PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Corredor dos Senandes CDM Project
Version number of the PDD	04.1
Completion date of the PDD	17/12/2012
Project participant(s)	OEA Eólica Corredor do Senandes 2 Ltda. OEA Eólica Corredor do Senandes III Ltda. OEA Eólica Corredor do Senandes IV Ltda. OEA Eólica Vento Aragano I Ltda. Enerbio Consultoria Ltda – ME.
Host Party(ies)	Brazil
Sectoral scope and selected methodology(ies)	Sectorial Scope 1 – Energy Industries (Renewable Source) ACM0002 (version 13.0.0)
Estimated amount of annual average GHG emission reductions	110,013 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Corredor dos Senandes CDM Project (hereinafter referred as Corredor dos Senandes Project) consists on the implantation and operation of the wind power complex Corredor dos Senandes. The Project has 108 MW of total installed capacity. This complex is formed by wind power plants (WPPs) Corredor dos Senandes II, Corredor dos Senandes III, Corredor dos Senandes IV and Vento Aragano I, located in the same site. This division in four wind power plants just happened for administrative/legal purposes. The complex was divided in four companies that are property of the same group. The project will supply clean electricity to the Brazilian National Interconnected System (SIN). It takes place in Rio Grande, Rio Grande do Sul State, south region of Brazil.

The Ministry of Mines and Energy[1] projects for the next 10 years, , through the Decennial Plan for Electric Energy Expansion of the period 2010-2019, an increase of 52.22% in the energy demand of the country. According to ANEEL (National Electric Energy Agency / Agência Nacional de Energia Elétrica)[2], in spite the great development potential , wind power plants represent only 1.09% of the installed capacity of the country. The main goal of the project is to help to meet the growing demand in Brazil due to its economic and population growth expanding the electricity supply through the provision of clean and renewable energy.

Besides the contribution for the Brazilian energetic matrix diversification, Corredor dos Senandes Project promotes the development on a sustainable basis to the extent that:

- It reduces greenhouse gases (CO_2) emissions from the Brazilian electric matrix;
- It generates extra income for the landowners, while they can continue using the area for other activities, thus it increases and diversifies the lands productivity;
- Besides generating income for the landowners, it stimulates the regional economy by increasing tax revenues for the local government and job opportunities for local workers and service suppliers. The resulting economic stimulus will improve capital stock and availability in the region, which in turn will allow investment in the improvement of general infrastructure, productive capacity and consequently the satisfaction of the population's basic needs, thus promoting a virtuous cycle in the local economy;
- The described economic stimulus goes along with a general improvement of the local infrastructure such as road, electricity transmission system and stimulus for education
- It will use equipment which have a domestic content of at least 60% and therefore induce the development of national technology and improvement of domestic know-how. By promoting the establishment and growth of the necessary industry equipment and services, the project will contribute to the increasing availability of wind generation technology, which will, consequently, reduce maintenance costs and risks of the technology in the country;
- The project operation requires services from skilled operators and maintenance staff and therefore stimulates the development of a proficient tertiary sector in the region, thus creating opportunities for education, professionalization and employment;
- It is an important complement and diversification to the run-of-river hydroelectric generation capacities which are being installed. As Brazil's hydro and wind regimes are largely

[1] Source: Decennial Plan for Electric Energy Expansion 2010-2019. Page 34, table 20. Available at: http://www.epe.gov.br/PDEE/Forms/EPEEstudo.aspx. Accessed on October 28th, 2011.
[2] Available on: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp. Accessed on November 24th 2011.

complementary, their combination allows to partially compensate the lack of hydropower storage capacity with minimal installation of thermal power generation units, while still providing sufficient energy security based on a portfolio of these complementary renewable sources.

- The wind turbines of the plants present one of the greatest unitary installed capacities of wind power plants in the country (2.7 MW per turbine). Therefore, the land space required to implement the project is reduced and the environmental impact is minimized.

Corredor dos Senandes CDM project activity will reduce greenhouse gases (GHG) emissions, avoiding electricity generation through fossil fuels sources. Clean and renewable electricity supply will bring an important contribution to environmental sustainability, reducing the carbon dioxide emissions that would occur in the absence of this project.

The baseline scenario is the same scenario existing before the start of implementation of the project activity, which is: "the 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 calculations according to "Tool to calculate the emission factor for an electric system"".

The estimated amount of annual average GHG emission reductions is **110,013 tCO_2** and total GHG emission reductions for the chosen crediting period is **770,090 tCO_2**.

A.2. Location of project activity
A.2.1. Host Party(ies)

Brazil

A.2.2. Region/State/Province etc.

Region: South of Brazil
State: Rio Grande do Sul

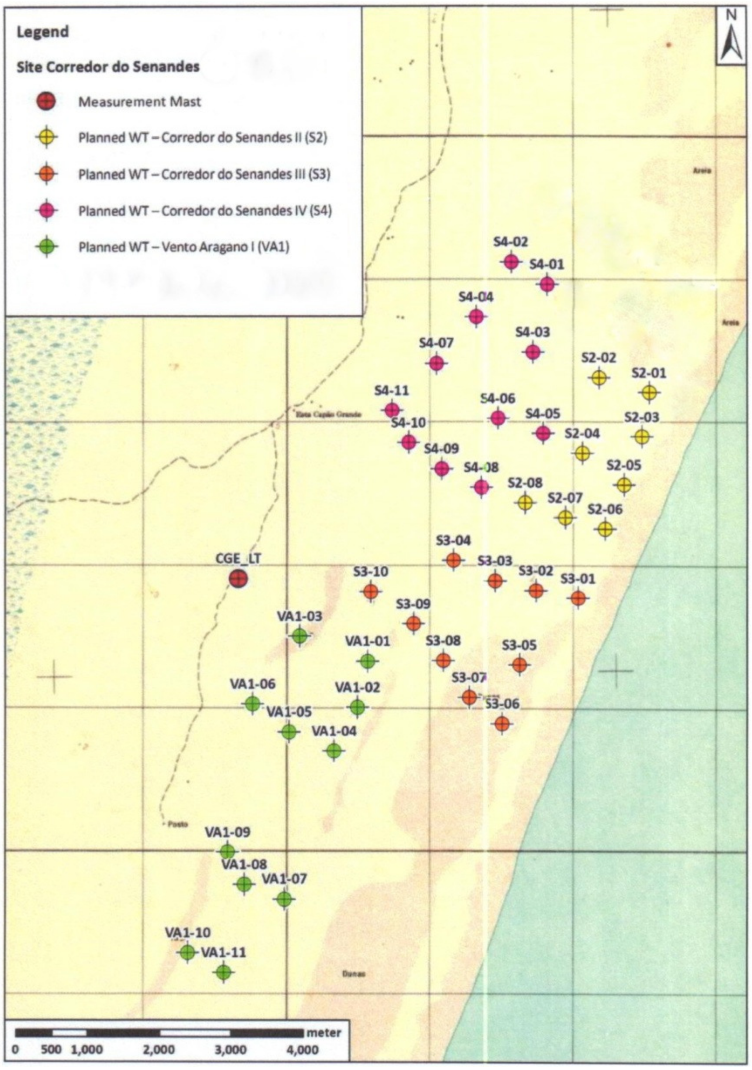
A.2.3. City/Town/Community etc.

City: Rio Grande

A.2.4. Physical/Geographical location

Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants are located in Rio Grande, about 313 Km from Porto Alegre, capital of Rio Grande do Sul state. Figure 1 presents more details about the specific location of the plants.

Figure 1: Enterprise Location



The coordinates UTM SIRGAS 2000 of wind turbine 04 of the plant Corredor dos Senandes III are: Zona 22: 372327 (Easting); 6414067 (Northing) --->DMS (Degree, Minute, Second).Latitude: 32°24'11"S Longitude: 52°21'27"W.

A.3. Technologies and/or measures

Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants have an installed capacity of 108MW. The area of the power plants has one of the best wind potentials in Rio Grande do Sul, according to information provided by Rio Grande do Sul Wind Atlas[3] and Atlas of Brazilian Wind Power Potential[4] (MME – ELETROBRAS – 2001).

There are, according to ANEEL, the following number of operational electricity generation plants in Brazil.

[3] Source: Rio Grande do Sul Wind Atlas – 2002. Available at: http://www.cresesb.cepel.br/publicacoes/download/atlas_eolico/atlas_eolico_RGS.pdf

[4] Source: Atlas of Brazilian Wind Power Potential [4] (MME – ELETROBRAS – 2001). Available at: http://www.cresesb.cepel.br/publicacoes/download/atlas_eolico/Atlas%20do%20Potencial%20Eolico%20Brasileiro.pdf

Table 01 - Operational enterprises in Brazil, according to ANEEL[5]

Type	Quantity	Installed Capacity (kW)	Installed Capacity (%)
HCG	364	208,225	0.18
WPP	**64**	**1,268,242**	**1.09**
SHP	417	3,818,207	3.28
SPP	06	1,087	0
HPP	180	78,141,904	67.19
TPP	1.488	30,861,676	26.53
TNPP	02	2,007,000	1.73
Total	**2.521**	**116,306,341**	**100**

- *HCG: Hydro Power Plant Central Generation (Installed Capacity smaller than 1 MW)*
- *SHP: Small Hydro Power Plant (Installed Capacity Greater than 1 MW and Smaller than 30 MW)*
- *HPP: Hydro Power Plant (Installed Capacity Greater than 30 MW)*
- *TPP: Thermal Power Plant*
- *WPP: Wind Power Plant*
- *SPP: Solar Power Plant*
- *TNPP: Thermonuclear Power Plant*

The table demonstrates there are only 64 wind power plants in operation in Brazil, which corresponds to only 1.09% of the installed energetic capacity of the country.

The following table presents the main technical parameters of the Corredor dos Senandes II, III, IV and Vento Aragano I WPPs.

Table 02 - Technical characteristics of Corredor dos Senandes CDM project activity

Description	Corredor dos Senandes CDM Project Activity
1. Electricity data[6]	
Installed capacity (MW)	108 MW
Plant Load Factor (P50)	47.4%
Annual Electricity Generation (P50)	448,365 MWh/year
2. Wind Turbines[7]	
Model	ECO 122 2.7 Class III-A
Supplier	Alstom
Nominal capacity (Unit)	2.7 MW
Units	40
Frequency	60 Hz
Rotor diameter	122 m
Hub height	89 m
Range of Control Speed	6,97 / 12,25 rpm
Lifetime	20 years
Energy Control System	Pitch control independently in each blade. Variable speed.

[5] Source: National Electric Energy Agency, ANEEL. Available at http://www.aneel.gov.br/area.cfm?idArea=15&idPerfil=2. Accessed on November 24th 2011.

[6] Inova Energy Report, page 02. Issued on March 13, 2012.

[7] General technical description of the ECO 122 wind turbine for Corredor dos Senandes project. page 05. Issued on February 15, 2012.

Wind Power Plants Corredor dos Senandes II, III, IV and Vento Aragano I have individual installed capacity of 21.6 MW, 27MW, 29.7 MW and 29.7MW, respectively.

The spatial organization of the wind turbines is a result of: (i) the spacing requirements between the machines, (ii) the existing infrastructure (roads, power lines, homes, permanent preservation areas, etc.), (iii) the environmental regimes and (iv) the wind conditions at the site.

On Aug/18/2011, project owners sold 20 years of the electricity to be supplied by Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants in the Auction of Reserve Energy 2011 organized by the Brazilian Ministry of Mines and Energy.

In order to take part of this this auction, the project owners had to submit wind certificate studies that were used as reference for the determination, by the Ministry of Mines and Energy, of the electricity that could be sold by them. At that time, the entrepreneurs were negotiating with potential wind turbines supplier without a definition of which company would be responsible for wind turbines supply of the project. The Ministry of Mines and Energy estimated the physical guarantee of Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants. Considering these previous studies, the Brazilian Ministry of Mines and Energy authorized the project to sell the physical guarantee of 50.5 MWh_{medium}.

The entrepreneurs participated in the auction of alternative sources and marketed the physical guarantee determined by the Ministry of Mines and Energy (50.5 MW_{medium}). Initially, the project design was formed by 70 wind turbines with 1.67 unitary nominal capacity each. The total installed capacity predicted at the time of the auction was 116.9 MW. However, after the effectiveness of the auction and the sale of electricity, the negotiation with potential suppliers continued.

In March 2012, the project owners decided the wind turbines supplier. The final project design is formed by 40 wind turbines with 2.7 unitary nominal capacity each. The total installed capacity of the project activity is 108 MW, with a total plant load factor of 47.4%[8] (P50). This plant load factor provides an annual average electricity generation higher that the electricity sold in the auction. Therefore, in the financial analysis and emission reductions calculations, this value was considered.

According to "Guidelines for reporting and validation of the capacity factor", version 01, the plant load factor of the CDM project activity should be defined ***ex-ante***, according to one of the following options:

(a) 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;

(b) The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company).

This plant load factor (47.4%) meets item "**b"** of the *Guidelines for reporting and validation of capacity factor*, because it was calculated by a third part engineering firm (Inova Serviços de Engenharia Ltda.) hired by the project owner.

The technical characteristics of Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants presented in this PDD are the real technical configuration that will be implemented at the project activity site.

[8] Inova Energy Report, page 21. Issued on March 13, 2012

Corredor dos Senandes Project has two power meters that will be located at the Quinta Substation, which is owned by CEEE (state-owned electricity company). The principal meter will record the net electricity generated by the project activity. The backup meter will also measure the net electricity supplied to the grid and it can be accessed in case the principal meter fails.

The baseline scenario, according to ACM0002, version 13.0.0, is the following: "Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin calculations described in the *Tool to calculate the emission factor for an electricity system*".

The baseline scenario is the same scenario that existed before the beginning of the project activity implementation and the CO_2 is the greenhouse gas involved in the project activity.

A.4. Parties and project participants

The Companies OEA Eólica Corredor do Senandes 2 Ltda., OEA Eólica Corredor do Senandes III Ltda, OEA Eólica Corredor do Senandes IV Ltda e OEA Eólica Vento Aragano I Ltda are Special Purpose Companies (SPCs), created to construct and to operate Corredor dos Senandes II,III, IV and Vento Aragano I Wind Power Plants.

These four SPCs are controlled by Odebrecht Energias Alternativas. Odebrecht is a Brazilian organization with presence in major infrastructure projects on the national scenario, having played a prominent role in the sectors of energy, industrial engineering, infrastructure, oil and gas, real state achievements, ethanol and sugar, chemical, petrochemical, transportation and logistics, technology and environment.

Enerbio Consultoria Ltda - ME is also project participant and advises in the CDM Project elaboration, as well as in monitoring the CERs to be generated by enterprises.

The table below represents the parties and entities involved in the Corredor dos Senandes Project.

Table 03 – Private and public parties and entities involved in the activity.

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Private Entity: OEA Eólica Corredor do Senandes 2 Ltda. Private Entity: OEA Eólica Corredor do Senandes III Ltda. Private Entity: OEA Eólica Corredor do Senandes IV Ltda. Private Entity: OEA Eólica Vento Aragano I Ltda. Private Entity: Enerbio Consultoria Ltda – ME.	No

A.5. Public funding of project activity

No public funding for the CDM's project activities was solicited from parties involved in Annex I.

SECTION B. Application of selected approved baseline and monitoring methodology
B.1. Reference of methodology

- Approved consolidated baseline and monitoring methodology ACM0002, version 13.0.0 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources.[9]"

- Tool for the Demonstration and Assessment of Additionality, version 06.0.0.

- Tool to calculate the emission factor for an electricity system, version 2.2.1.

B.2. Applicability of methodology

The consolidated methodology ACM0002, version 13.0.0, is applicable to Corredor dos Senandes CDM Project, because the plants of the project are grid-connected renewable power plant that will be implemented at a site where no renewable power plant was operated prior to the implementation of the project activity.

Moreover, the project activity does not involve capacity addition or retrofit of (an) existing plants, nor involves a replacement of (an) existing plants. The project is a wind power plant (therefore it is neither a biomass plant nor a hydro power plant with power density less than 4 W/m^2) and it does not involve switching from fossil fuels to renewable energy at the site of the project activity.

Thus, the ACM0002 methodology, version 13.0.0, is applicable to the Corredor dos Senandes CDM Project Activity because Corredor dos Senandes II, III, IV and Vento Aragano I WPPs are new wind power plants.

B.3. Project boundary

The National Interconnected System will be considered as the project boundary. The National Interconnected System (Sistema Interligado Nacional - SIN) is managed by the National Interconnected Power System Operator (from Operador Nacional do Sistema - ONS), which is responsible for all activities related to the planning and management of grid operation. The ONS traditionally divides the National Interconnected System into four interconnected Subsystems: the South; Southeast/Midwest; the North; and Northeast. These Subsystems are related to the respective Brazilian geographic regions.

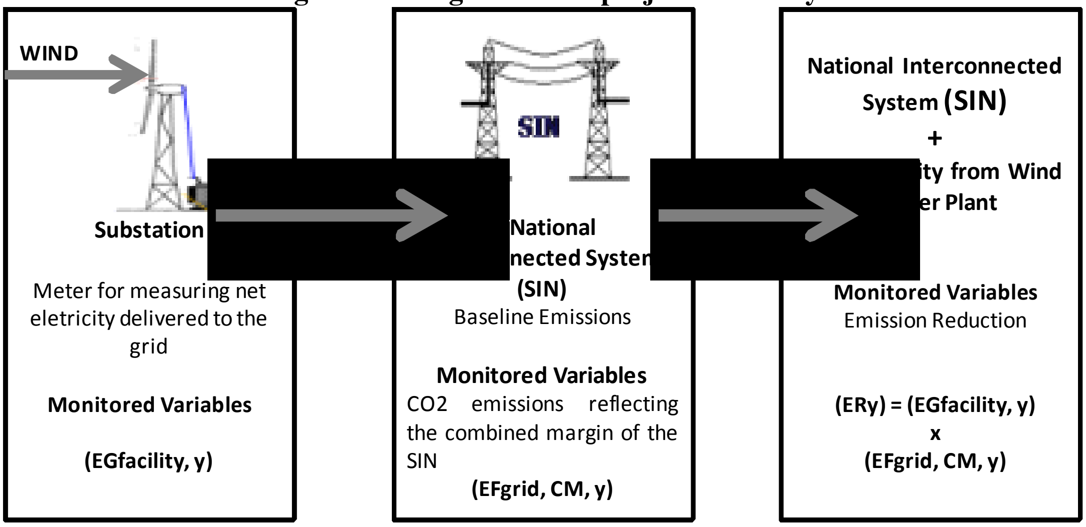
Based on the effective power generation availability and consumption behavior and demand in each region, the ONS defines the dispatch of each individual power plant, as well as the inter-regional energy exchange and mid and long term operational policies to warrant reservoir management and energy security, i.e. the dispatch of thermal power units once reservoir levels fall below a certain security level. These operational conditions of the system are permanently monitored and data is available to the electricity industry agents.

[9] For more information about the methodologies, consult: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

According to ACM0002, version 13.0.0, the spatial extension of the project boundary includes the project power plant and all power plants physically connected to the electricity system that the CDM project is connected to. Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants are connected to National Interconnected System (SIN).

The diagram of the project boundary is presented in the figure below:

Figure 02: Diagram of the project boundary



The greenhouse gases and emission sources included in or excluded from the project boundary are presented in the table below:

Table 04 - Greenhouse gases involved in the Project Activity

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main Emission Source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project scenario	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non condensable gases contained in geothermal steam.	CO_2	No	Not applicable to this project activity.
		CH_4	No	Not applicable to this project activity.
		N_2O	No	Not applicable to this project activity.
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants.	CO_2	No	Not applicable to this project activity.
		CH_4	No	Not applicable to this project activity.
		N_2O	No	Not applicable to this project activity.
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Not applicable to this project activity.
		CH_4	No	Not applicable to this project activity.
		N_2O	No	Not applicable to this project activity.

*According to ACM0002, version 13.0.0, the wind power plants are project activities that do not generate GHG emissions.

B.4. Establishment and description of baseline scenario

In the absence of the project activity, the clean electricity generated by Corredor dos Senandes Project, dispatched to the Brazilian National Interconnected System (SIN) would have been generated through power plants connected to the grid and by addition of new sources generating to the SIN.

According to the methodology ACM0002, version 13.0.0, if the project activity is the installation of a new renewable grid-connected power generation plant, the baseline scenario is the following: “Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin calculations described in the "Tool to calculate the emission factor for an electricity system””.

The baseline scenario presented by the ACM0002, version 13.0.0, is perfectly applicable to Corredor dos Senandes CDM Project. The combined margin emission factor of National Interconnected System will be calculated, according to the methodological tool “*Tool to calculate the emission factor for an electricity system*”, approved by the CDM Executive Board.

The combined margin emission factor for electricity generation verified in the Brazilian National Interconnected System (SIN) is calculated from the generation record of the plants centrally dispatched by ONS. The Brazilian Designated National Authority (DNA) calculates and publishes the emission factors of the energy generation for National Interconnected System based on data supplied by ONS and according the “*tool to calculate the emission factor for an electricity system”*. In case these data are no longer published, they will be calculated by the project participants.

The combined margin emission factor for the National Interconnected System will be, therefore, used to calculate the emission reductions of the project.

B.5. Demonstration of additionality

This section is elaborated based on the *“Tool for the demonstration and assessment of additionality”* version 06.0.0[10] which defines a step-wise procedure to assess and demonstrate the additionality of the project.

To illustrate the context of the project development and to evidence that the CDM was seriously considered in the decision to proceed with the development and implementation of the project activity, the following table provides an overview of the project’s development timeline.

[10] Information available on http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

Table 05 – Timeline of the Corredor dos Senandes CDM Project

Date	Type of evidence	Evidence/Reference
August 18, 2011	Project Milestone/ Electricity sale in the Auction	Result of the Auction 03/2011, promoted by Ministry of Mines and Energy. On this date, entrepreneurs marketed the electricity to be produced by the Wind Power Plants Corredor dos Senandes II, III, IV and Vento Aragano I. This date is the starting date of the Project activity and it represents the time of the investment decision.
September 28, 2011	CDM consideration	Contract signed between Odebrecht Energias Alternativas and Enerbio Consultoria Ltda – ME for CDM Project development.
October 05, 2011.	Project Milestone	Homologation of enterprises that marketed energy in Auction 03/2011
November 03, 2011	CDM consideration	Prior Communication letter sent to UNFCCC to inform the intention to become Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants a CDM project activity.
November 04, 2011	Project Milestone	Communication to the Executive Secretary of the Interministerial Commission of Global Climate Change – Brazilian DNA about the intention to make Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants a CDM project activity.
March 27,2012	Project Milestone	Contract signed with wind turbines supplier. At this time, the final technical design of the plants was defined.
May 15, 2014	Project Milestone	Expected commissioning period starting date according to implementation schedule of the Project.
July 01, 2014	Project Milestone	Expected commercial operation starting date of Corredor dos Senandes project activity, according to the Project implementation schedule.

The following requirements are necessary to demonstrate and to assess the Project additionality:

Starting date of the project activity definition

According to the *Glossary of CDM Terms*, the starting date of the project activity is "*the earliest date at which either the implementation or construction or real action of a project activity begins*" which is commonly the date when the project participant commits to significant expenses related to the effective implementation or construction of the project activity.

The electricity sale in the auction by the project owners brings a number of obligations related to the project implementation. The entrepreneurs commit themselves to incur expenditures related to the project. According clause 8 of the Auction Notice to participate in the auction entrepreneurs have to collect 1% of the CAPEX as guarantee for the auction, and after selling electricity through the Auction, Project Owners have to collect further 5% (clause 13). Besides that a penalty up to 10% of the CAPEX will be incurred, if the conditions established by the Auction Notice are not fulfilled (clause 17). Therefore, the date when the electricity of the project was marketed (18/08/2011) sets the starting date of the project activity.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Define realistic and credible alternatives to the project activity(s) through the following Sub-steps:

Sub-step 1a. Define alternatives to the project activity:

The realistic alternatives to the project activity are:

- The project activity undertaken without being registered as a CDM project;

- The continuation of the current situation with the electricity being supplied by the current composition of the national interconnected system and by the addition of new generation sources.

Sub-step 1b. Consistency with mandatory laws and regulations:

The institutional model of the Brazilian electricity sector has been through two great changes since the 1990's. The first one involved the privatization of the operators and the launch of Law 9.427, in Dec/1996, which implemented ANEEL (Agência Nacional de Energia Elétrica/ National Electric Energy Agency) and decided that the exploitation of energetic potential would be granted by competition or auction, in which the highest amount offered (Use of Public) would determine the winner.

The second change happened in 2004 with the introduction of the New Model of the Electricity Sector. This new model implemented two environments for the celebration of purchasing and selling electricity: the Regulated Environment (Ambiente de Contratação Regulada - ACR) and the Free Contracting Environment (Ambiente de Contratação Livre - ACL). The Regulated Environment (also known as electricity captive market) is based on a system of electricity auctions for the expansion of the electricity supply of the country. The government organizes annual auctions of long-term contracts for future delivery, taking into consideration the demand of the electricity distribution companies.

Take part in the Regulated Environment, as purchasers, only the distribution companies. The sellers are the generating plants which sell electricity according to the auction criteria established by regulatory agents. The Ministry of Mines and Energy (MME) sets the date of the auctions that are organized by ANEEL and by CCEE (Commercializing Energy Chamber / Câmara Comercializadora de Energia). The starting date for the delivery is predicted to happen within one, three or five years after the date the auction took place (which are called respectively A-1, A-3 and A-5). At these auctions, long-term purchasing and selling contracts are established, called *Power Purchase Agreements* (PPAs), which guarantee the electricity purchase for over 20 or 30 years.

On the other hand, at the Free Contracting Environment (Ambiente de Contratação Livre (ACL)) or free electricity market, purchasers and sellers negotiate among themselves the clauses of the contracts, such as price, deadline and delivery conditions. At the free market, the consumers are able to choose their electricity distributor, freely negotiating a set of variables such as contract deadline, price, price variation within time and services related to trading.

The insertion of wind power electricity in the national energetic matrix has happened through supporting programs. The first incentive was the creation, in 2002, of the Supporting Program to the Alternative Energy Sources (PROINFA/ Programa de Incentivo às Fontes Alternativas de Energia). This is a program of the federal government that aims at motivating from the financial point of view the development of projects which use renewable energy technologies, giving them guarantee of financing and electricity purchasing.

Through PROINFA, the state-owned company Eletrobrás ensures the entrepreneur a minimal financial resource of 70% from the hired energy during the loan period and whole protection for the short term market exposure risk. The contracts have a 20 years length.

Another incentive created for wind power electricity (and also applicable to other renewable sources such as the small hydro power plants and biomass) was the establishment of discounts in the fee of distribution/transmission system usage (TUSD/TUST – G) for plants that supplies in the transmission and distribution system up to 30 MW.

The Brazilian regulation also allows the use of specific auctions for the development of certain energy sources. In December 2009 the first exclusive auction for purchasing wind power electricity was organized and in August 2010 a new one for alternative sources took place for wind power plants, small hydro plants and biomass Plants. In August, 2011, two new auctions were developed for wind, biomass, hydroelectricity and natural gas sources. The energy that will be produced by Corredor dos Senandes CDM Project Activity was commercialized in August 2011, in the auction of reserve energy. The main objective of the auctions of reserve energy is to increase the security of electricity supply to the National Interconnected System.

It is important to clarify that the Brazilian Institutional New Model of the Electric Sector allows the private and public agents to decide the amount of energy to be hired and the investments to be realized with the promotion of auctions of power plants and transmission systems.

It is further noticeable that the Brazilian Institutional New Model of the Electric Sector provides autonomy to the economic agents about the investments to be realized in the Brazilian electric sector, not existing, therefore, restrictions nor impositions to the project activity and to its alternatives.

Thus, both the project activity and the alternative scenarios fulfil all the Brazilian norms and regulations, as well the project activity and the alternative scenarios are plausible according to the tendencies in the Brazilian electrical sector.

Step 2. Investment analysis

According to the "*Tool for the demonstration and assessment of additionality*", project participants shall determine whether the proposed project activity is not:

(a) The most economically attractive or financially;
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs);

To conduct the investment analysis, the following steps must be used:

Sub-step 2a. Determine appropriate analysis method

The project generates other economic and financial benefits, in addition to revenues from the CDM. Thus, the benchmark analysis will be used for the investment analysis of the project activity.

Sub-step 2b – Option III. Apply benchmark analysis

Financial indicator identification

It will be used the equity internal rate of return (IRR) as financial indicator of the project, because it is one of the indicators most commonly used and most appropriate in the investment analysis of infrastructure projects. The equity IRR calculation follows what it is indicated by the Guidelines on the Assessment of Investment Analysis.

Benchmark identification

The Guidelines on the Assessment of Investment Analysis, Version 05, provided and published by UNFCCC, supplies default values for expected return on equity for different project types and host countries. For electricity generation projects developed in Brazil, the expected return on equity, in real terms, is 11.75%. This expected return will be used as the benchmark of the project activity.

Sub-step 2c. Calculation and comparison of financial indicators

The cash flow of Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants is fully presented to the DOE (Designated Operational Entity) that will perform validation and to any entity linked to the CDM that request it for the purpose of proving the project additionality.

As described previously, on August 18, 2011, the project owners sold the electricity in the auction organized by the Government. At this time, no contract had been signed with wind turbines suppliers and the final technical characteristics of the plants had either not been defined. On March 27, 2012, entrepreneurs signed a contract with the wind turbine supplier. With that, the final characteristics of the project were defined and the final budget was firmed.

Due to this situation, the financial analysis of both moments will be presented: (1) the financial analysis at the time of the auction and (2) the financial analysis with the final technical design of the plants.

All input values and data used in the investment analysis were valid and applicable at the time presented for each analysis.

Before presenting the main arguments taken into consideration in the equity cash flow, it is important to describe some comments on the assumptions adopted in the investment analysis that considered orientations of the CDM Executive Board (EB).

General Features of the Investment Analysis and calculation of the Financial Indicator

- **Assessment Period:** The cash flow considers an economic plant lifetime of 20 years which is in line with the operational lifetime of the wind turbines. This is in agreement with the provisions of the *Guidelines on the Assessment of Investment Analysis*, Version 05, item 03, which defines that the IRR calculation has to preferably reflect the expected operational lifetime of the project activity.

- **The value of the assets of the project activity at the end of the assessment period:** As the assessment period covers the whole 20 year expected operational lifetime of the project, no residual value should be considered.

- **Depreciation:** the period of assets depreciation is also 20 years according to guidance from the Manual of Power Sector Asset Control (Manual de Controle Patrimonial do Setor Elétrico, page 209), published by ANEEL[11]. Because it is an accounting item which does not involve disbursements, depreciation has been deducted for tax calculations and added to net profit for purposes of equity IRR calculation.

- **Consolidated Financial Analysis:** All negotiations regarding CAPEX and OPEX considered the wind power plants together as a complex. All contracts with suppliers established up to now also consider the complex. Following this strategy, project owners could reach better (lower) prices. For CDM additionality analysis, this is a conservative approach once it assumes lower costs.

- **Equity IRR Calculation:** The purpose of Equity IRR is to determine the final return to the initial equity investment. This way, the Equity IRR calculation considers only the amount of

[11] Source: ANEEL (2009). Manual de Controle Patrimonial do Setor Elétrico. Annex of Normative Resolution nº 367/2009, 02 June 2009. Available at: http://www.aneel.gov.br/cedoc/aren2009367_2_primeira_Ver.pdf. Last access on 10 November 2011.

equity investment as a cash outflow, once the debt service cost (interest and principal) is already considered as an expense which shall not be counted twice.

- **Nature of the Cash Flow:** The equity cash flow has been performed in real terms, i.e. without considering the impact of inflation.

Sectoral Policies E-

In its twenty second meeting and referring to its decisions from EB 16, the CDM Executive Board reaffirmed that national and/or sectoral policies and circumstances are to be taken into account on the establishment of a baseline scenario, without creating perverse incentives that may impact host Parties' contributions to the ultimate objective of the Convention. Accordingly, the Board agreed to define E-policy as:

> *"National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs)"*

Further the Board agreed that such policies should be addressed as follows:

> E- Policies *"that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) need not be taken into account in developing a baseline scenario (i.e. the baseline scenario could refer to a hypothetical situation without the national and/or sectoral policies or regulations being in place).*

Accordingly, the Additionality Tool includes a footnote to the calculation of financial indicators in investment analysis which states that the inclusion of subsidies in investment analysis is subject to the guidance on such policies.

The importance of this concept has been reinforced by the CMP 5 in Copenhagen affirmed that *"it is the prerogative of the host country to decide on design and implementation of policies to promote low greenhouse gas emitting technologies;* and *the Executive Board shall ensure that its rules and guidelines do not create perverse incentives for emission reduction efforts.*

According to the summary provided in sub-step 1.b, the current Brazilian energy regulations effectively offer a set of regulatory and economic incentives that aim at promoting renewable electricity sources to guarantee country's electricity expansion based on renewable and low carbon emitting technologies.

The existence of these incentives requires their adequate treatment in the additionality assessment and specifically in the investment analysis. For this purpose the following paragraphs identify and discuss the relevant regulations and define their treatment according to the rules and principles defined by EB 22.

Policy E- #01- Reduction of the Distribution/Transmission Fee (TUSD/TUST-G) for Complementary Renewable Energy sources.

Through Resolution N°77, of 18 August 2004[12], ANEEL established a discount of 50% of the applicable distribution/transmission fee (TUSD/TUST-G) for complementary renewable energy projects, such as wind power generation projects, with installed capacity injected in the grid lower or equal to 30,000 kW.

[12] ANEEL (2004). Normative Resolution n° 77, 18 August 2004. Available at: http://www.aneel.gov.br/cedoc/ren2004077.pdf. Last accessed: September 2011.

This sectoral policy was established on 18 Aug 2004, and therefore after 11 November 2001. Thus it represents a "*comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies*" and classifies as E- policy. Accordingly the incentive shall not be considered for the baseline scenario and the investment analysis, taking into consideration the "*hypothetical situation without the national and/or sectoral policies or regulations being in place*".

Policy E- # 02 – Financing Conditions offered by the National Bank for Economic and Social Development (BNDES – Banco Nacional de Desenvolvimento Econômico e Social)

The BNDES has historically[13] played a fundamental role in the implementation of the governmental policies for economic development by providing a long-term financing for private sector investments in general infrastructure and specifically in the national electricity sector.

In the years after the privatization of the electric sector and especially after the launch of the new regulatory model of the sector, BNDES' key priority was financing the expansion of the energy supply and consequently assuring security of supply and unconstrained economic growth. During this period the bank did not have a general policy to offer different conditions for any kind of electricity source, apart from its limited activity in the PROINFA program where differential financing conditions were applied. Now as from 2007 and in light of the increasing participation of fossil fuelled thermal power plants, the BNDES started to revise its policy by differentiating financing conditions with a clear objective to promote renewable and low GHG intensive energies in the detriment of coal and oil fired thermal power plants.

The bank's central role shall be assessed in the context of the Brazilian Climate Change Policy. The fact that BNDES is an instrument of Brazilian policy and, specifically, of the Climate Change Mitigation Policy[14] (Política Nacional de Combate às Mudanças Climáticas) is referenced by the Climate Change National Plan (Plano Nacional de Mudanças Climáticas) and by the Climate Change National Policy Law (Política Nacional Sobre Mudança do Clima – PNMC)[15]. The specific activity in the electricity sector is further referenced by the Energy Research Company (EPE – Empresa de Pesquisa Energética), institution related to the Brazilian Ministry of Mines and Energy, which has issued the policy paper "Abatement of GHG emissions due to the production and use of energy in Brazil up to 2020". The publication clearly describes the importance of the BNDES to implement the Brazilian mitigation policies and to pursue a clean expansion trajectory in the energy sector.

In order to analyze the evolution of the operational policies which define the financing conditions offered by the BNDES, it is necessary to understand the individual items which compose the financial conditions offered by the bank:

Total financing cost = financing cost + basic spread + credit spread risk

Where:

- Financing cost - corresponds to the actual cost of BNDES financing, in other words, it is the interest actually paid by the bank to obtain funds necessary to its operations. This cost is

[13] Lage de Sousa (BNDES) and Ottaviano (Bolonha University): *The effects of BNDES loans on the productivity of Brazilian manufacturing firms*, July 2009, available at http://www.merit.unu.edu/MEIDE/papers/2009/1236186324_FS.pdf & http://virtualbib.fgv.br/ocs/index.php/sbe/EBE09/paper/view/1023/354, last accessed on March 6, 2012.

[14] This plan cited directly in the page 115 a summary financing lines, funds and BNDES financing instruments related the climate changes combat. The PNMC is available at: http://www.dialogue4s.de/_media/Brazil_National_Climate_Change_Plan.pdf. Accessed on 02 August 2011.

[15] Article 6º of Law 12,187 that Climate Change National Policies establishing.

primarily defined by the remuneration of the long-term interest rate (TJLP) released by the Brazilian Ministry of Finance.

- BNDES Basic Spread – represents the standard return required by BNDES to finance a specific investment. It is the main political tool for financing since it allows the bank to fix remuneration according to its priorities and strategies.

- Credit Risk – represents the risk spread required to remunerate the bank for incurring the credit risk of a certain project. As such, it reflects the perception of the creditor's (investors) insolvency risk on the basis of the evaluation of the project's cash flow and the capability to provide additional guarantees. Consequently, this is a project specific variable defined on the basis of the technical terms and not subject to any specific policy.

As can be referenced for all variables presented above, in 2006 and before, the BNDES applied identical conditions and criteria for all energy sources and there was no preference for coal, oil or gas fired thermal sources, neither for renewable sources. This means that Financing Cost, Basic Spread and the criteria for the definition of the Credit Risk Spread as well as period for amortization and maximum participation were always equal for all type of energy sources, regardless of their GHG intensity. An overview of the conditions applicable in 2006 is provided by Table 06.

In 2007, BNDES then subsequently started to improve financing conditions for the renewable energy sector, first for large hydropower and them, in 2008, for all renewable energy sources and GHG efficient gas cogeneration projects. As a result, the bank increased the rate used for coal and oil thermal to 1.8% and reduced the basic remuneration to other sources with low GHG intensity, such as wind power plants and small and medium-sized hydroelectric plants, to 0.9%.

In addition, the operational policy of BNDES defined a financial cost of funding of 100% TJLP for GHG efficient energy and renewable sources, while coal and oil fuelled power plants are financed on the basis of a mix of 50% TJLP and 50% TJ-462[16]. According to data provided by the BNDES website, the TJ-462 is equal to TJLP + 1%[17], resulting in a slightly higher financial cost.

On the other hand, there is no difference in credit risk rates between the different types of technologies. These rates vary depending on the specific project and are not directly related to the incentive policy of the bank.

The following table represents the evolution of the financing conditions provided by the BNDES.

Table 06 - Evolution of BNDES Financing Condition (2006-2010)

Analysis Component	Evolution of BNDES policies and comparative advantages to Electricity Sources less GHG emissions intensive	
	2006	2010
BNDES Participation of the Financing		
Financing Cost		
BNDES financing cost for GHG intensive energy sources	80% TJLP and 20% IPCA (NTN-B)	50% TJLP and 50% TJ-462
BNDES financing cost for GHG efficient energy sources	80% TJLP and 20% IPCA (NTN-B)	100% TJLP
Comparative advantages for GHG	0	100% TJLP

[16] Source: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energia_eletrica_geracao.html. Accessed on 28 June 2011.
[17] Source: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Custos_Financeiros/Composicao/. Accessed on 28 June 2011.

efficient energy sources		
BNDES Remuneration		
BNDES remuneration for GHG intensive energy sources	1.5%	1.8%
BNDES remuneration for GHG efficient energy sources	1.5%	0.9%
Comparative advantages for GHG efficient energy sources	0%	0.9%
Credit Risk		
Credit risk for GHG intensive energy sources	Calculated according credit risk, of 0.8% to 1.8%	Calculated according credit risk, of 0.46% to 3.57%
Credit risk for GHG efficient energy sources		
Comparative advantages for GHG efficient energy sources	0	0

Source: Based on Siffert Filho (2006, 2007) and BNDES

The result of the best conditions offered by BNDES since 2007 was the increased participation of renewable energy projects and, for the first time, the participation of Wind Energy outside of the PROINFA, as initiated by the successful Reserve Auction in December 2009.

Due to the structural capital intensity of renewable energy sources the financing policy defined by the BNDES and the resulting comparative advantage gained by clean and renewable generation sources, together with the revenues from the Clean Development Mechanism have an important role in the expansion trajectory of the Brazilian energy matrix. The results obtained show that the Brazilian mitigation strategies as defined in reference documents such as PNE 2030, the National Climate Change Plan and the "Abatement of GHG Emissions due to the production and use of energy in Brazil up to 2020". Further they are fully in line with the national communication that was provided to the UNFCCC as part of the Copenhagen accord and the applicable national legislation which defines the National Policy on Climate Change, as they all defined that the CDM shall continue to be a complementary tool for the implementation of the mitigation policies and for the achievement of the voluntary GHG reduction targets (Brazilian NAMAs).

Thus, in the case of the financing conditions provided by BNDES, the comparative advantage offered for less GHG intensive energies is the lower cost of debt in comparison with the cost for financing more GHG intensive energies, which is measured by the difference between the respective rates. Consequently, the comparative advantage presented by the policy can be eliminated from the financial analysis through the use of the financing conditions offered by BNDES to more GHG intensive technologies.

Following the requirements of the Additionality Tool and the guidelines of the CDM Executive Board for E- policy, project developers excluded the subsidies offered to less GHG intensive technologies by the BNDES by assuming financing conditions offered to GHG intensive technologies. With this adjustment, it is possible to ignore the effect of comparative advantage that is provided by the Brazilian Government for projects that contribute to the ultimate goals of UNFCCC.

The following table compares the different financing conditions as offered by the BNDES.

Table 07 - Main Differences between conditions to intensive and efficient GHG energies sources

Conditions	Conditions for GHG efficient energy sources	Conditions for GHG intensive energy sources	Conditions applied to the CDM Project investment analysis
Financing Cost	100% TJLP	50% TJLP + 50% TJ-462	50% TJLP + 50% TJ-462
BNDES Remuneration	0.9% per year	1.8% per year	1.8% per year

Assumptions used in the Cash Flow

After due discussion of the considerations and assumptions, according to CDM Executive Board guidance, the assumptions used in the project cash flow are presented below:

Table 08 - Financial Inputs used in Investment Analysis at time of the auction (August 18, 2011)

Revenues			
Item	**Description**	**Unit**	**Values**
Installed Capacity	Initially, the project design was formed by 70 wind turbines with 1.67 unitary nominal capacity each. The total installed capacity predicted at the time of the auction was 116.9 MW.	MW	116.9
Electricity generated for sale	It was considered the amount of electricity sold by entrepreneurs in the “Auction of Alternatives Sources” 03/2011 promoted by ANEEL (Agência Nacional de Energia Elétrica) from August 18, 2011. At this time, the final technical configuration was not known by the project owners and the electricity sold was the amount allowed by Brazilian Regulators.	MWh/year	442,380
Electricity Price	It was considered the electricity price of the project in the “Auction of Alternative Sources” 03/2011 promoted by ANEEL occurred on August 18th 2011.	R$/MWh	99.5
Investment and Operational Costs			
Item	**Description**	**Unit**	**Values**
Investment (CAPEX)	Budgeted according to supplier proposals, suppliers information, internal assumptions, and contracts established with suppliers	R$	370,496,161
Administrative and plant operation costs	Budgeted according to internal assumptions.	R$/year	487,824

Maintenance Costs	Budgeted according to the following internal assumptions which were later confirmed by proposal issued by potential supplier: • 3rd to 5th year – R$ 48,000/WTG • 6th to 10th year – R$ 59,129/WTG • From 11th year– average of the first 10 years + 12.5%	R$/year	1st to 2th year - 0 3rd to 5th year 3,360,000 6th to 10th year 4,139,030 From 11th year 4,130,563
Expenditures with transmission maintenance	Budgeted according to internal estimative. (R$ 10,530/ MWinstalled)	R$/year	1,230,957
Insurance	It was considered the cost of 0.25% on assets value of the enterprise. This budget followed previous experiences of the project owner.	R$/year	926,240
SPC Acquisition	Budgeted according to the contract established with MML Energia Elétrica	R$/year	3rd to 5th year - 1,482,531 6th year – 2,965,062
TUSD	Budgeted according to ANEEL resolution 1,074, Annex II-B and Article 5º, item II issued on October 19, 2010. This resolution defines TUSD value for Palmares WPP, enterprise located near to the project activity. It was adopted this assumption, because at the time of the investment decision, ANEEL had not issued resolution for WPPs of the Project activity.	R$/year	4,110,204
ANEEL Supervision Taxes	Budgeted according to Decree 2,410, November 28, 1997, and ANEEL Dispatch 4,080, December 27, 2010.	R$/year	225,459
Land Lease	Budgeted according to land lease agreements (1.5% of the project gross revenue).	R$/year	660,252
Contingencies	It was budgeted expenses with contingencies. Among these expenses are included CCEE taxes, ONS taxes and other expenses.	R$/year	200,000
Financing Conditions			
Item	**Description**	**Unit**	**Values**
Nominal Interest Rates	Budgeted in accordance with the conditions provided by BNDES to more intensive GHG technologies as described in the presentation of E-policy. A conservative credit risk spread of 1.5% was assumed.. These values were available in the BNDES webpage[18].	%/year	9.8
Amortization Period	Budgeted according to BNDES financing policies for the energy sector.	Years	16

[18] Source: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energias_alternativas.html

Leverage of the project	Since the project does not have a defined capital structure yet, it was adopted the 50% leverage standard, as proposed by UNFCCC in the item 17 of *Guidelines on the Assessment of Investment Analysis*, Version 05.	%	50
Inflation rate	To transform nominal interest rate in real interest rate, it was considered the inflation index meta (IPCA) published by Brazil Central Bank[19].	%	4.5
Taxes			
Item	**Description**	**Unit**	**Values**
PIS/COFINS	Budgeted as applicable Brazilian law of presumed profit.	%	3.65% on Gross revenue
Income Tax	Budgeted as applicable Brazilian law of presumed profit.	%	25% on 8% Gross revenue
Social contribution	Budgeted as applicable Brazilian law of presumed profit.	%	9% on 12% Gross revenue

On March 2012, contracts with suppliers were signed. Table below presents the input values of the financial analysis performed when the technical design of the project was defined.

Table 9 - Financial inputs used in investment analysis when the final technical design of the plants is defined (March 27, 2012)

Revenues			
Item	**Description**	**Unit**	**Values**
Installed Capacity	The final project design is formed by 40 wind turbines with 2.7 unitary nominal capacity each. The total installed capacity of the project activity is 108 MW	MW	108
Electricity generated for sale	The final technical design provides a higher expected annual net electricity generation. Despite the project owners have already firmed Power Purchase Agreements for twenty years, considering the amount sold in the auction, conservatively this scenario considers that all medium expected electricity will be sold at the same price of the auction .	MWh/year	448,365
Electricity Price	It was considered the electricity price of the project in the “Auction of Alternative Sources” 03/2011 promoted by ANEEL occurred on August 18th 2011.	R$/MWh	99.5
Investment and Operational Costs			
Item	**Description**	**Unit**	**Values**
Investment (CAPEX)	Budgeted according to internal assumptions, suppliers information and contracts established with suppliers	R$	384,271,827
Administrative and plant operation costs	Budgeted according to internal assumptions.	R$/year	487,824

[19] Source: http://www.bcb.gov.br/Pec/metas/TabelaMetaseResultados.pdf

Maintenance Costs	Budgeted according to supplier proposal.	R$/year	1st to 2th year - 0 3rd year – 1,200,000 4rd year – 1,600,000 5rd year – 2,000,000 6th to 7th year 2,400,000 8th to 10th year 6,800,000 From 11th year 3,150,000
Expenditures with transmission maintenance	Budgeted according to internal estimative. (R$ 10,530/ MWinstalled)	R$/year	1,137,240
Insurance	It was considered the cost of 0.25% on assets value of the enterprise. This budget followed previous experiences of the project owner.	R$/year	960,679
SPC Acquisition	Budgeted according to the first amendment to the contract established with MML Energia Elétrica	R$/year	3rd to 5th year - 1,334,232 6th year – 2,668,464
TUSD	Budgeted according to ANEEL resolution 1,074, Annex II-B, Article 5°, item II issued on October 19, 2010. This resolution defines TUSD value for Palmares WPP, enterprise located near to the project activity. It was adopted this assumption, because at the time of the investment decision, ANEEL had not issued resolution for WPPs of the Project activity.	R$/year	3,797,280
ANEEL Supervision Taxes	Budgeted according to Decree 2,410, November 28 1997, and ANEEL Dispatch 4,080, December 27 2010.	R$/year	208,294
Land Lease	Budgeted according to land lease agreements (1.5% of the project gross revenue).	R$/year	669,184
Contingencies	It was budgeted expenses with contingencies. Among these expenses are included CCEE taxes, ONS taxes and other expenses.	R$/year	200,000
Financing Conditions			
Item	**Description**	**Unit**	**Values**
Nominal Interest Rates	Budgeted in accordance with the conditions provided by BNDES to more intensive GHG technologies as described in the presentation of E-policy. A conservative credit risk spread of 1.5% was assumed.. These values were available in the BNDES webpage[20].	%/year	9.8
Amortization Period	Budgeted according to BNDES financing policies for the energy sector.	Years	16

[20]Source:
http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Produtos/FINEM/energias_alternativas.html

Leverage of the project	Since the project does not have a defined capital structure yet, it was adopted the 50% leverage standard, as proposed by UNFCCC in the item 17 of *Guidelines on the Assessment of Investment Analysis*, Version 05.	%	50
Inflation rate	To transform nominal interest rate in real interest rate, it was considered the inflation index meta (IPCA) published by Brazil Central Bank[21].	%	4.5
Taxes			
Item	**Description**	**Unit**	**Values**
PIS/COFINS	Budgeted as applicable Brazilian law of presumed profit.	%	3.65% on Gross revenue
Income Tax	Budgeted as applicable Brazilian law of presumed profit.	%	25% on 8% Gross revenue
Social contribution	Budgeted as applicable Brazilian law of presumed profit.	%	9% on 12% Gross revenue

Investment analysis results

The table below shows a summary with a comparison between the project financial indicator at the time of the auction, after the definition of the final project design and the benchmark:

Table 10 – Project Indicators X Benchmark

Equity IRR – At the time of the auction	Equity IRR – after project design definition	Benchmark
4.09%	4.32%	11.75%

The investment analysis was conducted according to option III of the *"Tool for the demonstration and assessment of additionality"* and the result shows that project's financial indicator is less favourable than the benchmark. Consequently it can be concluded, that the Project Activity without CDM revenues cannot be considered as financially attractive.

Sub-step 2d. Sensitivity analysis

The main variables that can affect the project's finances are (i) revenues of the project; (ii) CAPEX and (iii) OPEX costs.

The sensitivity analysis considers only those scenarios that contribute to increase economic and financial attractiveness of the project aiming to confirm how solid the analysis of sub-steps 2b and 2c are. Table below presents how changes in the main parameters affect equity IRR. Table also presents the necessary variation for equity IRR to achieve the benchmark .

[21] Source: http://www.bcb.gov.br/Pec/metas/TabelaMetaseResultados.pdf

Table 11 - Sensitivity Analysis

Revenues (electricity price or PLF) variation			
At the time of the auction		**After project design definition**	
Projected Situation	**Equity IRR**	**Projected Situation**	**Equity IRR**
0%	4.09%	0%	4.32%
+10%	6.44%	+10%	6.61%
+35.3%	11.75%	+35.1%	11.75%
CAPEX variation			
At the time of the auction		**After project design definition**	
Projected Situation	**Equity IRR**	**Projected Situation**	**Equity IRR**
0%	4.09%	0%	4.32%
-10%	6.06%	-10%	6.31%
-31.8%	11.75%	-30.9%	11.75%
OPEX variation			
At the time of the auction		**After project design definition**	
Projected Situation	**Equity IRR**	**Projected Situation**	**Equity IRR**
0%	4.09%	0%	4.32%
-10%	4.79%	-10%	4.94%
-100%	10.38%	-100%	9.91%
% of Debt in the Project Finance			
At the time of the auction		**After project design definition**	
% Debt	**Equity IRR**	**% Debt**	**Equity IRR**
50%	4.09%	50%	4.32%
80%	3.48%	80%	3.86%

Project Revenues:

The wind power project's revenue depends solely on two factors: the electricity generated and the electricity sales price, which will be discussed individually, but in effect are related, once uncertainties and variations in the electricity generation have an impact on the commercial conditions, electricity pricing and thus revenues and fines.

Electricity of the project's plants was already sold in the Auction of Reserve Energy from August 2011. The price was established through power purchase agreements after the auctions. The power purchase agreement is valid for the entire assessment period (20 years). Therefore, no variation is expected.

With the technical design definition, the wind certification showed that the medium electricity can be slightly higher (1.35%). Scenarios "after project design definition" considers as base-case this electricity generation with the fixed price firmed in the auction for the whole assessment period, being conservative.

With regards to the volume of energy generated, the project is subject to significant variations and uncertainties as well as risk for wind resource related structural underproduction. In this respect it is important to note that, according to information provided by Eletrobrás[22], in 2009 and 2010, the performance of the wind power generation projects of the PROINFA, which represents the only available wind generation experience in Brazil, is significantly below the volume of energy expected and sold by these investments. This is also confirmed by the generation monitoring reports published by Brazil's National Interconnected System Operator[23] (Operador Nacional do Sistema Elétrico - ONS), for the

[22] Annual Plan of the PROINFA – PAP 2011.

[23] ONS Report "Acompanhamento mensal da geração de energia das usinas eolioelétricas com programação e despacho centralizado pelo ONS" and Excel spreadsheet "Geração Eólicas", Outubro/2011. Document Boletim_Eolica_out-2011, available in: http://www.ons.org.br/resultados_operacao/boletim_mensal_geracao_eolica/index.aspx

period from 2007 until October 2011. The data shows that, among 13 wind power plants centrally dispatched, 11 plants have a verified capacity factor below the original load factor projection.

This underperformance can be related to two possible reasons: (i) the effective average wind resource availability is lower than projected on the base of limited historic measurements and/or (ii) too optimistic estimates and forecasts developed by the engineering consultants (wind certification companies).

Based on these data we can conclude that increased revenues due to overproduction of electricity is not an likely or expected scenario, while there is significant risk for decreased revenues due to underperformance.

Looking at the data mentioned above, it is noticed that it is unlikely that the scenario of revenue generation over 10% predicted in the sensitivity analysis will happen. Even so, to prove how solid the scenarios included in the sensitivity analysis are, it is also presented in this section the necessary increase in the price and in the amount of the commercialized energy for IRR achieves benchmark.

The sensitivity analysis shows that, in the scenario at the time of the auction, it is necessary an increase of 35.3% in the revenues for this scenario happen. In other words, either the price or the amount of electricity sold would have to have on average 35.3% above the value projected for the entire lifetime of the project for the equity IRR to achieve the benchmark. Thus, it is noticeable that it is very unlikely that variations in the revenue make the equity IRR higher than the benchmark.

<u>CAPEX</u>

CAPEX represents the most important disbursement of the enterprise. At the time of the auction, CAPEX was estimated based on contact with potential suppliers and experience of the company. After the technical design definition, 77% of CAPEX is already contracted and the current budget shows a superior value comparing to the amount estimated at the time of the auction.

In general, the works of infrastructure projects end up costing above the initially budgeted due to the occurrence of unpredictable events. Thus, CAPEX reduction scenario is very unlikely. The sensitivity analysis shows that, for the benchmark meets the Equity IRR, it is necessary a decrease of 31.8% in the CAPEX, a very unlikely scenario.

<u>Operational Costs (OPEX)</u>

The operational costs include Transmission Costs, sectoral taxes, costs for Operation &Maintenance, regular overhaul and land lease expenses. The result of the sensitivity analysis shows that a 10% reduction in all these costs when compared to the base case assumption would not materially affect the Project’s return. Even if the operational costs are zero, Equity IRR does not reach the benchmark.

Thus, it is unlikely that these items may undergo changes that contribute with an increase in the economic and financial attractiveness that is not covered by the variation range between 0 and 10%. Therefore the variation range between 0 and 10% cover more than the probable scenarios.

The sensitivity analysis shows that the Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants are not financially attractive, because the equity internal rate of return (IRR) of the project is lower than the benchmark in all scenarios analyzed.

The tool for demonstration and assessment of additionality indicates that:

"If after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive, then proceed to Step 4 (Common practice analysis)."

This way, as the sensitivity analysis showed that the proposed activity is not attractive from a financial point of view, it must proceed to Step 4 (Common Practice Analysis).

Step 3. Barrier analysis

This is step will not be considered. **Continue to step 04.**

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

According to the sub-step 4.a. of the "Tool for the demonstration and assessment of additionality"**,** version 06.0.0, projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scales, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

Considering the concept above and the "Tool for the demonstration and assessment of additionality", a stepwise approach for demonstrating if the project activity represents a commonly adopted practice in the country is presented below:

Step 01: Installed capacity (Scale)

The "Tool for the demonstration and assessment of additionality"**,** version 06.0.0, paragraph 47, step 01, defines that Project Participants must calculate applicable output range as +/-50% of the design or capacity of the proposed project activity. Therefore, the applicable output range for this project activity is 10.8 MW to 44.6 MW. Based on this recommendation 387 energy generation plants have been identified, among small hydropower plants, wind power plants, thermal plants, biomass and large hydropower plants[24].

Step 02: Identification of Project Activities developed as CDM Projects

The Step 02 of the Tool requires project participants to identify in the applicable geographical area and within the applicable output range calculated in Step 1 the plants that started commercial operation before the start date of the project activity, excluding the project activities registered as CDM projects or undergoing validation. Among the 387 operational plants identified in Step 1, 94 plants are being developed as CDM project activities (registered or under validation) and 14 have started commercial operation after the start date of the project activity.

Following the tool, these plants were excluded from the common practice analysis. Thus, N_{all} = 279. The table below presents the amount of plants within the applicable capacity range and excluded as per Step 2

[24] A full list of plants is presented in the Excel spreadsheet "Common Practice Analysis" provided to the auditors.

Table 12 - Operational plants within the applicable output range according to ANEEL[25]

Energy source/ Fuel	Quantity within the range	CDM Plants	Plants with commercial operation after start date of project	N_{all}
HCG	0	0	0	0
WPP	**19**	**6**	**5**	**8**
SHP	132	62	4	66
SPP	0	0	0	0
HPP	47	1	0	46
TPP	189	25	5	159
TNPP	0	0	0	0
Total	**387**	**94**	**14**	**279**

Step 03: Identification of Different Technologies

The "Tool for the demonstration and assessment of additionality"**,** version 06.0.0, paragraph 47 step 03, establishes that project participants must identify those plants that apply different technologies from the technology applied to the project activity. The Tool acknowledges that different technologies are technologies that deliver the same output and differ by at least one of the following:

(a) **Energy Source/fuel**;
(b) Feed Stock;
(c) Size of installation (…);
(iv) Investment climate in the time of the investment decision, inter alia:
- i) access to technology;
- ii) subsidies or other financial flows;
- iii) **promotional policies**;
- iv) legal Regulation.

v) Other features, inter alia:
- Unit cost of output (unit costs are considered different if they differ by at least 20 %).

As demonstrated in the table 12, among the 279 plants identified after applying Steps 1 and 2 of the Tool, 271 have different energy sources from the project activity. Therefore, there are just eight operational wind power plants with installed capacities between 10.8 MW and 44.6 MW that are not CDM and have started commercial operation before the start date of the project activity.

According to the Step 3 of the Tool, different technologies are also identified as the ones implemented in a different investment climate in the date of investment decision when compared to the project activity.
All eight wind power plants within the capacity range of Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plant relied on subsides and incentives from PROINFA[26]. PROINFA is a federal government program that defines attractive feed-in-tariffs for investments in non-conventional renewable energies such as biomass, small hydropower and wind energy[27]. Besides the attractive feed-in-tariffs, the PROINFA offers a special financing package from BNDES and a 20 year Power Purchase Agreements (PPAs) with Eletrobrás, a state-owned company. The PPAs signed with Eletrobras guarantees to the investors, at least, 70% of the electricity contracted during the overall duration of the PPA.

[25] Source: ANEEL. Available at http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp. Access in 24/11/2011.
[26] Document "Empreendimentos Contratados-PROINFA-Contratos". Available on: http://www.eletrobras.com/elb/data/Pages/LUMISABB61D26PTBRIE.htm#Dados. Accessed on 24 November 24th 2011.
[27] Source: MME Ordinance 45, 30 march 2004, Page 01 (article 2º - Annex II).
Source: PROINFA Programa de Incentivo às Fontes Alternativas de Energia Elétrica (Eletrosul), slide 05.
Source: http://www.mme.gov.br/programas/proinfa/. Accessed on 29 November 2011.

Hence the program offered important mechanisms to protect the investors against oscillation of wind and market conditions[28] which are substantially different from those identified for the project activity, as described in section B.5.

Now following the Climate Change National Plan (Plano Nacional de Mudanças Climáticas – page 33) [29], the PROINFA program, which was established in 2001/2002 as the first investment incentive for complementary renewable energies was substituted by dedicated tenders for the purchase of alternative energy sources, as well as by the special conditions offered in the liberalized markets. PROINFA program is limited to projects that were contracted before April 29, 2004 as defined by the National Decree 4,541[30]. As the starting date of the project activity is much later, on 18 August 2011, the project activity was developed according to the new regulatory framework and not under the PROINFA program. For further details please refer to the description of the new regulatory framework offered on sub-step 1b.

Therefore, there are just 08 power plants which generate electricity from the same energy source within the applicable output range of the project activity in the country, but they relied on very attractive incentives from PROINFA. These eight projects have only been materialized with special contractual arrangements, improved financing conditions and privileged access to the wind technology, which was still an incipient technology option at that moment. For this reason, WPPs that relied on the aforementioned incentives as part of the PROINFA cannot be compared to Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plant.

The table below shows the operational wind power plants in Brazil within the installed capacity range of the project activity.

Table 13 – Operational WPPs within the applicable output range

Operational Wind Power Plants	Installed Capacity (MW)	Promotional policies - PROINFA
Parque Eólico de Beberibe	25.6	X
Praia do Morgado	28.8	X
Volta do Rio	42	X
Eólica Praias de Parajuru	28.8	X
Pedra do Sal	18	X
Parque Eólico Enacel	31.5	X
Taíba Albatroz	16.5	X
Rio do Ouro	30	X

According the "Tool for the demonstration and assessment of additionality", version 06.0.0, the proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled: (a) the factor F is greater than 0.2 and (b) N_{all}-N_{diff} is greater than 3. The table below shows that no condition is fulfilled.

Table 14 - Parameters and values applied in the common practice analysis

Parameters	Values/Results
N_{all}	279
N_{dif}	279
$F = 1-(N_{diff}/N_{all})$	0
N_{all}-Nd_{iff}	0

[28] Source: http://www.mme.gov.br/programas/proinfa/galerias/arquivos/programa/resolproinfa.pdf. Accessed on 29 November 2011.
[29] Available from http://www.forumclima.org.br/index.php/biblioteca/documentos-fbmc
[30] Article 08 of the National Decree 4,541, from December 22, 2012. Available at: http://www.planalto.gov.br/ccivil_03/decreto/2002/d4541.htm .

So, the proposed project activity is not common practice within the identified sector in Brazil.

Sub-step 4b. Discuss similar options that are occurring:

The information provided in sub-step 4a, evidences that, in a country with continental dimensions like Brazil, WPPs projects like Corredor dos Senandes II, III, IV and Vento Aragano I are not considered a common practice.

According to the Methodology ACM0002 version 13.0.0, if Sub-steps 4a and 4b are satisfied, (i) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional.

SATISFIED/APPROVED – Project is ADDITIONAL

B.6. Emission reductions
B.6.1. Explanation of methodological choices

According to ACM0002 methodology (version 13.0.0), the emission reductions (ER_y) are calculated as follows:

$$ER_y = BE_y - PE_y \qquad \textbf{Equation 01}$$

Where:
ER_y = Emission reductions in year *y* (tCO_2e/yr);
BE_y = Baseline emissions in year *y* (tCO_2/yr);
PE_y = Project emissions in year *y* (tCO_2e/yr).

<u>BEy Calculation (Baseline emissions in year y (tCO_2/yr))</u>

The baseline methodology ACM0002, version 13.0.0, establishes that baseline emissions include only CO_2 emissions from electricity generation by fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emission is calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \qquad \textbf{Equation 02}$$

Where:
BE_y = Baseline emissions in year *y* (tCO_2/yr);
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr);
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the *"Tool to calculate the emission factor for an electricity system"*. (tCO_2/MWh).

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield renewable energy power plants), then:

$$EG_{PJ,y} = EG_{facility,y} \qquad \textbf{Equation 03}$$

Where:
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr);
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr).

The Plant Load Factor of Corredor dos Senandes II, III, IV and Vento Aragano I was considered to determine the ***ex-ante*** calculation of $EG_{facility,y}$.

To calculate $EF_{grid, CM, y}$ it will be used the data provided by Brazilian DNA, which provides data of the operating margin emission and the build margin emission factors by dispatch analysis using the *tool to calculate the emission factor for an electricity system.* In case the Brazilian DNA discontinues the publication of these data during the monitoring period, they will be calculated by the project participants.

The steps recommended to *Tool to calculate the emission factor for an electricity system,* version 02.2.1, are discussed below.

Step 1: Identify the relevant electricity systems

The National Interconnected System is defined as relevant for project activities of electricity generation connected to the grid as recommended by the DNA[31] through Resolution N° 08 of May/2008.

Brazilian DNA defined that the National Interconnected System shall be considered as a unique system and that this setting will be valid for calculation purposes of CO_2 emission factors used to estimate the greenhouse gas emission reductions of electricity generation CDM projects connected to the grid. This definition will be applied to Corredor dos Senandes Project.

Step 2: Choose whether to include off-grid power plants in the project electricity systems (optional)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

The option I was chosen for the project activity, once the operation margin and build margin emission factor calculated by the Brazilian DNA or alternatively calculated by the project developer are based on data of plants connected to the grid.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple Operation Margin; or
(b) Simple adjusted Operation Margin; or
(c) Dispatch data analysis Operation Margin; or
(d) Average Operation Margin.

[31] Source: http://www.mct.gov.br/upd_blob/0024/24719.pdf. Accessed on July 19th 2011.

The method chosen for the calculation of operation margin emission factor of the Corredor dos Senandes Project is the dispatch data analysis operation margin method.

Step 4: Calculate the operating margin emission factor according to the selected method

The method chosen for the calculation of the operation margin emission factor of the Corredor dos Senandes CDM Project was the dispatch data analysis.

The calculation of the Operation Margin emission factor follows the method by dispatch data analysis ($EF_{grid,OM-DD,y}$) and it is calculated and defined by the Brazilian DNA in accordance with the dispatch data supplied by ONS - National System Operator.

According to the "*tool to calculate the emission factor for an electricity system*", for the dispatch data analysis OM it must be used the year in which the project activity displaces grid electricity and the emission factor must be updated annually during monitoring. This way, data are *ex-post*.

Dispatch data OM for 2011 will be used for CERs ***ex-ante*** estimation. All data used to calculate ***ex-ante*** estimation of the operating margin emission factor are available in the annex 3 of this PDD.

Step 5: Calculate the build margin emission factor

In terms of the vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ***ex-post***, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated ***ex-ante***, as described in option 1 above. For the third crediting period, the built margin emission factor calculated for the second crediting period should be used.

The option that was chosen by project participants was Option 2.

The build margin emission factor is calculated by Brazilian DNA[32] and in case the Brazilian AND discontinues the publication of these data during the monitoring period, the required data will be calculated by the project participants.

Build Margin emission factor for 2011 will be used for CERs ***ex-ante*** estimation, because data vintage are the latest data available.

[32] For more information: http://www.mct.gov.br/index.php/content/view/74689.html

Step 6: Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average Combined Margin; or
(b) Simplified Combined Margin.

Corredor dos Senandes project activity used option (a) to calculate the combined margin emission factor.

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

$$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$$ **Equation 04**

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/ MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/ MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

The "*Tool to calculate the emission factor for an electricity system*" recommends that the following default values should be used for W_{OM} and $W_{BM:}$

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

This way, for Corredor dos Senandes Project it was adopted the following weights: W_{OM} = 0.75 and W_{BM} = 0.25.

PEy Calculation (project emissions in year y (tCO_2e/yr))

According to the methodology used, for most renewable power generation project activities, PE_y = 0. However some project activities may involve project emissions that can be significant. These emissions shall be accounted as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$ **Equation 05**

Where:
PE_y = Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr).

For Corredor dos Senandes CDM project $PE_{FF,y,}$ $PE_{GP,y}$ and $PE_{GP,y}$ are zero.

Leakage

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

Project Emissions Reductions

To summarize, the project emission reductions are calculated based on equation 1 of this PDD, where PE_y is zero (0). Therefore, project emission reductions, can be calculated according to equation 2 of this PDD, where $ER_y = BE_y = EG_{PJ,y} * EF_{grid,CM,y.}$

As the plants of Corredor dos Senandes Project are new power plants, the project emission reductions are calculated as the simple product between the quantity of net electricity supplied by the project activity to the grid and the combined margin emission factor, where the operating margin emission factor will be calculated according to the dispatch data analysis operation margin and the build margin emission factor will be calculated through the option 2 which considers that this emission factor must be updated ***ex-post***.

Besides it will be considered the weights of 75% for the Operating Margin and 25% for Build Margin, which composes the Combined Margin Emission Factor.

B.6.2. Data and parameters fixed ex ante

According the consolidated baseline methodology ACM0002, version 13.0.0, there are no data and parameters available at validation.

B.6.3. Ex ante calculation of emission reductions

As previously stated, project activity emissions reduction will be calculated based on equation 1, where both PE_y and the Leakage are considered to be 0 (zero). Therefore, the emissions reduction will be calculated according equation 2, as follows:

$$ER_y = BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$ **Equation 2**

Where:
ER_y = Emission Reductions in year *y* (tCO_2e/yr);
BE_y = Baseline emissions in year *y* (tCO_2/yr);
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr);
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO_2/MWh).

It follows below a description of the calculation of net electricity to be produced and fed into the grid as a result of the Corredor dos Senandes II, III, IV and Vento Aragano I WPPs project activity implementation.

$EG_{PJ,y}$ Calculation

The table below shows the net electricity that will be produced by Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants.

Table 15 - $EG_{PJ,y}$ Calculation

Year	Corredor dos Senandes II	Corredor dos Senandes III	Corredor dos Senandes IV	Vento Aragano I	Total
	$EG_{PJ,y}$ (MWh/year)	$EG_{PJ,y}$ (MWh/year)	$EG_{PJ,y}$ (MWh/year)	$EG_{PJ,y}$ (MWh/year)	$EG_{PJ,y}$ (MWh/year)
2014	45,340	56,693	60,310	61,838	224,181
2015	90,681	113,387	120,621	123,676	448,365
2016	90,681	113,387	120,621	123,676	448,365
2017	90,681	113,387	120,621	123,676	448,365
2018	90,681	113,387	120,621	123,676	448,365
2019	90,681	113,387	120,621	123,676	448,365
2020	90,681	113,387	120,621	123,676	448,365
2021	45,340	56,693	60,310	61,838	224,181
Total	**634,766**	**793,708**	**844,346**	**865,732**	**3,138,552**

Assumptions:

- $EG_{PJ,y}$ projection was performed assuming the operation of the Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants during 8,760 hours per year;
- Electricity generation is projected according to Plant Load Factor of the wind power plants;
- The projection assumed July 01th 2014 as the starting date of the crediting period (which is the projected operation starting date of the Wind Power Plants, according with enterprise implementation schedule).

Emission Factor Calculation

The emission factor that will be used for ***ex-ante*** emission reductions estimation of Corredor dos Senandes Project is **0.2454**. Table below shows a summary of the main parameters involved on the emission factor calculation:

Table 16 – EFgrid,CM 2011 Calculation

Emission Factor	Annual
$EF_{grid,OM}$	0.2920
$EF_{grid,BM}$	**0.1056**
WOM	0.75
WBM	0.25
$EF_{grid,CM}$	**0.2454**

Observations:

- The most recent information available by Brazilian Designated National Authority for complete years refers to the year 2011;
- The daily data for operation margin emission factor is available in the site of Ministry of Innovation, Technology and Science. (www.mct.gov.br).

The ***ex-ante*** Emission Reductions estimation of the Project is presented in the table below:

Table 17 - *Ex-ante* Emission Reductions Estimation for the Corredor dos Senandes Project (tCO_2e)

Years	Total Emission Reductions (tCO_2e)
2014	55,006
2015	110,013
2016	110,013
2017	110,013
2018	110,013
2019	110,013
2020	110,013
2021	55,006
Total	**770,090**

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2014	55,006	0	0	55,006
2015	110,013	0	0	110,013
2016	110,013	0	0	110,013
2017	110,013	0	0	110,013
2018	110,013	0	0	110,013
2019	110,013	0	0	110,013
2020	110,013	0	0	110,013
2021	55,006	0	0	55,006
Total	**770,090**	0	0	**770,090**
Total number of crediting years	7 years and 0 (zero) months			
Annual average over the crediting period	110,013	0	0	110,013

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

The consolidated baseline methodology for grid-connected electricity generation from renewable sources, ACM0002, version 13.0.0, must be applied together with the monitoring methodology present in the same methodology.

Based on the applied methodology and on what was described on the item B.6.1, there are no leakages, nor project emissions to be monitored. The energy measurement is essential to verify and monitor the GHGs emission reduction. It is necessary, therefore, to use metering equipment to register and check the electricity generated by the units. The Monitoring Plan (item B.7.3) allows the calculation of GHG emissions generated by the project activity in a direct manner, by applying the baseline emission factor.

All data collected as part of the monitoring will be electronically archived and be kept at least for 2 years after the end of the last crediting period. All measurements will be conducted with calibrated measurement equipment according to Brazilian industry standards.

All the tables below are in accordance with the table template provided in the “Guidelines for completing the project design document form” (version 01.0).

The following data and parameters will be monitored:

Data / Parameter	$EG_{facility,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Electricity meter(s)
Value(s) applied	The value used to calculate the expected emission reductions is 448,365 MWh/yr. This value is obtained by the multiplication of the electricity supplied by the plants by 8,760 (number of hours in the year).
Measurement methods and procedures	The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid. The quantity of electricity supplied by the project plant/unit to the grid and the electricity delivered from the grid to the project will be measured by two bidirectional power meters (one principal and one back up) located in the Quinta Substation. Class 0.2S power meters will be used in accordance with the established Grid Procedures defined by the Electric System National Operator (ONS)[33] and Commercialization Procedures by the CCEE. Meters calibration will be performed according to the ONS Grid Procedures (Sub-module 12.3). The information of these meters can be confronted with information of generation provided by CCEE – Chamber of Electrical Energy Commercialization. Continuous measurement and, at least monthly recording will be the monitoring frequency. The quantity of net electricity supplied to the grid by the plant is registered every 5 minutes.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	The level of uncertainty of these data is low. They will be used to calculate emission reductions. Electricity generation data will be monitored by project owner and counter-checked with spreadsheets provided by CCEE. This counter-checking process will be carried out monthly by project owner’s team or outsources agent determined during operation phase. Moreover, information can also be checked with receipt of sales. Principal meter of the plant have backup meter. In case of failure, the backup meter will register the electricity. More details related to measurement procedures are described in the item B.7.3.
Purpose of data	Project Baseline
Additional comment	-

[33] Available at: http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.2_Rev_1.0.pdf
Available at: http://www.ons.org.br/download/procedimentos/modulos/Modulo_12/Submodulo%2012.3_Rev_1.1.pdf

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data	*Ex-post* emission factor will be calculated by Enerbio Consultoria through ONS data supplied by Brazilian DNA. The variables $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ necessary for $EF_{grid,CM,y}$ calculation will be supplied by Brazilian DNA. The annual $EF_{grid,CM,y}$ will be calculated through an simple average of the monthly values supplied by Brazilian DNA in its website.
Value(s) applied	The value of Combined Margin CO_2 Emission Factor ($EF_{grid,CM,y}$) which was used for *ex-ante* estimation of emission reduction of the Project is 0.2454**,** according data of National Interconnected System published by Brazilian DNA. The monitoring frequency of this data is as per the "Tool to calculate the emission factor for an electricity system".
Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system".
Monitoring frequency	As per the "Tool to calculate the emission factor for an electricity system".
QA/QC procedures	As per the "Tool to calculate the emission factor for an electricity system". The uncertainty level for these data is low.
Purpose of data	Project Baseline
Additional comment	-

B.7.2. Sampling plan

Not applicable

B.7.3. Other elements of monitoring plan

The Monitoring Plan is elaborated according to the Monitoring Methodology presented in the Consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 13.0.0.

The responsibilities for information monitoring are listed below.

Responsibilities

- Corredor dos Senandes II, III, IV and Vento Aragano I WPPs Team: responsible for activities related to the operation of the wind power plants and for collecting the information directly in the meters.
- Outsourced Agent: part of the assignment of measurement and operation can be outsourced by hiring an Agent of Measurement. In this case, of Corredor dos Senandes II, III, IV and Vento Aragano I WPPs team will be responsible for monitoring the work done by the outsourced company.
- Enerbio Consultoria: responsible for calculating the greenhouse gases emission reductions.

The project will have a principal meter and a backup meter (both bidirectional), located in the substation, to measure net electricity and the electricity delivered from the grid to the project.

Process Description

I – Procedure for Collection of Generation Data

Measurements of the electricity generated and provided to the grid will be electronically monitored through the use of on-site metering equipment. The Measurement Area will continuously monitor the electricity supplied to the grid ($EG_{facility}$) by following up and automatically storing data from the (main and backup) metering devices. Data stored on the meters is also collected by the System of Energy Data Collection (*Sistema de Coleta de Dados de Energia – SCDE*) of CCEE, remotely and automatically through direct access to the meters of the project participant. These collected data are processed in SCDE for electricity accounting by CCEE and are available to all energy market participants.

All meters related to the project are model ION 8600C

II – Data Storage

The information of generation is electronically stored by the Operation and Maintenance Board. In order to assure that relevant generation is appropriatelly and secured stored, the Information Technology Area will conduct an insurance *backup* for all company`s data through a Data Server *backup.* Following these procedures, Project participants will assure that all relevant data is kept at least 2 years after the end of the crediting period or the last issuance of CERs, whichever occurs later.

III – Confronting of the internal generation data with the third part reports:

Monthly, information will be confronted with external entities (CCEE – Electric Energy Commercialization Chamber or ONS - Electric National System Operator). Besides, information of generation can be checked with records for sold energy, if it is necessary to do so.

IV – Procedure for Controlling of Generation Data

The generation data collected and recorded by the project owners can be monthly cross-checked with the energy readings performed by the CCEE. Reports/Invoices of CCEE provides information of “gross electricity”, losses until the delivery point and net electricity supplied to the grid. Besides, as an additional QA/QC procedure, generation data can be cross-checked with records for energy sold.

CCEE reads the electricity generated by the plant remotely via telemetering. If any problem with data transmission occurs, electricity generation data can be sent when the system is re-established. If the system does not work, a technical professional will be sent to the site and data can be obtained directly from the meters.

V – Meters Accuracy and Calibration Procedures:

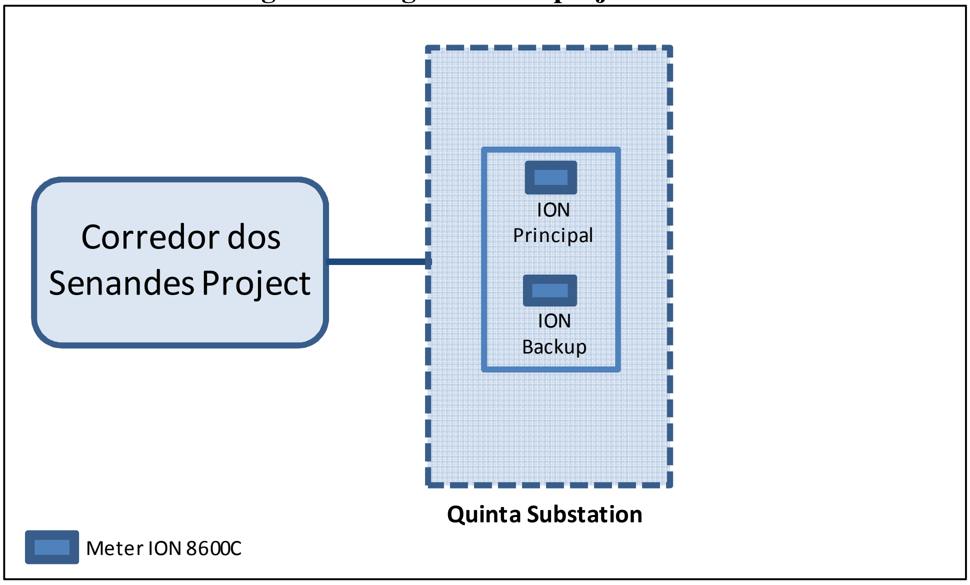
Regarding the class of accuracy of energy meters, they will meet all relevant metrological requirements prescribed in Metrological Technical Regulation (*Regulamento Técnico Metrológico – RMT*) for Class 0.2 of energy meters, approved by INMETRO.

Calibration of energy meters is regulated by the National Interconnected Power System Operator (ONS) and shall be conducted by a qualified organization in compliance with national standards and industrial regulations to ensure accuracy. ONS Grid Procedures (Sub-module 12.3) establishes calibration frequency and other maintenance procedures. By the time of completion of this document, the frequency of calibration is a maximum of two years, but in the case of any changes occurred in the ONS Grid Procedures, the project owners shall follow the rules from the relevant sector organizations (e.g. ONS, ANEEL, CCEE).

Meters location:

Corredor dos Senandes Project will have a principal meter and a backup meter, located in the Quinta Substation, to measure net electricity and the electricity delivered from the grid to the project,, owned by CEEE (state-owned electricity company). All meters related to the project are model ION 8600C (class 0.2 accuracy level).

Figure 3: Diagram of the project meters



Emission Factors:

Emission reductions calculation for the the project will be carried out by Enerbio Consultoria. The emission factors are calculated each year, as explained in item B.6.1. To calculate the emission factors, it will be used data supplied by the Ministry of Science, Technology and Innovation, MCTI, (www.mct.gov.br), an institution that chairs Brazilian DNA. In case the Brazilian DNA discontinues the publication of these data during the monitoring period, they will be calculated by the project participants.

Project Emission Reductions Calculation:

Enerbio Consultoria will be responsible for emission reductions calculation in the monitoring period of the project activity. The emission reductions calculation will follow the equations described in this PDD.

Archivement Period:

All data collected as part of monitoring will be electronically archived and be kept at least for 2 years after the end of the last crediting period.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity

18/08/2011 is the date on which entrepreneurs marketed the electricity to be produced by the plants in the auction of Reserve Energy 2011, regulated by the ANEEL.

To define the starting date of the project activity, it should be considered the date on which the project participant has committed to expenditures related to the implementation or construction of the project activity. The electricity sale from the projects in the auction causes to the project owners a series of obligations related to the project implementation.

The item B.5 of this PDD presented additional information about the starting date definition and a table with timeline that shows all actions taken to assure the CDM status to Corredor dos Senandes II, III, IV and Vento Aragano I Wind Power Plants Project.

C.1.2. Expected operational lifetime of project activity

20 (twenty) years and 0 (zero) months.

C.2. Crediting period of project activity
C.2.1. Type of crediting period

This is the first crediting period and the project activity will use renewable crediting period.

C.2.2. Start date of crediting period

01/07/2014[34] or the project's registration date (whichever is later).

C.2.3. Length of crediting period

7 years and 0 (zero) months.

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts

The growing global concern with the sustainable use of natural resources is leading to a need for more stringent practices for environmental management of enterprises. This is being reflected in legislation and polices of countries around the world. In Brazil the situation is not different. Licensing is one of the instruments of environmental management established by the Federal Law, 6938/81, also known as the Law of the National Environmental Policy. Environmental licensing is the procedure where the public administration, through the competent environmental agency, analyses the proposal for the enterprise and legitimates it, considering applicable legal and statutory provisions and their interdependence with the environment, issuing the license.

The environmental licensing in the state of Rio Grande do Sul is held by the State Foundation of Environmental Protection Henrique Luiz Roessler (FEPAM) linked to the State Secretariat of Environment of Rio Grande do Sul (SEMA). Thus, FEPAM is legally responsible for the process of

[34] Predicted date for commercial operation starting date of Corredor dos Senandes II, III, IV and Vento Aragno I WPPs, according to project schedule.

environmental licensing of the projects in the state. This procedure started with the Simplified Environmental Report (RAS – Relatório Ambiental Simplificado) performed by the entrepreneur as requested by FEPAM.

Verified the environmental viability, the project must go through three phases in order to obtain all necessary licenses for its operation. According to Article 56 of the State Law No. 11,520 of Aug/03/2000 – which establishes the State Environmental Code – the competent environmental agency will dispatch the following licenses:

I – Previous License (PL): issued at the preliminary stage of planning the project or activity containing the basic requirements to be met by the entrepreneur.

II – Installation License (IL): authorizes the beginning of the project implementation, according to the conditions and restrictions of the PL and other requirements of the environmental agency.

III – Operation License (OL): authorizes, after the necessary verifications, the beginning of the enterprise operation.

The project has the following environmental licenses up the time of PDD elaboration:

- Previous License 00149/2011-DL, granted by FEPAM on February 08,2011;
- Previous License 00768/2011-DL, granted by FEPAM on July 12, 2011;
- Installation License 1258/2012, granted by FEPAM on October 23, 2012.

D.2. Environmental impact assessment

The environmental impacts were identified based on RAS (Simplified Environmental Report) and were measured according to the implementation and operation phases of the project. From this premise, it was considered the main impact on physical, biotic and socio-economic environment of the region and project area, thereby ensuring the local and regional focus of the environmental analysis.

Corredor dos Senandes Project presents positive and negative impacts during the implementation and operation phases of the entrepreneurship, being the positive impacts the most significant. According to RAS, the negative impacts in the implementation phase are: noise emission, the emission of air pollutants, alteration of landscape, changes in vegetation and running over wildlife. Among the project positive impacts are: development of the economy in the region of the project, job creation, infrastructure growth, increased tax revenues and discovery and recovery of archaeological heritage.

In the operation phase, some of the possible negative impacts are: noise, the possibility of disruption in the migration routes of birds and bats, birds colliding with wind turbines and electrocution of birds with the transmission line. The positive impacts are; regional development, job creation and increased tax and land lease revenues for land owners.

Programs to mitigate environmental impacts performed during the different phases of implementation and operation of the wind farm enterprise in the physical, biotic and anthropic seek to minimize negative impacts and maximize positive impacts of the project so its construction can occur in the most balanced possible way. Wind turbines of the project present one of the greatest unitary capacity of this kind of projects in Brazil. Therefore, the project requires less land to be implemented and it provides minor impacts in the physical environment,

The following table shows some of the possible impacts that will occur during the implementation phase and the measures adopted to mitigate them.

Table 18- Impacts in the implementation phase – Physical Environment

Impacts		Mitigation and Monitoring
Noise	The movement of machinery may increase the noise level	Environment Educational Program Monitoring of Noise Emission
Air	Increased dust in the air due to movement of machinery for the construction of roads and yards for maneuver	Environment Educational Program Monitoring of Air Pollutant Emission
Soil	Moving and changing of the soil structure at the sites affected by the works	Restoration of Degraded Area Programs Soil Erosion Controlling Program
Landscape	Modification of the natural landscape by the construction of the wind farm infrastructure	Restoration of Degraded Area Programs
Water Resources	Input of sediment into water bodies by the road construction	Restoration of Degraded Area Programs Soil Erosion Controlling Program

Table 19 - Impacts in the implementation phase – Biotic Environment

Impacts		Mitigation and Monitoring
Fauna	Loss of aquatic and terrestrial habitats for all fauna groups	Monitoring Program of Mammals, Avifauna and Herpetofauna *Pre Implementation and Implementation Phase*
	Intervention and disruption of eating habits and displacement of the fauna in general	
	Running over of mammals, reptiles, amphibians and birds.	Environment Educational Program Fauna Monitoring Programs *Pre Implementation and Implementation Phase*
	Increasing of Hunting and Fishing	
	Destruction of nests in the soil	Avifauna Monitoring Program *Pre Implementation and Implementation Phase*
Flora	Change of herbaceous, terrestrial and aquatic vegetation in the construction of roads	Restoration of Degraded Area Programs

Table 20 - Impacts in the implementation phase – Anthropic Environment

Impacts		Mitigation and Monitoring
Socio-Economic	Economic Development	Social Communication Program
	Job Creation	
	Growth of Real Estate and Construction Market	
	Increase in Infrastructure	
	Increased Tax Revenue	
	Increased Vehicle Traffic	Environment Educational Program Social Communication Program
	Landscape Change	Environment Educational Program Impact Study to the Landscape
	Generation of particulate matter and noise	Environment Educational Program
Archaeological Heritage	Possible Discovery of Archaeological Heritage Existing in the Area of the Wind Farm	Archaeological Survey Program
	Possible Damage to the Archaeological Heritage Existing in the Area of the Wind Farm	

The Simplified Environmental Report with all the impacts and mitigation programs are available to the DOE that will validate the project.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders

According to resolution n° 07 from 05/2008[35], published by Brazilian Designated National Authority, the local stakeholders of the project should be invited to perform comments about CDM project.

Therefore, project proponents have sent letters to the following local stakeholders:

State and National

1. State Federal Attorney of Public Interest
2. Federal Attorney of Public Interest
3. State Department of Environment (SEMA)
4. Henrique Luis Roessler State Foundation of Environmental Protection (FEPAM) - State Environmental Agency
5. Forum of Brazilian NGO and Social Movements for Environment and Development - FBOMS

Rio Grande City

6. Rio Grande City Hall;
7. Rio Grande City Assembly;
8. Rio Grande Environmental Secretariat
9. Rio Grande Retailers Trade Union (Sindicato dos Lojistas do Comercio de Rio Grande)

Besides the letters sent to stakeholders, the PDD was made available for public comments for the local stakeholders on website www.grupoenerbio.com.br.

E.2. Summary of comments received
>>
The project activity received just one comment. On December 15, 2011, Rio Grande Environmental Secretariat sent by email its position about the project. According to Environmental Secretariat, Rio Grande is a city that provides good conditions to receive the project. The Secretariat mentioned that the project will provide positive and negative impacts with the positive impacts being the most significant.

The Enviromental Secretariat also highlights that the project owner will develop environmental programs to assure the environmental quality, aiming to comply to requirements of FEPAM and the applicable regulation.

E.3. Report on consideration of comments received

Enerbio Consultoria answered the email to Rio Grande Environmental Secretariat. After that, the comment was sent to the project owners and added to the PDD.

This comment did not require any specific action.

SECTION F. Approval and authorization

Brazilian DNA just issues letter of approval for CDM Project after the validation process.

[35] Source: http://www.mct.gov.br/upd_blob/0023/23744.pdf. Accessed on 28 October 2011.

Appendix 1: Contact information of project participants

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Appendix 2: Affirmation regarding public funding

No public funding coming from Annex I countries was used in this project.

Appendix 3: Applicability of selected methodology

Not applicable

Appendix 4: Further background information on ex ante calculation of emission reductions

BASELINE INFORMATION

Since 2006, MCT in cooperation with the MME and ONS, started to publish the calculation methodology for CO_2 emission factor for grid-connected electricity generation in the Brazilian National Interconnected System using dispatch data analysis. The emission factor started to be widespread for each Subsystem of Brazilian Interconnected System.

In May 2008, the CDM Designated National Authority in Brazil defined that the National Interconnected System must be considered as a unique System and, this way, this configuration started to be valid for calculating the CO_2 emission factor used to calculate the GHG emission reduction of for CDM Projects of electricity generation connected to the grid.

The calculation of CO_2, emission factor published by CIMGC, follows the methodological tool "Tool to calculate the emission factor for an electricity system".

The tables below present the values considered to calculate the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$) which were used for Corredor dos Senandes Project emission reductions ***ex-ante*** estimation. All these data were provided by the Brazilian DNA.

Table 21 - Monthly Medium Operating Margin Emission Factor of the year 2011
Brazilian Interconnected System

Medium Emission Factor (tCO_2/MWh) - MONTHLY												
2011	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
	0.2621	0.2876	0.2076	0.1977	0.2698	0.3410	0.3076	0.3009	0.2734	0.3498	0.3565	0.3495

Table 22 - Daily Medium Operating Margin Emission Factor of the year 2011 – Brazilian Interconnected System

Medium Emission Factor (tCO_2/MWh) – Daily												
2011	**Month**											
Day	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1	0.3268	0.3163	0.2752	0.1385	0.2331	0.2544	0.2339	0.3576	0.2136	0.3140	0.4347	0.3160
2	0.3137	0.3479	0.2245	0.1732	0.2085	0.2605	0.2530	0.3848	0.2267	0.3486	0.4757	0.3139
3	0.2518	0.3087	0.2379	0.2159	0.2322	0.2669	0.2783	0.2734	0.2337	0.3131	0.3850	0.3910
4	0.2885	0.2940	0.2383	0.1882	0.2459	0.3598	0.2380	0.2784	0.2459	0.3450	0.3695	0.4382
5	0.3168	0.2454	0.2969	0.1779	0.2420	0.4168	0.2484	0.3343	0.2028	0.3533	0.4016	0.3446
6	0.3082	0.2441	0.3849	0.1661	0.2196	0.3289	0.2502	0.4227	0.1997	0.3437	0.4506	0.3349
7	0.2958	0.2728	0.3228	0.1664	0.2499	0.3472	0.2399	0.4560	0.2354	0.3428	0.3827	0.3451
8	0.2746	0.2895	0.3152	0.1942	0.2931	0.3576	0.2731	0.3825	0.2367	0.3167	0.3485	0.3713
9	0.2804	0.2884	0.2126	0.2275	0.2463	0.3427	0.3432	0.3587	0.2262	0.3172	0.2871	0.3697
10	0.2508	0.3035	0.1739	0.2416	0.2071	0.3394	0.3516	0.3622	0.2128	0.2547	0.3181	0.3594
11	0.2427	0.2754	0.1736	0.1969	0.2315	0.3501	0.3091	0.3281	0.2623	0.3024	0.3584	0.3919
12	0.2378	0.2285	0.1958	0.1949	0.2362	0.3963	0.3058	0.2606	0.2206	0.3416	0.3883	0.3324
13	0.2379	0.2596	0.2486	0.1673	0.2616	0.3644	0.3091	0.2805	0.2071	0.3594	0.4569	0.3442
14	0.2557	0.2441	0.2030	0.1909	0.2764	0.3681	0.3140	0.3143	0.2138	0.3372	0.4085	0.3409
15	0.2558	0.2327	0.2074	0.2276	0.3005	0.3660	0.3190	0.2757	0.2155	0.3315	0.4355	0.3401
16	0.2965	0.2452	0.2325	0.1950	0.2749	0.3606	0.3774	0.2773	0.2324	0.3702	0.3823	0.3128
17	0.2552	0.2632	0.1865	0.2229	0.2568	0.3520	0.3767	0.2751	0.2366	0.3229	0.3412	0.3454
18	0.2690	0.2728	0.1631	0.1864	0.2681	0.3382	0.3532	0.2838	0.2892	0.3266	0.3351	0.4029
19	0.2606	0.2633	0.2134	0.1859	0.2569	0.3736	0.3290	0.2808	0.2161	0.3679	0.3585	0.3235
20	0.2254	0.2549	0.1902	0.1934	0.2644	0.3297	0.2984	0.3829	0.2301	0.3804	0.3644	0.2778
21	0.2691	0.2918	0.2389	0.1992	0.3228	0.3368	0.3534	0.3824	0.3559	0.3752	0.2944	0.2761
22	0.3304	0.3429	0.1334	0.2148	0.3697	0.3325	0.3520	0.2483	0.3436	0.3920	0.2720	0.2682
23	0.2771	0.3522	0.1394	0.2045	0.3275	0.3755	0.3781	0.2282	0.2949	0.4331	0.2726	0.2854
24	0.1813	0.3757	0.1364	0.2062	0.3039	0.3918	0.3842	0.2249	0.2990	0.3941	0.2814	0.4031
25	0.1851	0.3473	0.1420	0.1971	0.2813	0.3809	0.3065	0.2280	0.4026	0.3764	0.2907	0.4594
26	0.1972	0.2871	0.1702	0.1974	0.2983	0.4063	0.3002	0.2058	0.3293	0.3195	0.3380	0.3843
27	0.2234	0.2916	0.1774	0.2326	0.2905	0.3201	0.2855	0.3321	0.3569	0.2945	0.4018	0.3315
28	0.2655	0.2806	0.1857	0.2169	0.3102	0.3231	0.2796	0.3212	0.3810	0.3397	0.3194	0.3628
29	0.2536		0.1911	0.2176	0.3873	0.3035	0.2768	0.2255	0.4354	0.3998	0.3242	0.3651
30	0.2612		0.1770	0.2217	0.2759	0.2440	0.2946	0.2185	0.4375	0.4363	0.3198	0.3676
31	0.2937		0.1377		0.2479		0.3708	0.2259		0.4384		0.4381

The hourly average emission factors are also available at the following link: http://www.mct.gov.br/index.php/content/view/333605.html#ancora (Accessed on June 2012), the Emissions Factor Operating Margin is calculated for the Brazilian National Interconnected System every hour from the value of energy exported from each plant, the cost of generation of each plant (scheduling priority), schedules of exchanges with the neighboring subsystems and emission factors of thermal power plants.

The dispatch order for Brazilian Interconnected System is: hydroelectric power plants, wind, nuclear, imports from other systems in ascending order of cost, thermoelectric power plants in ascending order of generation cost.

The tables below present the emission factor for the build margin ($EF_{grid, BM, y}$) used for the ***ex-ante*** estimation of emission reductions from the project.

Table 23 - Build Margin Emission Factor of the year 2011 – National Interconnected System

	Medium Emission Factor (tCO_2/MWh) - ANNUAL
2011	**0.1056**

Source: Designated National Authority
http://www.mct.gov.br/index.php/content/view/333605.html#ancora. Accessed on June 2012.

The emission factor for the build margin emission factor is the average number of new plants over the subsystem. This set must contain at least five plants and their capacity must be greater than 20% of installed capacity of the subsystem.

Others information about the baseline scenario and baseline emissions are presented on item B of the PDD.

Appendix 5: Further background information on monitoring plan

Information about the monitoring plan is described on section B.7.3 of this PDD.

Appendix 6: Summary of post registration changes

Not applicable

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