needs to be clearly identified in the project with no hidden formulas. Project participants have not clearly reasoned the differences in the plant load factors and energy generation for the investment analysis and the estimation of emission reductions presented in the project.</p> <p>The PDD does not present evidenced calculations that 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 12.3.0, as per <i>Validation and Verification Manual</i>, version 1.2, paragraph 77.</p>	<p>CAR-2</p> <p>CAR-8</p>	

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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/ /45/	DR	<p>The parameters monitored <i>ex-post</i> are the net electricity generation ($EG_{\text{facility},y}$) from each facility of the proposed project activity.</p> <p>The PDD does not detail how metering equipment point of connection to the Brazilian grid for each wind farm will be established.</p> <p>The PDD describes in a general way the equipment to be used for monitoring purposes. Relevant technical details about the type of electricity meter and accuracy are not provided in the PDD.</p>	CAR-14 CAR-15	OK
B.7.2	Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	Refer to B.7.1.	CAR-14 CAR-15	OK
B.7.3	In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	Refer to B.7.2.	CAR-14 CAR-15	OK
B.7.4	In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	Refer to B.7.3.	CAR-14 CAR-15	OK
B.7.5	In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR	Refer to B.7.3.	CAR-14 CAR-15	OK
B.7.6	Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Refer to B.7.2 and B.7.3.	CAR-14 CAR-15	OK
B.7.7	Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Refer to B.7.2 and B.7.3.	CAR-14 CAR-15	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Ability of project participants to implement monitoring plan						
B.7.8	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR	The project applies the approved monitoring methodology ACM0002 " <i>Consolidated baseline methodology for grid-connected electricity generation from renewable sources</i> ", (version 12.1.0). The selected monitoring methodology is applicable for the project activity as it involves grid-connected renewable power generation using wind energy. Authorities and responsibilities for project management, monitoring and reporting activities are clearly defined.		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/		Refer to B.7.8.		OK
B.7.10	Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR	Refer to B.7.8.		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	Refer to B.7.8.		OK
Monitoring of sustainable development indicators/ environmental impacts						
B.7.12	Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	Neither ACM0002, version 12.3.0 nor the Brazilian DNA 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	/1/	DR	Refer to B.7.13.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
archiving of relevant data concerning environmental, social and economic impacts?						
B.7.14	Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	Refer to B.7.13.		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/ /46/	DR	The starting date of the proposed project activity was defined as 20 August 2011, which represents the signature of the Power Purchase Agreement of Icarai wind farm, in which the energy is contracted. The starting date of a project activity, as defined in <i>Glossary of CDM Terms</i> , should be the earliest date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. Hence, the starting date stated in the PDD shall be in accordance with its definition as per the <i>Glossary of CDM Terms</i> .	CL-7	OK
C.1.3	Is the stated expected operational lifetime of the project activity reasonable?	/1/ /9/ /10/	DR	The expected operational lifetime of the project activity is 20 years derived from the lifetime of the wind turbine Suzlon S88. The PDD states that the period of investment analysis is according to the project and equipment lifetime. It is not possible to evidence the equipment lifetime.	CL-4	OK
C.1.4	Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR	A 10-year fixed crediting period has been chosen for the project, starting on 1 January 2013 or the registration date, whichever is later. The chosen crediting starting date is deemed to		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			be reasonable. The emission reductions are estimated to be 68 966 tCO ₂ e per year and 689 660 tCO ₂ e over the ten-year fixed crediting period.		
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/ /19/ /55/	DR I	According to Brazilian environmental law a Simplified Environmental Report (RAS) is required to grant the installation license of electricity generation projects with more than 10 MW of installed capacity. As stated in the PDD, a Simplified Environmental Report (RAS) has been conducted according to Brazilian law and regulation.		OK
D.1.2 Does the project comply with environmental legislation in the host country?	/1/ /19/ /55/	DR	See D.1.1.		OK
D.1.3 Will the project create any adverse environmental effects?	/1/ /19/ /55/	DR	See D.1.1.		OK
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/ /19/ /55/	DR	See D.1.1.		OK
D.1.5 Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/ /19/ /55/	DR	See D.1.1.		OK
D.1.6 Are transboundary environmental impacts considered in the analysis?	/1/ /19/ /55/		See D.1.1.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
E Stakeholder Comments (VVM para 128-130)					
E.1.1 Have relevant stakeholders been consulted?	/1/ /13/	DR I	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 15 September 2011 to comment on the project. Invitation letters were sent in accordance with the requirements of Resolution 7 (5 March 2008) of the Brazilian DNA.		OK
E.1.2 Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	Refer to E.1.1.		OK
E.1.3 If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR	Refer to E.1.1.		OK
E.1.4 Is a summary of the stakeholder comments received provided?	/1/	DR	One comment was received by the Federal Prosecution stating that despite of the project relevance, the Federal Prosecution is forbidden to provide consultancy activities, and therefore they cannot analyse the project. No further action was needed. No comments were received for the proposed project during the global stakeholder consultation.		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
CAR 1 The project is a wind power project which involves installation and operation of 44 wind turbines. The project information must be coherent throughout the PDD and supporting documents. The number of WTGs in the project considered in the investment analysis and in the estimation of emission reduction is not explained.	A.2.4 A.2.4 B.6.16	<p>As verified during the site visit, the wind power plants were optimized in order to guarantee that the electricity negotiated in the auction would be delivered. The wind power plants present in total 45 aerogenerators as described below:</p> <ul style="list-style-type: none"> - <i>Mar e Terra</i>: the wind power plant presents 11 aerogenerators (10 S88 model and 1 S95 model). - <i>Areia Branca</i>: the wind power plant presents 13 aerogenerators (8 S88 model and 5 S95 model). - <i>Embuaca</i>: the wind power plant presents 13 aerogenerators (4 S88 model and 9 S95 model). - <i>Icaraí</i>: the wind power plant presents 8 aerogenerators (8 S88 model). <p>As requested, project participants clarify that the number of WTGs considered in the estimation of emission reduction is 45, <i>i.e.</i>, the new configuration of the wind power plants as described above.</p> <p>In the investment analysis, the data used are the one defined at the time of the</p>	<p>DNV has assessed the revised PDD /1/ version 2 of 10 April 2012 and information regarding the number of WTGs and the differences of wind farms configurations were made clear in the PDD.</p> <p>The project involves installation and operation of 45 WECs (Suzlon S88 2.1 MW model /9/ and Suzlon S95 2.1 MW model /10/). The installed capacity of each turbine is 2.1 MW thus, constituting a total installed capacity of 94.5 MW.</p> <p>This is the current configuration (quantity and model of the WTGs expressed in Table 2) which is different from the investment decision date (also project starting date 20 August 2010 /23/), to the latest wind study available /17/ /18/. When the PPAs were signed /20/-/23/, the project participants expected a different availability of wind in the land areas. Back then, the Engineering, Procurement and Construction (EPC) contracts were signed /26/. With a more recent wind study based on higher quantity of historical data available, prepared by</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		investment decision, <i>i.e.</i> , considering the previous configuration of the wind power plants. Furthermore, project participants opted to consider the new data available concerning the new configuration of the wind power plants in the sensitivity analysis in order to demonstrate that the alterations did not compromise the project's additionality. Please, refer to sections A.4.3 and B.5 of the second version of the PDD to access fully information.	consultancy Garrad Hassen Ibérica S.L.U., an independent third party /17/ /18/, the project participant realized that the original wind farms configuration could not deliver the amount of electricity contracted in the PPAs (324 120 MWh) /20/-/23/ corresponding an estimated average plant load factor of 44.25% /11/. Hence, project participants had decided to rearrange the wind farms configuration in a manner to obtain a safe electricity production to fulfil the PPAs committed amounts. Therefore this CAR is closed.
CAR 2 The annual net electricity delivered to the National Interconnected System (SIN) is expected to be 306 806 MWh, corresponding to an average plant load factor of 38.4%. Plant load factors and energy generation (and how they were calculated) needs to be clearly identified in the project with no hidden formulas. Project participants have not clearly reasoned the differences in the plant load factors and energy generation for the investment analysis and the estimation of emission reductions presented in the project.	A.2.4 B.5.20 B.6.16	Considering the new wind power plants configuration, as explained above in CAR 1, the annual electricity delivered to the National Interconnected Grid System (SIN) is 336 794 MWh/year, corresponding to an average plant load factor of 38.45%. In addition, as stated above, the difference in the annual net electricity considered in the investment analysis and in the estimation of the emission reductions is due to the fact that in the investment analysis applies the data used is the one defined at the time of the investment decision, <i>i.e.</i> , considering the previous configuration of the wind	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/, the investment analysis /4/-/7/ and the estimation of CERs /2/ and it is clearly defined in the PDD and supporting documents the differences between the wind farms configurations at the investment decision /23/ and at the technical reconfiguration in the EPC contract amendment /27/. Therefore this CAR is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		<p>power plants.</p> <p>On the other hand, the net electricity generation used in the estimation of the emission reductions considers the new wind power plants configuration.</p> <p>Please, refer to the second version of the PDD to check the provided information.</p>	
<p>CAR 3</p> <p>The signed PPAs for each wind complex is guaranteeing the commercialization of energy related to the assured annual energy generation of 324 120 MWh. However, the electricity generation of the project considered in the financial analysis is smaller. Project participants did not consider the total sales of the electricity covered by the PPAs.</p>	<p>A.2.4</p> <p>B.5.28</p> <p>B.5.48</p>	<p>As requested, the negotiated energy considered in the PPA was applied in the investment analysis.</p> <p>In addition, considering that the wind power plants were optimized, the new amount of net electricity generated was applied in the sensitivity analysis in order to demonstrate that the project remains additional.</p> <p>Please, refer to the second version of the wind power plants cash flows and to the Section B.5 of the second version of the PDD.</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the investment analysis /4/-/7/, and the assured energy established by the PPAs /20/-/23/ is clearly stated in the PDD and correctly considered in the financial analysis.</p> <p>Moreover, the modified configuration, which presents a higher number of WTGs and thus with a potential higher revenue, was also analysed in terms of IRR in a way to assess its additionality in the sensitivity analysis. Project continues to be additional.</p> <p>Therefore this CAR is closed.</p>
<p>CAR 4</p> <p>According to the <i>Guidelines on the Assessment of Investment Analysis</i> version 5, Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. The PDD statements do not</p>	<p>B.5.14</p> <p>B.5.16</p> <p>B.5.19</p> <p>B.5.48</p>	<p>The input values used in the investment analysis were the parameters considering the first wind power plants configuration, <i>i.e.</i>, the data available at the time that the auction took place.</p> <p>The Amplified Consumers Price Index (from the Portuguese <i>Índice de Preços ao Consumidor Ampliado - IPCA</i>) is</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the investment analysis /4/-/7/, and the input values were adjusted to the investment decision date.</p> <p>Values of investment and operation and maintenance costs were deflated according using an accordingly period</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
clearly state the event and correspondent date of the investment decision.		<p>measured monthly by the Brazilian Geography and Statistics Institute (from the Portuguese <i>Instituto Brasileiro de Geografia e Estatística – IBGE</i>) and is considered the official data available to account the inflation in the country.</p> <p>Furthermore, the <i>IPCA</i> is considered the adjustment index applied in the wind auctions contracts, as can be observed in the Power Purchase Agreement (PPA) and in the EPC Contract of the wind power plants included in this project activity.</p> <p>The <i>IPCA</i> index is available at the IBGE website: http://www.ibge.gov.br/home/estatistica/indicadores/precos/inpc_ipca/defaulttab.shtm.</p> <p>Also, project participants revised the project starting date considering the Power Purchase Agreement (PPA) signature of 20/08/2011 wind power plant. Sections B.5 and C.1.1 of the PDD were revised.</p>	<p>for each wind farm and the energy tariffs were inflated since tariff values were determined during the auction /12/, on January 2010.</p> <p>The Amplified Consumer Price Index (IPCA) for the corresponding period between reference dates and investment decision date /77/ applied are correct. The IPCA index is considered appropriate for the type of activity. Therefore this CAR closed.</p>
<p>CAR 5</p> <p>During site visit, the project participant has presented the values of investment and operation and maintenance costs approved in the request for funding from SUDENE as evidence for the investment analysis.</p>	<p>B.5.15</p> <p>B.5.48</p>	<p>Project participants do not use financing in the cash flow since the investment analysis is conducted taking into account the project IRR. Also, the project cash flow does not consider interest, amortization and the equity</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the investment analysis /4-/7/, and since the IRR calculated is project IRR, the benchmark used in the project is appropriated for comparison. The</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Considering that a financing was granted to the project, a clarification is needed to the the financial indicator choice.		<p>portion of the investment.</p> <p>The SUDENE letter was presented during the site visit, in order to demonstrate the project total investment at the time of the investment decision.</p>	<p>selected benchmark is calculated based on weighted average costs of capital (WACC) which is appropriate benchmark for the project activity and complies with the “Guidelines on the Assessment of Investment Analysis” version 5 /48/, as per the guidelines the project benchmark needs to be calculated based on bond rates. The nominal post tax WACC, uses data before 31 July 2010 as the investment decision was made in 20 August 2010</p> <p>Therefore this CAR is closed.</p>
<p>CAR 6</p> <p>The PDD states that the values applied in the investment analysis are from supplier’s quotation when in fact the values used as the basis in the analysis are the values presented to the government institution SUDENE for project funding. The values applied are not consistent throughout the PDD and supporting documents and are not properly evidenced to correspond to the investment decision date.</p>	<p>B.5.19</p> <p>B.5.22</p> <p>B.5.23</p> <p>B.5.48</p>	<p>As stated above in CAR 5, project participants clarify that the SUDENE letter was presented in order to demonstrate the total project investment at the time of the investment decision. The total investment presented by the SUDENE letter includes the EPC costs. Please, refer to the Section B.5 of the second version of the PDD the whole explanation.</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the investment analysis /4/-/7/, and the input parameters used in the financial analysis of this project are taken from EPC contracts for each wind farm and correspondent transmission lines /26/ and cross-checked with the values stated in the funding request letters /16/ sent to financing institution SUDENE /69/. Project participant has applied inflation rates in order to deflate the investment values of SUDENE letters to the investment decision date /23/.</p> <p>Values presented for the operation and maintenance costs are taken directly from the EPC contract, as per</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			referenced in the revised PDD. Therefore this CAR is closed.
CAR 7 The starting date of the proposed project activity was defined as 20 August 2011, which represents the signature of the Power Purchase Agreement of Icarai wind farm, in which the energy is contracted. The starting date of a project activity, as defined in <i>Glossary of CDM Terms</i> , should be the earliest date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. Clarification and evidence are necessary so the PPA can be adequate to the starting date definition.	A.2.4 C.1.2 B.5.48	Considering that the PPA represents a commitment of the project sponsor in implement the wind power plants, the project activity starting date was revised and updated to the Power Purchase Agreement (PPA) signature of <i>Icarai</i> wind power plant. Please, refer to Section B.5 and C.1.1 of the third version of the PDD to access revised information concerning the project activity starting date.	Project participant has clarified that the starting date of the project activity was defined as 20 August 2010, which represents the signature of the Power Purchase Agreement of Icarai wind farm, in which the energy is contracted /23/. The starting date of a project activity, as defined in <i>Glossary of CDM Terms</i> /46/, should be the earliest date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. DNV assessed the signed PPAs between the project participants Rio Grande do Norte and Ceara Wind Energy Complex Project Activity and the power utilities /20/-/23/, and was able to confirm that this is the earliest commitment to financial expenditure as it obliges the PP to sell the amount of electricity accorded in the auction /12/. The penalty of not providing this electricity to the grid equals the expected revenues of the project. Therefore this CAR is closed.
CAR 8 The PDD does not present evidenced	B.3.3 B.6.10	Project participants clarify that there will be two diesel generators	DNV has assessed the estimations and calculations of project emissions due to

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
<p>calculations that 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 12.3.0, as per <i>Validation and Verification Manual</i>, version 1.2, paragraph 77.</p>	<p>B.6.11 B.6.12 B.6.16</p>	<p>considering the entire project activity. One generator is located at Mar e Terra substation and the other one at Icaraí substation. Areia Branca and Embuaca wind power plants do not present a substation since Areia Branca interconnected directly at Mar e Terra substation and Embuaca at Faíças wind power plants.</p> <p>The substations operate at 99.5% of the day, <i>i.e.</i>, only 0.5% of the day the diesel generators should be used. Taking into account an entire year, it corresponds to 1.825 days that the diesel generators should be used. Considering the 1.8 days, the substation could be fed one entire day by batteries. It remains 0.8 days which corresponds to 19.8 hours in a year.</p> <p>Considering the generator consumption of 12.5 L of diesel per hour, each generator consumes in a year 240 L.</p> <p>According to the description provided above, the emissions from the generators do not surpass 1% of the overall expected average annual emission reduction of the project activity and therefore should not be taken into consideration.</p> <p>Please, refer to the additional file sent to</p>	<p>diesel generators located at the project site /36/.</p> <p>Calculations have demonstrated that the expected emissions are less than 1% of total project emission reductions (2 tCO₂e/year).</p> <p>Moreover, DNV could verify that in order to reach project emissions at 1% of project emission reductions, the diesel consumption would have to be 100 times higher.</p> <p>Therefore this CAR is closed.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		access information concerning the generators specifications provided by the manufacturer and the spreadsheet calculation of the emissions due its operation.	
<p>CAR 9</p> <p>The costs related to the insurance, property lease, taxes, resolutions presented in the investment analysis are not evidenced, referenced and listed in the PDD.</p>	<p>B.5.24</p> <p>B.5.48</p>	<p>The costs related to the insurance, property lease, taxes were included in the PDD. Please, refer to the second version of the document.</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/, the investment analysis /4/-/7/ and additional document sent by the project participant on the premises adopted in order to assume part of the insurance and electric charges /8/, and:</p> <ul style="list-style-type: none"> • Transmission charges were calculated following regulatory decree /57/ and vary on the production of energy, totalling around BRL 6 382 000 for the first year of full operation; • Insurance fees were calculated as percentage of the total investment. The insurance is composed for three different parts: legal responsibility, construction and operation. Project participant has presented an average calculation according to each wind farm, which resulted in 0.66% of total investment for Mar e Terra, 0.61% for Areia Branca, 0.64% for Embuaca and 0.71% for Icarai,

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			<p>totalling around BRL 2 641 000 for the first year of full operation onwards. Values are based on experience of other projects and confirmed by financing institution. Calculations and descriptions were provided to DNV /8/ and are found to be correct;</p> <ul style="list-style-type: none"> • Property lease is 1.7% of the annual gross income for Mar e Terra /32/ and Areia Branca /33/ wind farms and 1.5% of the annual gross income for Embuaca /34/ and Icarai /35/ wind farms, as per contract with land owners, totalling each year BRL 187 482 for Mar e Terra, BRL 257 770 for Areia Branca, BRL 225 120 for Embuaca and BRL 143 267 for the first year of full operation; • The CCEE charge is estimated since it is yearly calculated by the Electric Energy Commercialization Chamber based on the amount and share of energy delivered to the grid by all the country's energy producers /72/. It is an estimated cost per yearly energy produced as 0.11 BRL/MWh for Mar e Terra and Areia Branca wind farms, 0.1

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			<p>BRL/MWh for Embuaca and 0.07 BRL/MWh for Icarai /8/;</p> <ul style="list-style-type: none"> The ONS fee is also estimated since it is yearly calculated by the National Operator System based on the charges of the transmission system for the associated producers /73/. It is an estimated cost per installed capacity as 0.69 BRL/kW for Mar e Terra, 0.59 BRL/kW for Areia Branca and Embuaca and 0.91 BRL/kW for Icarai /8/. <p>Therefore this CAR is closed.</p>
<p>CAR 10</p> <p>A sensitivity analysis has been carried out for the electricity tariff, energy generation and capital expenditures. In the PDD and in the financial analysis, it is not clear if the parameters chosen contribute to more than 20% to the revenues or costs as per the “<i>Guidelines on the Assessment of Investment Analysis</i>” version 5.</p>	<p>B.5.26 B.5.48</p>	<p>Project participants clarify that the wind power plants revenue are exclusive from the energy generation. Therefore the sensitivity analysis carried out considering the electricity generation and the electricity tariff corresponds to more than 20% of the revenues.</p> <p>The investment, also considered in the sensitivity analysis corresponds to the total investment concerning the wind power plants including the EPC Contract value and other costs related to the project activity.</p> <p>Please, refer to section B.5 of the second version of the PDD to accesses the requested information.</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/, the investment analysis /4/-/7/ and it is clearly stated that the parameters chosen for sensitivity analysis contribute to more than 20% to the revenues and/or costs of the project.</p> <p>Therefore this CAR is closed.</p>
<p>CAR 11</p>	<p>B.5.27</p>	<p>Project participants revised the</p>	<p>DNV has assessed the revised PDD</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
<p>The sensitivity analysis did not evaluate the resulting values of the sensitivity analysis against the EPC contracts recently signed for the wind parks.</p>	<p>B.5.28 B.5.48</p>	<p>sensitivity analysis considering the alteration in the wind power plants configuration.</p> <p>For the sensitivity analysis was applied the assured energy determined in the engineering study conducted by Garrad Hassen.</p> <p>Refer to the revised PDD and to the additional file with sensitivity analysis of each farm with the assured energy from Garrad Hassen.</p>	<p>version 2 of 10 April 2012 /1/, the investment analysis performed with the assured energy resulted in the certificates of wind measurements. To equals the IRR to the 11.65% benchmark, electricity generation must increase at least by 15.80% (Embuaca wind farm). The assured energy is determined by the PPAs /20/-/23/. However, after the wind farms configuration, the <i>Certificates of Wind Measurements and of Production of Energy</i> from Garrad Hassen /17/ /18/ states that it is expected the proposed project will supply to SIN approximately 336 822 MWh at an average plant load factor of 41%. Project participant has presented a sensitivity analysis with the information from the wind study, the IRR resulted for Mar e Terra is 4.18%, for Areia Branca is 7.46%, for Embuaca is 8.34% and for Icarai 7.06% /37/. Hence, project is still not financially attractive. Therefore this CAR is closed.</p>
<p>CAR 12</p> <p>It is not clear in the PDD if the combined emission factor will be monitored <i>ex-ante</i> and <i>ex-post</i>.</p>	<p>B.6.3</p>	<p>Project participants opted to choose the <i>ex-ante</i> vintage combined emission factor in the proposed project activity. Please, refer to section B.6.2 of the second version of the PDD, where the</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and it is clearly stated that the parameters determined <i>ex-ante</i> are the operating margin CO₂ emission factor in year y</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		$EF_{grid,CM,y}$ was included as an available parameter at validation.	(EF _{grid,OM-adj,y}) and the build margin CO ₂ emission factor in year y (EF _{grid,BM}) and the combined margin CO ₂ emission factor for grid connected power generation in year y (EF _{grid,CM}). The emission factors were calculated by the project participants and presented to DNV /14/. Therefore this CAR is closed.
<p>CAR 13</p> <p>According to the PDD section B.6.3, the steps <i>e</i> and <i>f</i> were applied. However, the calculation of the resultant set SET_{sample-CDM>10yrs}, is not demonstrated in build margin emission factor spreadsheet.</p>	<p>B.6.7 B.6.8 B.6.9</p>	<p>Project participants clarify that the SET_{sample-CDM>10yrs} include five power plants that have started to supply electricity to the grid more than 10 years ago comprising plants which started its operation from January, 1999 until December, 2010. Please, refer to the second version of the PDD at Section B.6.3 to access the information.</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the <i>ex-ante</i> build margin emission factor calculation /14/. The option 1 of the “<i>Tool to calculate the emission factor for an electricity system</i>” version 2.2.1 was chosen, i.e., the most recent information available at the time of the PDD submission to DNV for validation /64/, the year 2010.</p> <p>The energy generation including the units with CDM project activities reaches 74 902 471 MWh (AEG_{SET-sample-CDM}). Since the value did not reach the original 20% (93 183 936 MWh), the power units that started to supply electricity to the grid more than 10 years ago were re-inserted in the set of plants again until it reaches the 20% (steps <i>e</i> and <i>f</i> of the tool, set called SET_{sample-CDM>10yrs}) resulting in an</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			energy generation used for calculation as 94 545 640 MWh. DNV has checked the calculations and they are correct /14/. Therefore this CAR is closed.
CAR 14 The PDD does not detail how metering equipment point of connection to the Brazilian grid for each wind farm will be established.	B.7.1 B.7.2 B.7.3 B.7.4 B.7.5 B.7.6 B.7.7	Project participants revised the PDD and included the information related to the monitoring system considering all the wind power plants. Please, refer to sections B.7.2 of the third version of the PDD.	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and information is clearly stated. The net electricity dispatched will be measured through the metering equipment at the point of connection of electricity generation from each wind farm to the correspondent substation. In each point of connection, there will be a main and a back-up meter /78/. Therefore this CAR is closed.
CAR 15 The PDD describes in a general way the equipment to be used for monitoring purposes. Relevant technical details about the type of electricity meter and accuracy are not provided in the PDD.	B.7.1 B.7.2 B.7.3 B.7.4 B.7.5 B.7.6 B.7.7	Project participants included requested information concerning the electricity meters. Please, refer to section B.7.2 of the second version of the PDD to accesses provided information.	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and information is clearly stated. The net electricity dispatched will be measured through the metering equipment at the point of connection of electricity generation from each wind farm to the correspondent substation. In each point of connection, there will be a main and a back-up meter /78/ which technical specifications are defined by the National Operator System (ONS). The accuracy is 0.2% of maximum

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			permissible error. Therefore this CAR is closed.
CL 1 The physical implementation of the project had not started yet, as stated by the project participant during site visit. Evidence on the site conditions at the time of commencing of validation is needed.	A.2.1 A.2.2	Project participants provided pictures from the wind power plants site location and the location determined by the geographic coordinates in order to demonstrate that they did not started their implementation. Please, refer to the file with photographic images.	Project participant has provided pictures and satellite images of the areas /31/ confirming that physical implementation of the project had started only the foundations inspections and construction. Therefore this CL is closed.
CL 2 The notification letter for the proposed project was sent by the project participant to the Brazilian DNA and to the UNFCCC secretariat. No evidence was provided on the notification letters.	B.5.5 B.5.6 B.5.48	Project participants forwarded the Prior Consideration of the CDM to the UNFCCC and to the Brazilian DNA on 16 March 2010.	In accordance with the “ <i>Guidelines on the demonstration and assessment of prior consideration of the CDM</i> ” /47/, the proposed project is a newly built wind farm and the starting date of the project activity (20 August 2010) is after 2 August 2008. Thus, the notification letter for the proposed project was sent by the project participant to the Brazilian DNA and confirmed on 16 March 2010 /25/. In parallel to this the project participants sent the prior consideration of the CDM Form to UNFCCC, which was confirmed by UNFCCC on 16 March 2010 /24/. Both confirmations are within six months of the project activity starting date i.e. 20 August 2010. CDM was therefore seriously considered in the decision to proceed with the project

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			activity. Therefore this CL is closed.
<p>CL 3 Regarding the benchmark calculation, the outstanding issues need clarification:</p> <ul style="list-style-type: none"> • W_d (weight of debt) is 67.7%, which is the maximum financing granted by BNDES for wind farms for the period of August 2003 to August 2009. Evidence presented by the project participant cannot be assessed and confirmed by DNV; • The application of a 10-years treasury note does not correspond to the project period of investment (and lifetime), which is 20 years. Period of time chosen is not justified; • R_c (estimated country risk premium) is Brazilian country risk calculated as 2.50%. The PDD states that the value is for a 5-year average, however, the calculation in the spreadsheet is not according to the statement; • The selection of companies by industry for the beta calculation is not clearly stated and does not allow to be reproduced; • c is the credit risk rate calculated as 2% given by the BNDES. The use of 	<p>B.5.15 B.5.48</p>	<p>Concerning the benchmark calculation project participants clarify:</p> <ul style="list-style-type: none"> • The evidence for the W_d (weight of debt) and W_e (weight of equity) requires login and password from canalenergia.com.br. Please, find attached the evidence document concerning the requested information “<i>Evidencia Alavancagem BNDES.pdf</i>” • To estimate the inflation, it was considered the difference between an index with inflation and an index without inflation. The publicly available historical series for the index with inflation (^ TNX) contemplate 10 and 30 years. Hence 10 years is used for the calculation of inflation for more assertiveness at the project participants estimative. • The R_c was revised and now contemplates 5 years project. The applied value is 2.58%. • The instructions were revised. 	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the benchmark calculation spreadsheet /3/ and:</p> <ul style="list-style-type: none"> • W_e (weight of equity) and W_d (weight of debt) are 32.3% and 67.7%. The share of 67.7% is the average financing granted by BNDES for wind farms from year 2003 to 2009 /30/; • The R_f (risk free rate) is calculated as 3.45%, based on the 10-year US Treasury Yield on August 2010 /65/. The project lifetime is of 20 years /28/. A 10-years treasury note presents lower returns in comparison to 30 year treasury yield of 4.35%, leading to a lower benchmark when comparing the other available period of 30-years. This represents a conservative approach when calculating the benchmark in order to compare with the project IRR; • The R_c (estimated country risk premium): calculated as 2.58%, based on Brazilian Risk Premium on a 5-year average until August 2010 /68/;

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
<p>2%, according to the reference given in the PDD, is not clearly evidenced and justified.</p>		<p>The companies were selected as the following steps: Select “Power” Companies, remove the companies with no beta or D/E value. For more consistency, project participants made a selection of the companies, choosing the companies with more relation to renewable energy. By considering all power companies, beta value would be 2.91. refer to the revised WACC spreadsheet.</p> <ul style="list-style-type: none"> the Credit risk rate (c) determined by BNDES was updated considering the available value of 3.57% at BNDES website: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/meio_ambiente.html 	<ul style="list-style-type: none"> The β (Adjusted industry beta) is considered to be 2.91%, based on the covariance of the daily return of electric industries listed on S&P500. Beta when relevered used the conditions of Presumed (or Assumed) Profit regime, which tax rate is zero when releveraging beta. The power industry type companies were selected for calculation of beta /65/; The c is the credit risk rate calculated as 3.57%. The reference value used is the maximum credit risk defined by BNDES /53/. <p>With the corrections applied to the WACC calculations, the value of 8.94% from the PDD webhosted has changed to 11.65%. Values and rates are correspondent to the investment decision date and are reasonable in order to calculate a WACC for the type of the project activity.</p> <p>Therefore this CL is closed.</p>
<p>CL 4</p> <p>The PDD states that the period of investment analysis is according to the project and equipment lifetime. It is not possible to evidence equipment lifetime.</p>	<p>B.5.18 B.5.48 C.1.3</p>	<p>Project participants provided a certification concerning the equipment’s lifetime. Please, refer to the design specifications from manufacturer.</p>	<p>DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the design specifications for the Suzlon equipment /28/ and they are according to International Electrotechnical Commission (IEC) standard on turbine</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			design class II-A /76/ for a lifetime of 20 years. The period of 20 years also coincides with the PPAs period of energy contracted /20/-/23/. Therefore this CL is closed.
CL 5 It is not specified in the PDD the regulatory requirements in which the proposed project activity is consistent and complies to, according to the “ <i>Tool for the demonstration and assessment of additionality</i> ” version 6.0.0.	B.5.2 B.5.48	Sections B.7.2 (Description of the monitoring plan) and D.1 (Documentation on the analysis of the environment impacts, including transboundary impact) were revised and the regulatory requirements in which the proposed project activity complies to were included. Please, refer to the second version of the PDD.	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the regulatory requirements are clearly described in section D.1 of the PDD. Therefore this CL is closed.
CL 6 It is not clear in the PDD the period of contract and assured energy defined in the auction and followed by the PPA.	B.5.21 B.5.48	Project participants included in the PDD, the period of the electricity commercialization as defined in the PPA, <i>i.e.</i> , 20 years. Please, refer to the second version of the PDD.	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the period of 20 years of contracted energy established in the PPAs /20/-/23/ is clearly stated in the PDD. Therefore this CL is closed.
CL 7 Project participant utilize other study developed by a third party to discuss the likelihood of generating more energy than expected. However, it is not clear if the study represents a conservative approach in terms of more energy generation.	B.5.27 B.5.28 B.5.48	As requested, project participants replaced the wind certification performed by MegaJoule applied to demonstrate the likelihood of generating more energy by the wind certification performed by Garrad Hassan (GH), which is considered the world’s largest renewable energy consultancy.	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the most recent wind report from Garrad Hassen Ibérica S.L.U was made on 22 November 2011 /17/ for Mar e Terra, Areia Branca and Icarai wind farms, and on 19 September 2011 for Embuaca wind farm /18/ to confirm the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		Please, refer to the second version of the PDD to verify the revised information.	generation of the wind park and the load factor was adjusted. The initial average plant load factor was 44.25% and 90 MW of installed capacity /11/. This new configuration was used in the <i>ex-ante</i> estimation of emission reductions and it did not modify the additionality of the project, as it is demonstrated in the additionality analysis. Therefore this CL is closed.
CL 8 It is not clear in the PDD what type of incentive PROINFA is, and why the base information on wind farms is taken from 2009 since the validation started on November 2011.	B.5.42 B.5.44 B.5.47 B.5.48	The Alternative Electricity Sources Incentive Program (from the Portuguese <i>Programa de Incentivo às Fontes Alternativas de Energia Elétrica – PROINFA</i>) is an initiative which aims to increase the renewable energy resources in the Brazilian electricity market. In addition, the base information on wind power plants was revised and the most recently available information was used. Please, refer to the second version of the PDD.	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the common practise analysis demonstration provided by the project participant /29/. The common practice analysis was revised in order to incorporate the changes in the “ <i>Tool for the demonstration and assessment of additionality</i> ” version 6.0.0 /44/. The PROINFA incentive is clearly stated in the PDD and is considered as a different technology in order to calculate the N_{diff} . 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. Therefore this CL is closed.
CL 9 The criteria adopted for the 50% range applied in the installed capacity of the project	B.5.43 B.5.47 B.5.48	The 50% range adopted is specified by the “ <i>Tool for the demonstration and assessment of additionality</i> ” (version	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the common practise analysis

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
in order to narrow down the scenario assessed in the common practice analysis is not clearly evidenced.		6.0.0). The PDD was revised and the version 6.0.0 of the tool was applied. Please, refer to the second version of the PDD.	demonstration provided by the project participant /29/. The output range of +/- 50% was calculated considering the installed capacity of 23.1MW of Mar e Terra, 27.3MW of Areia Branca, 27.3MW of Embuaca and 16.8MW of Icarai as per the EB <i>“Tool for the demonstration and assessment of additionality”</i> . Therefore only wind projects between 8.4MW and 40.95 MW of installed capacity were taken into consideration. Also regarding the three plant together sum 94.5MW, projects of installed capacity between 47.25 and 141.75MW were also considered. Therefore this CL is closed.
CL 10 PDD states that one wind farm was implemented without any kind of incentive. The common practice analysis provided by project participant is not clear regarding the exclusion of this wind farm.	B.5.42 B.5.45 B.5.46 B.5.47 B.5.48	The common practice was revised according to the new version of the <i>“Tool for the demonstration and assessment of additionality”</i> , version 6.0.0. Please, refer to the second version of the PDD.	DNV has assessed the revised PDD version 2 of 10 April 2012 /1/ and the common practise analysis demonstration provided by the project participant /29/ and the exclusion criteria was modified and is according to the common practice analysis criteria inserted in the version 6.0.0 of the <i>“Tool for the demonstration and assessment of additionality”</i> . Therefore this CL is closed.

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
No forward action request was identified.		

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APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

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 start on DNV as ISO 9001, ISO 14001 and OHSAS lead auditor, certifying numerous management systems during 7 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.

Juliana Scalón

Ms. Juliana Scalón holds a Bachelor Degree in Civil Engineering having an overall experience of around 11 years. Prior to joining DNV having 5 years of experience in waste handling and disposal service industry, covering technical operation and environment aspects of landfills and gas management, and 5 years of experience in CDM consultancy services, responsible for the development of several Project Design Documents for landfill gas to energy projects, project management on CDM projects of renewables, transport, and the development of greenhouse gas inventories for chemical industry.

She is part of DNV team for validation and verification of CDM projects/JI and other 3rd party validation/verification services.

Her qualification, industrial experience and experience in CDM demonstrate her sufficient sectoral competence in waste handling and disposal.

Frederico Rosas

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

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

He presents a working experience of more than 15 years in companies of areas such as of finances, mining and cosmetics.

Robin Weldy

Mr. Weldy holds a Master's degree in Sustainable Cities from King's College London and a Bachelor's degree in Geology from Western Washington University having an overall experience of around 7 years. Prior to joining DNV he performed geotechnical consulting and construction monitoring for large residential and commercial developments.

While with DNV his responsibilities have previously included project management, wind data collection, quality checking, archiving and preparing monthly reports for clients.

Linh Huynh

Ms. Huynh holds Bachelor Degrees in Environmental Sciences and Community, Environment and Planning with an overall experience of twelve years in the environmental industry. Prior to joining DNV, she has worked as an ecological researcher to study phytoremediation and establish experimental methods in testing the biological transport and tolerance mechanisms of the plant, Vetiver under contaminants and heavy metals prominent in the Lower Duwamish River. Her experience also covers surveying, developing and executing ecological restoration plans for the University of Washington Environmental Services and Resource Management Department and the City of Seattle Department of Public Utilities. Approximately two years were also designated towards assisting environmental and urban projects related to land use notices, city ordinances, zoning codes and the City of Kirkland Shoreline Master Program.

Ms. Huynh joined DNV Renewables Inc. in March 2008 and brings nearly four years of experience in the wind industry. Her responsibilities include managing and quality checking meteorological data, generating wind resource assessment summaries, and assisting clients with data requests. She utilizes strong communication skills and works closely with the meteorological services associates, energy analysts, test engineers and data group to ensure consistent application of the industry's best practices.

Beginning in December 2011, Ms. Huynh joined the Climate Change and Environmental Services unit within DNV Sustainability and Innovation. Her new position as a Greenhouse Gas (GHG) Assessor involves assessing Cleaner Development Mechanism (CDM) validation and verification projects associated to renewable energy.

Sharmistha Shome

Sharmistha Shome, DNV Bangalore, India holds a Master's Degree in Energy Systems. Her educational qualification covers the fields of sustainable development, power plant technology, renewable energy technology, performance of thermal & electrical utilities and project financing.

She has experience in validation and verification of several CDM projects/JI and other 3rd party validation/verification services. She has completed the ISO14001 EMS Lead Auditor course. Her qualification and experience in CDM demonstrate her sufficient sectoral competence in renewable energy sector.