CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Title of the project activity: *Arizona 1 Wind Power Plant CDM Project Activity.*

Version number of the document: 02

Date (DD/MM/YYYY): 24/01/2012

A.2. Description of the project activity:

The primary objective of Arizona 1 Wind Power Plant CDM Project Activity is to help meet Brazil's rising demand for energy due to economic growth and to improve the supply of electricity, while contributing to environmental, social and economic sustainability by increasing the share of renewable energy consumption for Brazil (and for the region of Latin America and the Caribbean).

The Latin America and the Caribbean region countries have expressed their commitment towards achieving a target of 10% renewable energy for the total energy use in the region. Through an initiative from the Ministers of the Environment in 2002 (UNEP-LAC, 2002)[1], a preliminary meeting of the World Summit for Sustainable Development (WSSD) was held in Johannesburg in 2002. In the WSSD final Plan of Implementation no specific targets or timeframes were stated, however, their importance was recognized to achieve sustainability in accordance with the Millennium Development Goals[2].

The privatization process in the electric sector, initiated in 1995, arrived in conjunction with the expectation of adequate tariffs (fewer subsidies) and more attractive prices for generators. It drew the attention of investors to possible alternatives not available in the centrally planned electricity market. Unfortunately the Brazilian energy market lacked a consistent expansion plan, with the biggest problems being political and regulatory uncertainties. At the end of the 1990's a strong increase in demand in contrast with a less-than-average increase in installed capacity caused the supply crisis/rationing from 2001/2002. One of the solutions the government provided was flexible legislation favoring smaller independent energy producers. In addition to this, the possible eligibility under the Clean Development Mechanism of the Kyoto Protocol also drew the attention of investors regarding renewable energy projects.

In this context, the proposed project activity can be seen as an example of a solution by the private sector to the Brazilian electricity crisis of 2001, contributing to the country's sustainable development. This indigenous and cleaner source of electricity will also have an important contribution to environmental sustainability by

[1] **UNEP-LAC (2002).** Final Report of the 7th Meeting of the Inter-Sessional Committee of the Forum of Ministers of Environment of Latin America and the Caribbean. United Nations Environment Programme, Regional Office for Latin America and the Caribbean. May 15th to 17th, 2002, São Paulo (Brazil).

[2] WSSD Plan of Implementation, Paragraph 19 (e): "*Diversify energy supply by developing advanced, cleaner, more efficient, affordable and cost-effective energy technologies, including fossil fuel technologies and renewable energy technologies, hydro included, and their transfer to developing countries on concessional terms as mutually agreed. With a sense of urgency, substantially increase the global share of renewable energy sources with the objective of increasing its contribution to total energy supply, recognizing the role of*

reducing carbon dioxide emissions that would have occurred otherwise in the absence of the project. The project activity reduces emissions of greenhouse gases (GHG) by avoiding electricity generation from fossil fuel sources, which would be generated (and emitted) in the absence of the project.

Arizona 1 Wind Power Plant possesses 28 MW of installed capacity and is expected to become operational in May 2012. The plant is located at the municipality of Rio do Fogo, Rio Grande do Norte State, Northeast region of Brazil. The owner of the plant is *Arizona 1 Energia Renovável S/A* which is a Special Purpose Company (SPC) set up specifically to build and operate the proposed wind power plant. The major shareholders of this SPC are Neoenergia (50%) and Iberdrola Renovables S/A (48%).

NEOENERGIA is one of the largest groups of the Brazilian electrical sector, acting in the entire electric energy production chain, with businesses in the areas of generation, transmission, distribution and commercialization. The company expanded its investments in renewable sources of energy and has a strong commitment with social and environmental initiatives. Amongst other initiatives, the program of distributor Coelba, one of the companies owned by Neoenergia, donates efficient refrigerators to low-income clients and re-uses gas CFC-R12 removed from old refrigerators. This program was classified as exemplary by Montreal Protocol - international agreement of countries for the protection of the ozone layer in the atmosphere[3].

IBERDROLA is Spain's leading energy group, one of the top five electricity companies worldwide, and global leader in wind energy. The focus on the development of clean energy and respect for the environment are some of the pillars of the company's model. This strong commitment with sustainability can be demonstrated trough the performance of one of its branch, ScottishPower Renewables, which recently awarded with the Queen's Award for Enterprise in Sustainable Development for Whitelee windfarm near Glasgow[4].

The project contributes to sustainable development since it meets present needs without compromising the ability of future generations to meet their own needs, as defined by the Brundtland Commission (1987)[5]. In other words, the implementation of wind power plants ensures renewable energy generation, reduces the demand on the national electric system, avoids negative social and environmental impacts caused by fossil fuel fired thermo power plants, and drives regional economies, increasing the quality of life in local communities.

In summary, the proposed project activity will contribute to the sustainable development in the following aspects:

- Reducing air pollutants that are emitted from fossil fuel electricity generation from power plants connected to the Brazilian grid;
- Creating job opportunities during the project construction, operation and maintenance, improving capacities related to wind farms in Brazil through advanced technology transferred from developed countries;
- Efficiently generating electricity, for which there is a growing demand in the country;

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national and voluntary regional targets as well as initiatives, where they exist, and ensuring that energy policies are supportive to developing countries' efforts to eradicate poverty, and regularly evaluate available data to review progress to this end."

[3] More information regarding the company profile is available at <http://www.neoenergia.com>.

[4] More information regarding the company profile is available at <http://www.iberdrola.es>.

[5] **WCED (1987).** Our Common Future. The World Commission on Environment and Development. Oxford University Press.

– Contributing towards national economic development, adding an Independent Power Producer, leading to energy diversification and creation of additional renewable energy sources;

From the above, it can be concluded that the project has reduced environmental impacts and will develop the regional economy, resulting in better quality of life. In other words, environmental sustainability combined with social and economic justice, undeniably contributing to the host country's sustainable development.

A.3. Project participants:

Table 1 - Party(ies) and private/public entities involved in the project activity

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the Party involved whishes to be considered as project participant (Yes/No)
Brazil (host)	Neoenergia S/A (private entity)	No
	Iberdrola Renováveis do Brasil S/A (private entity)	
	Ecopart Assessoria em Negócios Empresariais Ltda. (private entity)	
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Detailed contact information on party(ies) and private/public entities involved in the project activity listed in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

A.4.1.2. Region/State/Province etc.:

Rio Grande do Norte

A.4.1.3. City/Town/Community etc.:

Rio do Fogo.

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The geographic coordinates[6] of the site is presented in the table below.

Table 2 – Arizona 1 Wind Power Plant geographic coordinates.

Geographic Coordinates	*Arizona 1 Wind Power Plant*
Longitude (West)	-35.3817
Latitude (South)	-5.3042

Figure 1 –Rio Grande do Norte state (on the left) and Rio do Fogo municipality as well as project's location (on the right)

A.4.2. Category(ies) of project activity:

Sectoral Scope: 1 - Energy industries (renewable - / non-renewable sources).

Category: Renewable electricity generation for a grid.

A.4.3. Technology to be employed by the project activity:

Utilizing wind energy means installing a device which converts part of the kinetic energy in the atmosphere to, say, mechanical useful energy[7]. A wind turbine is a device for extracting kinetic energy from the wind[8].

[6] The geographic coordinates of the pant are described in ANEEL Ordinance #144, dated 03/03/2011. The document is publicly available at <http://www.aneel.gov.br/cedoc/prt2011144mme.pdf >. Accessed on 29/04/2011.

[7] SØRENSEN, B. **Renewable Energy.** Academic Press, 2004 - 3rd edition, 928 p. Partially available at <http://books.google.com.br/books?id=Y17FoN2VUEwC&printsec=frontcover#v=onepage&q&f=false> Accessed on 25 April 2011.

According to WWEA[9] (2011), wind turbines that generate electricity and feed it directly to the grid usually have two or three rotor blades, while horizontal axis, a nacelle with a rotor hub, gears, and a generator, all of which can be turned into and out of the wind. The rotor is positioned in front of the tower in the direction the wind is blowing (windward as opposed to leeward). The figure below presents the basic components of a modern wind turbine.

1. Foundation: it anchors the turbine to the ground while ensuring its stability. Generally it is made of concrete or steel.
2. Tower: its height varies as a function of the rated power of the turbine as well as its rotor diameter.
3. Nacelle: this component holds the turbine machinery.
4. Rotor blade: the rotor as well as the rotor blades are the equipment which effectively convert the wind energy into rotary mechanical movement
5. Hub: The hub is the center of the rotor to which the rotor blades are attached.
6. Transformer (this is not a part of the Wind Turbine)

Figure 2 – Schematic view of the components of a wind turbine. (Source: WWEA, 2006[9]).

The project activity is the construction of a wind power plant with 28MW of total installed capacity. There will be 14 turbines at the plant. All of them correspond to model G90 manufactured by GAMESA EÓLICA S.A. A more detailed description of the technology to be employed in this project activity is provided in Table 3 below.

Table 3 - Project technical description[10].

Turbine	
Nominal Power (MW)	2
Diameter (m)	90
Area swept (m2)	6,362
Nominal revolutions (rpm)	9 - 19
Number of blades	3
Cut-in wind speed (m/s)	3

[8] BURTON, T.; SHARPE, D.; JENKINS, N.; BOSSANYI, E. **Wind Energy Handbook**, Wiley: 2001, 642 p. Partially available at < http://books.google.com.br/books?id=4UYm893y-34C&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false>. Accessed on 25 April 2011.
[9] WWEA – World Wind energy Association. **Wind Energy: Technology and Planning.** 2006. Available at <http://www.wwindea.org/technology/intro/estructura-en.htm>. Accessed on 25 April 2011.
[10] Turbine information is available with the Project Participants and at Gamesa's website: <http://www.gamesa.es/en/products-and-services/wind-turbines/gamesa-g90-20-mw-iia-en.html>

Cut-out wind speed (m/s)	21
Generator	
Type	Asynchronous
Manufacturer	Cantarey Reinosa S.A.
Nominal output (kW)	2,000
Frequency (Hz)	60
Tension (V)	690

The equipment and technology utilized in the proposed project activity has been successfully applied to similar projects around the world.

Figure 3 – Gamesa's turbine[11].

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

The full implementation of proposed project activity will generate the estimated annual reductions as in Table 4 below.

Table 4 – Project Emissions Reductions Estimation

Years*	**Annual estimation of emission reductions in tonnes of CO_2e**
Year 1	38,986
Year 2	44,535
Year 3	44,535
Year 4	44,535
Year 5	44,535
Year 6	44,535
Year 7	44,535
Total estimated reductions (tonnes of CO_2e)	**306,196**
Total number of crediting years	7

[11] Available at: <http://www.gamesa.es/en/products-and-services/wind-turbines/gamesa-g90-20-mw-iia-en.html>.

Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	43,742

**From May 7th until May 6th of the subsequent year*

A.4.5. Public funding of the project activity:

This project does not receive any public funding and it is not a diversion of ODA.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

ACM0002 - "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" (Version 12.2.0).

- Tool to calculate the emission factor for an electricity system (version 2.2.1);
- Tool for the demonstration and assessment of additionality (version 6.0.0);
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 2);
- Combined tool to identify the baseline scenario and demonstrate additionality (version 3.0.1).

The *Combined tool to identify the baseline scenario and demonstrate additionality* and the *Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion* are not applicable to the project activity, and therefore are not used.

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The applicability conditions of ACM0002 are all fulfilled by the proposed project activity as further detailed below.

According to this methodology, it *is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).*

The proposed project activity comprises a greenfield plant corresponding to option a).

The methodology also provides the following conditions:

– *The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;*

The proposed project activity is the installation of a new wind power plant.

- *In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;*

Not applicable. The proposed project activity does not correspond to a capacity addition, retrofit or replacement.

- *In case of hydro power plants:*

- *One of the following conditions must apply:*
  - *The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or*
  - *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or*
  - *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.*

In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4W/m^2 all the following conditions must apply:

- *The power density calculated for the entire project activity using equation 5 is greater than 4W/m2;*
- *Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant;*
- *Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;*
- *Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4W/m^2, is lower than 15MW;*

Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.

Not applicable. The proposed project activity does not correspond to a hydropower plant.

Finally, the methodology has the following restrictions – *i.e.* project activities may not be applicable in the following cases:

- *Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;*
- *Biomass fired power plants;*
- *Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m²*.

The project is still applicable for the use of ACM0002 since it does not correspond to any of the restrictions listed above.

In addition to the ACM0002 methodology applicability conditions, the ones listed in the tools applied must also be assessed.

In order to estimate the baseline emissions occurring after the implementation of the proposed project activity the "*Tool to calculate the emission factor for an electricity system*" is used. This tool provides the steps required to estimate the CO_2 emission factor, which consists of a "*combined margin*", for the displacement of electricity generated by plants connected to an electric grid.

As further described below in section B.6.1, off-grid power plants are not considered. Hence, the requirements of Annex 2 of the tool, referring to the applicability conditions that shall be met when this kind of plants are considered, is not applicable. Besides, the Brazilian Electric System is neither partially nor totally located in any Annex-I country.

In this sense, it can be concluded that there are no applicability conditions preventing the use of this tool to estimate the CO_2 emission factor of the Brazilian Electricity System in the context of the proposed project activity.

B.3. Description of the sources and gases included in the project boundary:

According to ACM0002, *the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to*.

On May 26th, 2008, the Brazilian Designated Authority published Resolution #8[12] defining the Brazilian Interconnected Grid as a single system covering all five geographical regions of the country (North, Northeast, South, Southeast and Midwest).

The figure below is a representation of the project boundary.

[12] Comissão Interministerial de Mudança Global do Clima (CIMGC). Available at: <http://www.mct.gov.br/upd_blob/0024/24719.pdf>.

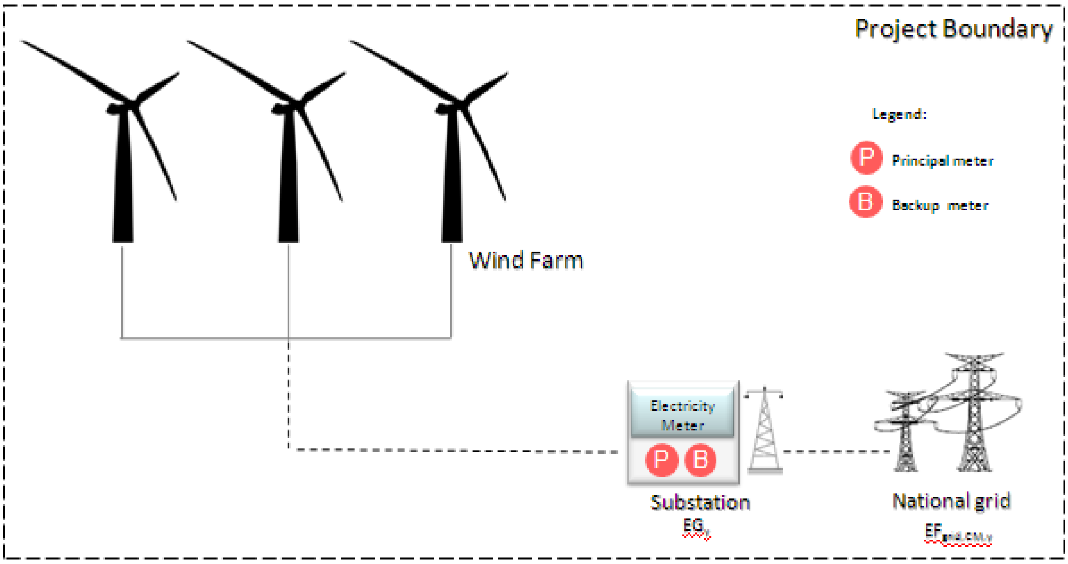

Figure 4 - Project boundary

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

Table 5 - Emissions sources included or excluded in the project boundary

	Source	**Gas**	**Included ?**	**Justification/Explanation**
Baseline	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 Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from noncondensable gases contained in geothermal steam.	Not applicable.		
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	Not applicable.		
	For hydro power plants, emissions of CH_4 from the reservoir.	Not applicable.		

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

The project activity is the installation of a new grid-connected renewable power plant/unit. Therefore, according to ACM0002, the baseline scenario is the following:

"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations as described in the "Tool to calculate the emission factor for an electricity system".

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The GSP of the proposed CDM Project Activity started on 18/06/2011. The identified starting date of the proposed project activity is 28/07/2011, which represents the date when the Power Purchase Agreement was signed. For details on how the project starting date was identified please refer to Section C.1.1.

In accordance with the "*Guidelines in the demonstration and assessment of prior consideration of the CDM*" (Annex 13, EB 62), for projects activities with a starting date on or after 02 August 2008, Project Participants must notify the host country DNA the UNFCCC secretariat of their intention to seek CDM status.

Although the guidelines also states that such confirmation is not necessary if a PDD has been published for global stakeholder consultation, both UNFCCC and Brazilian DNA were informed by the Project Participants' of their intention to seek CDM certification. The Prior Consideration of the CDM Form (F-CDM-Prior consideration) was forwarded, as recommended by the guidelines, on 09/11/2011. The form as well as the confirmation of receipt are available under request and were presented to the DOE validating the project.

The additionality of the proposed project activity will be assessed and demonstrated trough the application of the "*Tool for the demonstration and assessment of additionality*". This tool provides 4 steps to determine whether the project activity is additional or not, which are below further detailed.

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

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

Scenario 1: Continuation of the current (previous) situation of electricity supplied by the Brazilian Interconnected Grid.

Scenario 2: The proposed project activity undertaken without being registered as a CDM project activity.

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

Both alternative scenarios identified above are in compliance with all regulations according the following entities: National Electric System Operator (ONS from the Portuguese *Operador Nacional do Sistema Elétrico*), Electricity Regulatory Agency (ANEEL from the Portuguese *Agência Nacional de Energia Elétrica*), Rio Grande do Norte Environmental Agency (IDEMA from the Portuguese *Instituto de Desenvolvimento Sustentável e Meio Ambiente do Rio Grande do Norte)* and the CDM Executive Board.

SATISFIED/PASS – Proceed to Step 2

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method:

Additionality is demonstrated through an investment benchmark analysis (option III). Options I and II are not applicable to the proposed project activity considering the following:

Option I – both the CDM project activity and the alternatives identified in Step 1 generate financial and economic benefits other than CDM related income.

Option II – the implementation of other project types of renewable energy generation - *i.e.* cogeneration or small hydro power plant projects - are not potential alternatives in the site where the project is planned.

In addition, in accordance with paragraph 19, Annex 5, EB62, the benchmark analysis was identified as the most appropriate method to demonstrate the additionality of the proposed CDM Project Activity since the alternative to the implementation of the wind power plant is the supply of electricity from the grid.

Sub-step 2b - Option III - benchmark analysis

The financial indicator identified for the project activity is the Internal Rate of Return (IRR) calculated in the project cash-flow. The IRR here presented is compared to the appropriate benchmark of the electric sector, which is the Weighted Average Cost of Capital (WACC).

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

Weighted Average Cost of Capital (WACC)

The weighted-average cost of capital (WACC) is a rate used to discount business cash flows and takes into consideration the cost of debt and the cost of equity of a typical investor in the sector of the project activity. The benchmark can be applied to the cash flow of the project as a discount rate when calculating the net present value (NPV) of the same, or simply by comparing its value to the internal rate of return (IRR) of the project (in accordance with paragraph 12, Annex 5, EB62). The WACC considers that shareholders expect compensation towards the projected risk of investing resources in a specific sector or industry in a particular country.

The WACC calculation is based on parameters that are standard in the market, considers the specific characteristics of the project type, and is not linked to the subjective profitability expectation or risk profile of this particular project developer. Once a wind power potential is discovered, any corporate entity is able to obtain the authorization from the government to build a wind power plant. In addition to that, even after the project proponent obtains such authorization, it can be negotiated afterwards. Therefore, the use a sectoral benchmark is applicable as per the guidance provided in paragraph 13, Annex 5, EB62.

The WACC of the sector considered is the one calculated for 2011 – *i.e.* Power Purchase Agreement signed representing the first significant commitment towards the implementation of the project – and is equal to 9.39%. This value was calculated through the formula below:

$$WACC = Wd \times Kd + We \times Ke$$

We and **Wd** are, respectively, the weights of equity and debt - **We** is of 32.3%, and **Wd** of 67.7%. These numbers derive from the typical leverage of similar projects in the sector in Brazil, based on the rules for available long term loans from Brazilian Development Bank (BNDES - from the Portuguese *Banco Nacional de Desenvolvimento Econômico e Social*). BNDES is the major provider of long-term loans in the country; it supplies the financing for small to large scale projects. Long-term loans are scarcely provided by commercial banks, and in general, these entities do not have competitive rates compared to the BNDES. The use of BNDES' structure is in accordance with paragraph 18, Annex 5, EB62, since it represents the *typical debt/equity finance structure observed in the sector*.

Kd is the cost of debt, which is observed in the market related to the project activity, and which already accounts for the tax benefits of contracting debts. In the **Kd** calculation, the marginal tax rate (**t**) is multiplied by the Cost of debt and then by the debt to total cost of capital ratio to ascertain the debt portion of the WACC formula. In the case of Brazil, and specifically to energy projects, this tax factor could either be 34% (actual profit) or 0% (presumed profit). This is decided by the specific type of project and tax regime under which it sits. In the case of the proposed project activity, the 0% tax factor applies. This method for calculating the corporate income tax and social contribution is called Presumed Profit (detailed explanations are provided while calculating financial indicator below).

Arizona I is a post-tax cash flow. Thus, it must be compared against a sectoral post-tax benchmark (Weighted Average Cost of Capital - WACC). The companies opting for the Presumed Profit System do not benefit from the cash and non-cash items deductions (as further detailed in the financial indicator calculation section below). Therefore, in the calculation for the cost of debt the marginal tax is zero. This results in a pre-tax WACC percentage equal to a post-tax WACC percentage, as follows:

$$\text{Post-tax Rate} = (\text{Pre-tax Rate} \times (1 - \text{Marginal Tax}))$$

Therefore, if marginal tax is 0 (zero) (Presumed Profit scheme), Post-tax rate is equal to Pre-tax rate. Thus, the post-tax Cost of Debt is added in the WACC calculation reaching a post tax WACC in accordance with the post-tax cash flow as recommended in paragraph 11 of Annex5, EB62.

The nominal rate achieved for debt is used to calculate nominal WACC, which is used to discount nominal cash flow projections. In order to achieve the real cash flow rate, the inflation targeting figure (d) for Brazil is reduced from the nominal figure achieved. The (d) is obtained from the Brazilian Central Bank (www.bcb.gov.br) and has experienced very little variance in the past 5 years.

Kd is calculated through the following equation:

$$Kd = [1 + (a+b+c) \times (1-t)]/(1+d)-1$$

Values used in the cost of debt calculation are presented in Table 6 below.

Table 6 – Cost of debt (Kd) calculation

Cost of Debt (Kd)	
(a) Financial cost[13]	6.53%
(b) BNDES fee[14]	0.90%
(c) Spread[15]	2.00%
(a+b+c) Pre-Cost of Debt	9.43%
(t) Marginal tax rate[16]	0.00
(d) Inflation forecast[17]	4.50%
After tax Cost of Debt	4.71%p.a.

According to the table above, **Kd** is of 4.71%.

Ke is the cost of equity. As per option b) provided in the paragraph 15 of Annex5, EB62, it was estimated using the best financial practices through the Capital Asset Pricing Model - CAPM (mentioned as an appropriate method to determine benchmarks in guidance 14, Annex 5, EB62). This method considers the risk associated in investing in the Brazilian electricity market, which has become increasingly competitive in the last years mainly due the electricity auctions conducted by the government.

The following equation is used to calculate the ***Ke***:

$$Ke = [(1+ Rf) /(1+I)-1] + \beta \times (Rm-Rf) + Rc$$

Rf stands for the risk free rate. The risk-free rate used for **Ke** calculation was a long term bond rate. This bond was issued by the Brazilian government, denominated in US dollars. Therefore the rate includes the Brazilian country risk. There is a higher risk associated to investing in Brazil, or in Brazilian bonds, compared to investing in a mature market such as the United States. This risk is reflected in higher returns expected on Brazilian government bonds compared to the mature markets government bonds. In considering the Brazilian government bond, this premium for a higher risk is captured in our calculations.

In order to adjust the risk-free rate (**Rf**) to the inflation adjusted rate, the expected inflation rate (for the United States) (**π'**) is reduced. The inflation is calculated based on the treasury through spot TIPS (Treasury Inflation Protected Securities) which are readily quoted in the market. There is no need to adjust for Brazil's expected inflation when dealing with a hurdle rate in real terms.

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13 http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Custos_Financeiros/Taxa_de_Juros_de_Longo_Prazo_TJLP/index.html

14 http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/conhecimento/bnset/Set2901.pdf

15 http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/conhecimento/bnset/Set2901.pdf

16 http://www.receita.fazenda.gov.br/Aliquotas/ContribCsll/Aliquotas.htm http://www.receita.fazenda.gov.br/Aliquotas/ContribPj.htm

17 http://www.bcb.gov.br/pec/metas/InflationTargetingTable.pdf

Beta, or **β,** stands for the average sensitivity of comparable companies in that industry to movements in the underlying market. **β** derives from the correlation between returns of US companies from the sector and the performance of the returns of the US market. **β** has been adjusted to the leverage of Brazilian companies in the sector, reflecting both structural and financial risks. **β** adjusts the market premium to the sector.

Rm represents the market premium, or higher return, expected by market participants in light of historical spreads attained from investing in equities versus risk free assets such as government bond rates, investors require a higher return when investing in private companies. The market premium is estimated based on the historical difference between the S&P 500 returns and the long term US bonds returns. The spread over the risk-free rate is the average of the difference between those returns.

Note that in the formula above there is the factor EMBI+ (Emerging Markets Bond Index Plus), considers as the country risk premium, **Rc**. This factor accounts for the country or sovereign risk embedded in the debt of a country. Assuming that relative to the US risk-free debt market EMBI+ is 0, then Brazil's EMBI+ would calculate for the added or reduced risk relative of Brazils debt markets to the US.

Justification for the EMBI+ addition to the risk-free rate lies in the vast differences between the United States in such factors as credit risk, inflation history, politics, debt markets, and more. Ignoring these differences would result in the incorrect application of relevant environmental factors in the decision-making process of an investor in Brazil.

Values used in the cost of equity calculation are presented in Table 7 below.

Table 7 – Cost of equity (Ke) calculation

Cost of Equity (Ke) – CAPM	
(Rf) Risk-free rate[18]	4.25%
(Rm) Equity risk premium[19]	6.03%
(Rc) Estimated country risk premium[20]	2.45%
(β) Adjusted industry beta[21]	2.41%
(I) US expected inflation[22]	1.98%
Cost of Equity with Brazilian Country Risk (p.a.)	19.18%p.a.

According to the table above, Ke is of 19.18%. Plugging these numbers into WACC formulae we obtain:

$$WACC = 67.7\% \times 4.71\% + 32.3\% \times 19.18\% = 9.39\%$$

Each assumption made and all data used to estimate the benchmark has been presented to the DOE. The spreadsheet used for calculation of the WACC is available with the Project Participants and has also been

[18] http://pages.stern.nyu.edu/~adamodar/
[19] http://pages.stern.nyu.edu/~adamodar/
[20] http://www.cbonds.info/all/eng/index/index_detail/group_id/1/
[21] http://pages.stern.nyu.edu/~adamodar/
[22] http://www.federalreserve.gov/econresdata/researchdata.htm

provided to the DOE. For complete reference of the data used to estimate the benchmark please refer to this spreadsheet, which is also attached to this PDD.

Financial Indicator, Internal rate of return (IRR)

As mentioned above, the financial indicator identified for the Project Activity is the project Internal Rate of Return (IRR). Arizona 1 cash flow was calculated considering an expected lifetime of 20 years (term of the PPA and expected technical lifetime of the plant). This term is also in line with the guidance of paragraph 3, Annex 5, EB62.

Besides, the income tax calculation also follows relevant guidance provided by Annex 5, EB62. In Brazil, there are two income taxes: (a) the corporate income tax (IRPJ) and (b) the social contribution tax on profits (CSLL) (see KPMG report "Investment in Brazil"[23]). There are also three methods provided by legislation to calculate corporate income tax and social contribution tax due on profits: Actual Profit, Presumed Profit and Arbitrated Profit.

Corporate entities are eligible to apply for the Presumed Profit if their revenues are under Forty eight million Reais per year (Article #13, Law #9.718/1998)[24].

For the Presumed Profit system, 8% of gross sales in addition to financial revenues/earnings is used as basis for the income tax calculation. To this figure a 25% rate is applied resulting in the final income tax value. For the social contribution calculation 12% of gross sales in addition to financial revenues/earnings is used as a basis for the calculation. To this figure a 9% rate is applied resulting in the final social contribution value (As per Article #518 of the Federal Decree #3000, dated 26 March 1999)[25].

Therefore, a corporate entity that opts for the presumed profit scheme pays the same rate of income tax and social contribution regardless of its costs, expenses, other cash items such as payable interest and non-cash items such as depreciation, because these elements are not deductable under this system. In this sense, depreciation and consequently fair value are not considered in the spreadsheet (paragraphs 4 and 5 of Annex 5, EB62).

The result is that the IRR of the project is equal to 5.71%. The table presented below provides a summary of the main input values as well as a brief justification for their use. Documents evidencing all input values mentioned below which were used to estimate the IRR, were supplied to the DOE. Besides, the IRR calculation spreadsheet is also attached to this PDD.

Parameter	Value used	Justification/source of information used
Installed Capacity (MW)	28.00	Based on the project design of the wind farm.
Guaranteed power output (MW)	12.28	The guaranteed power as authorized by the ANEEL is 12.9MW.

[23] KPMG. Investment in Brazil: tax. São Paulo: Escrituras Editora, 2008. Publicly available in English at http://www.kpmg.com.br/publicacoes/livros_tecnicos/Investment_in_Brazil10_out08.pdf

[24] Publicly available in Portuguese at http://www.receita.fazenda.gov.br/legislacao/leis/Ant2001/lei971898.htm.

[25] Publicly available in Portuguese at http://www.receita.fazenda.gov.br/legislacao/rir/L2Parte3.htm.

		However, based on its own experience and wind certification, project developers negotiated 12.28MW under the auction. Both figures were determined at 50% of probability (P50). This range of probability represents 50% of chance of a higher or lower generation of electricity by the plant, which is deemed conservative. As an example, the financing institutions usually consider P90 for the financing agreement. The lower value (12.28MW) is used in the investment analysis since it represents the one in which the company based its decision. However, the influence of considering the highest value (12.9MW) for the IRR calculation will be assessed in the sensitivity analysis as discussed below.
Plant Load Factor	43.86%	Determined dividing the guaranteed power of the plant by its installed capacity. This parameter is used to estimate the electricity generated by the plant.
PPA price (R$/MWh)	130.21	The price of the PPA, as submitted and obtained by the project owner in the energy auction is R$134.59/MWh. The investment decision (signature of the PPA) was made approximately one year after the auction. As per paragraph 6 of Annex 5, EB62, the tariff considered in the investment analysis (obtained during the auction) was valid and applicable, since this same value was taken into account during the signature of the contracts, in July 2011. A correction factor of 3.26 was applied to the price. This correction factor takes into account possible penalties that may arise due to a lower generation of electricity during the expected operational lifetime of the project (penalties are foreseen both in the PPA and in the *Request for Proposal* of the public auction). Below this table is included a detailed explanation regarding the correction price.
TUSD	R$3.18/kW.month	The value of the tariff is determined for generators connected to the local distribution network as per ANEEL Ordinance #972/2010. In Brazil, electricity producers using renewable sources receive a 50% discount in the Tariff for the Use of the Distribution System - TUSD fee (from the Portuguese *Tarifa de Uso do Sistema de Distribuição*). This discount aims at boost investments in renewable energy projects and shall be considered

		as a Type E- policy as defined by Annex 3, EB 22. Additionally, according to this clarification, type E- policies[26] do not need to be considered in the development of the baseline scenario if implemented after 11 November 2001. The reduction in the TUST fee was regulated by the Law10 438, dated 26/04/2002[27]. Therefore, the discount is not going to be taken into account.
Investment (R$)	110,717,000	Based on quotations and contracts from the manufacturers as well as from the EPC services providers. EPC and equipment costs amount the majority of the construction costs. Evidences were supplied by the DOE during the validation.

As discussed above, the original investment analysis conducted by the project owner considered a price correction factor. This concept of reducing the revenues is related to the rules of the CCEAR[28] (Power Purchase Agreement under the Regulated Market, from the Portuguese *Contrato de Comercialização de Energia no Ambiente Regulado*).

According to the CCEAR, there is a fixed payment[29] associated with the amount of electricity and price negotiated in the auction as well as a variable revenue or refund depending on the annual generation within a tolerance band[30] (+30% in the first year, second year +20%, +10% in the third year, 0% in the fourth year - repeated in every four years; -10% any year). The production that exceeds this range is commercialized in the free market[31].

In contrast, when the electricity production of a given year is less than 90% of the contracted energy, or less than 100% at the end of the forth year, the seller must refund the fixed payment proportional to the energy not supplied, considering the price obtained in the auction[32].

The projections of the historical PLD prices (from the Portuguese *Preço de Liquidação das Diferenças*), which is the price of the short-term market, shows that there is a high probability that this value is very low in the next years (less than BRL40/MWh)[33] – see Figure 5.

[26] From paragraph 6.b) of Annex 3, EB 22 Type E- policies are *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).*
[27] Available in Portuguese at <http://www.aneel.gov.br/cedoc/lei200210438.pdf>. Accessed on 28/04/2011.
[28] ANEEL / Contrato de Comercialização de Energia no Ambiente Regulado – CCEAR por disponibilidade eólica http://www.aneel.gov.br/aplicacoes/editais_geracao/documentos/072010_ANEXO%202%20-%20_CCEAR_Leilao_FA_2010_pos_AP_final.pdf.
[29] See clause 7 of the CCEAR. This document is publicly available in Portuguese.
[30] See clause 5.14 of the CCEAR. This document is publicly available in Portuguese.
[31] Also refer to clause 5.14 of the CCEAR. This document is publicly available in Portuguese.
[32] See clause 6.7 of the CCEAR. This document is publicly available in Portuguese.
[33] Compass / Presentation Cigre-Brasil 20.7.2010 - http://www.acenergia.com.br/sinrem/pdf/pdf_07.pdf

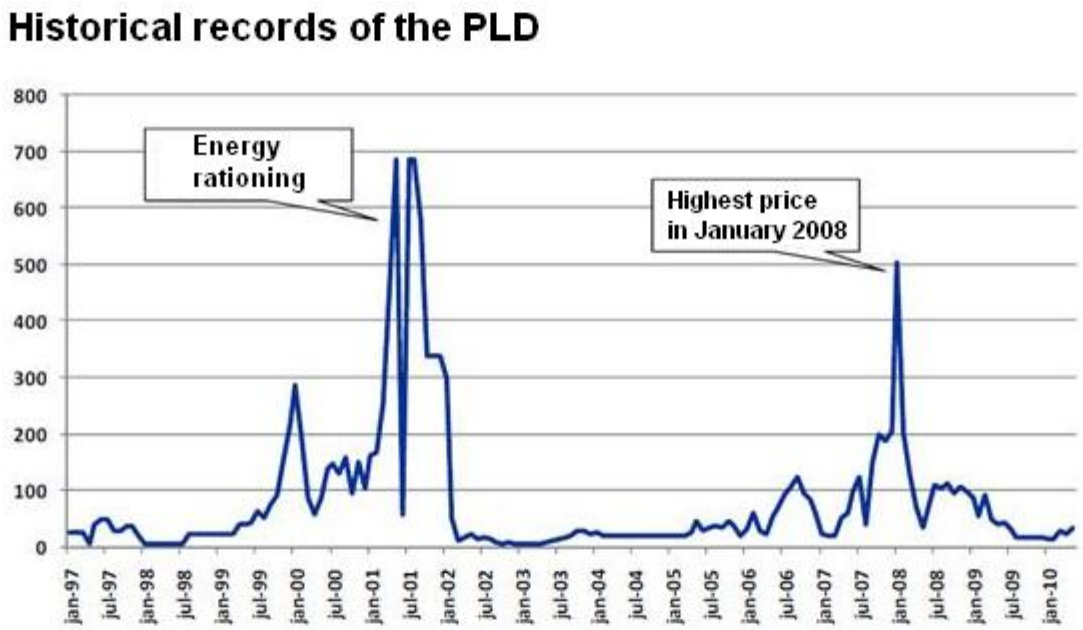

Figure 5 – Historical records of the PLD.

The following example shows the impact of these rules in the reduction of the project revenues, considering the income related to the electricity production observed during the four years, with and without the reduction of the income:

- Hypothetical price obtained in the auction: BRL133/MWh
- PLD (hypothetical price in the short-term market at the time of production: BRL40/MWh (historically this occurs more than 50% of time)
- Energy contracted: 3,000MWh/MW/year (Tolerance band: 130% -> 3,900MWh/MW/year; 120% -> 3,600MWh/MW/year; 110% -> 3,300MWh/MW/year; 90% -> 2,700MWh/MW/year)

Scenario 1:

Production example: 3,000MWh/MW in the first year, 3,000MWh/MW in the second year, 3,000MWh/MW in the third year, 3,000MWh/MW in the fourth year;

Total output: 12,000MWh/MW

Considering the above scenario, the reduction of income is not applicable because there is no electricity generation outside the tolerance band, because the electricity generation is constant during the four years. Therefore, there is no electricity to be sold considering the PLD.

Total income: [3,000MWh/MW * BRL133/MWh] + [3,000 MWh/MW * BRL133/MWh] + [3,000MWh/MW * BRL133/MWh] + [3,000MWh/MW * BRL133/MWh] = BRL1,596,000/MW

Selling price per MWh = BRL1,596,000/MW / 12,000MWh/MW = BRL133.00/MWh

Scenario 2:

Production example: 3,000MWh/MW in the first year, 3,000MWh/MW in the second year, **4,000MWh/MW** in the third year, **2,000MWh/MW** in the fourth year;

Total output: 12,000MWh/MW (same as in Scenario 1)

Considering the above scenario for electricity generation, the reduction in the revenue must be considered since part of the generation is outside the tolerance band. Specifically during the third year 700MWh are below the tolerance band and during the fourth year 700MWh are above the tolerance band. In this sense, some electricity must be sold considering the PLD price.

Total income: [3,000MWh/MW * BRL133/MWh] + [3,000MWh/MW * BRL133/MWh] + [3,000MWh/MW * BRL133/MWh + 700MWh/MW * BRL40/MWh] + [3,000MWh/MW * BRL133/MWh - 700MWh/MW * BRL133/MWh] = BRL1,530,900/MW

Selling price per MWh = BRL1,530,900/MW / 12,000 MWh/MW = BRL127.58/MWh

As observed in the above example, although the total production of the four years and the auction price is the same as the one mentioned in the Scenario 1, the natural variability of wind resources causes a reduction of 4% of the earnings for each MWh generated (1 - 127.58 / 133.00 = 4%) and absolute income of the facility (1-1530900 / 1596000 = 4%).

Other aspects to consider in the investment analysis are the ones related to the specific risks associated with climate conditions and regulatory framework. In the specific case of wind energy the inevitable uncertainty about the total production over the lifetime of the project which is dependent of the wind resource available at a given moment must be considered.

In addition, in the future the wind availability may be affected by other project developers. It is worth noting the possibility that a third party wind farm, built later in a nearby site, may reduce the available wind resources and thus reduce the expected income. The basis of the Auction Alternative Sources (A-3) also introduces additional specific regulatory uncertainties linked to the uncertainty of the wind resource such as the reduction of the assured energy (from the Portuguese "*Garantia Física*") in the case of a lower production of electricity than the one contracted.

In order to quantify the possible reduction in income of the proposed project activity, the project owner conducted a statistical study that considered 5,000 wind generation scenarios over the 20 years of the PPA taking into account the expected variability of the wind resource over this period. The lower revenue per MWh for energy that is generated above the tolerance band has direct impacts in the reduction of project revenues as income at the free market is considered lower than the price negotiated in the auction.

The statistical results related to the correction factor calculation are presented in the Excel file "A-3 Simulation Results 30V1.xls Agio." supplied to the DOE.

Sub-step 2d: Sensitivity analysis

A sensitivity analysis was conducted by altering the following parameters:

• Increase in electricity generation, which may increase the project revenues;

• Increase in electricity tariff, which may also influence project revenues;

• Reduction in expected investments

• Reduction in O&M costs

Those parameters were selected as being the most likely to fluctuate over time. In addition, these variables constitute more than 20% of either total project costs or total project revenues (paragraph 20 of Annex 5, EB62). Financial analyses were performed altering each of these parameters by 10%, and assessing what was the impact on project's IRR (paragraph 21 of Annex 5, EB62). The result is presented below in Table 8.

Table 8 – Sensitivity analysis

Scenario	**% change**	**IRR (%)**
Original	-	5.71
Increase electricity generation	10%	7.27
Increase in the tariff	10%	7.27
Reduction in project investment	10%	7.05
Reduction in O&M costs	10%	5.94

As it can be seen from the results presented above, the IRR of the project does not surpass the benchmark considering the variation of the selected parameters by 10%. As observed, the IRR is not significantly modified when the O&M costs vary. Therefore, a simulation was conducted in order to verify possible scenarios where the IRR would equal the benchmark (Table 9) when the electricity generation, tariff and investments are changed.

Table 9 – Scenarios when project's IRR equals the benchmark (9.39%), considering 12.28MW of guaranteed power.

	IRR %	***PRICE (BRL/MWh)***	***COST (tBRL/MWh)***	***ELECTRICITY (MWh/yr)***	***Variation (%)***
Original	5.71	130.21	110,717	107,573	N/A
Price	9.39	162.17	110,717	107,573	24.55
Investment	9.39	130.21	84,089	107,573	24.05
Electricity	9.39	130.21	110,717	133,982	24.55

An increase in the price would result in a project IRR equal to the benchmark if readjusted to BRL 162.17/MWh. This corresponds to a variation of 24.55% from the original price considered (BRL130.21/MWh). In the other hand, the project's IRR would equal the benchmark in the scenario where 133,982MWh/yr are exported by the plant to the grid (originally, the plant is planned to export

107,573MWh/yr). This variation also corresponds to an increase in the electricity generation equivalent to 24.55%.

The results presented above were achieved considering the guaranteed power actually negotiated during the auction in which the project sold its electricity - *i.e.* 12.28MW. In addition to this analysis, another simulation can be conducted considering the total guaranteed power as authorized by ANEEL – *i.e.* 12.9MW. The results are presented in the table below.

Table 10 – Scenarios when project's IRR equals the benchmark (9.39%), considering 12.9MW of guaranteed power.

	IRR %	*PRICE (BRL/MWh)*	*COST (tBRL/MWh)*	*ELECTRICITY (MWh/yr)*	*Variation (%)*
Original	6.51	130.21	110,717	113,004	N/A
Price	9.39	154.43	110,717	113,004	18.60
Investment	9.39	130.21	89,570	113,004	19.10
Electricity	9.39	130.21	110,717	134,023	18.60

As it can be seen from the results presented above, even considering the highest guaranteed power as authorized by ANEEL, significant variations have to be observed in order the IRR of the project equals the benchmark. Nevertheless, it shall be noted that these variations in price, electricity and investment are not expected to occur as further substantiated below.

The price used in the analysis (BRL130.21/MWh) was taken from the results of the public auction conducted by the Chamber of Electrical Energy Commercialization (CCEE – *Câmara de Comercialização de Energia Elétrica*) in which the electricity to be dispatched by the plant was negotiated. According to CCEE *the criterion of the least tariff is used to define the winners of a given auction, that is, the winners of the auction shall be those bidders which offer electric power for the least price per Mega-Watt Hour to supply the demand envisaged by the Distributors*.

The result of a successful participation in this kind of public auction is the signature of a Power Purchase Agreement called CCEAR – Contract on Energy Commercialization in Regulated Market[34]. CCEAR's will remain fixed throughout the years, and will only be adjusted accordingly to the Amplified Consumers Price Index (from the Portuguese *Índice de Preços ao Consumidor Amipliado*), which is the official index that measures the inflation in Brazil. However, the cash flow was done without considering any variation due to inflation over the considered years.

As discussed above, a discount rate of 3.26 was applied to this price to account for the possible penalties related to a lower generation of electricity by the plant. These penalties are established in the PPA. Moreover,

[34] According to CCEE *the new model for the electric sector states that the commercialization of electric power is accomplished in two market ambiences: the Regulated Contracting Ambience – ACR (Ambiente de Contratação Regulada) and the Free Contracting Ambience –ACL (Ambiente de Contratação Livre). Contracting in the ACR is formalized by means of regulated, bilateral agreements, called Electric Power Commercialization Agreements within the Regulated Ambience (CCEAR – Contratos de Comercialização de Energia Elétrica no Ambiente Regulado) entered into between Selling Agents (sellers, generators, independent producers or self-producers) and Purchasing Agents (distributors) which participate of electric power purchase and sale auctions.*

this discount also takes into account the uncertainties related the regulatory framework from the investors' perspective.

The use of this discount is in line with the scenario considered in the decision making context. Even when the correction price is not considered for the scenario presented above in Table 10 (higher installed capacity), the IRR of the project is significantly below the benchmark (7.06%). Yet, the electricity price would have to be increased by 14.70% so the IRR of the project equals the benchmark. Hence, no variation in the project IRR can be expected to be associated to a possible increase in the price of electricity.

The electricity generation is not expected to rise because the estimative is based on the guaranteed power as measured at the plant's site by a third party at 50% of probability (P50). As explained previously this range means that there is a 50:50 chance of a higher or lower generation of electricity generation by the plant. At this range, more wind is captured indicating and optimistic estimative. For a reference, financing institutions consider wind measurements at 90% of probability (P90) as a conservative approach. Therefore, an increase in project revenues due to an increase in the electricity generation above the assumption presented in the cash-flow is not probable.

The total investment necessary to build the plant as it is presented in the cash flow corresponds to the estimated investment cost made by the project owner. Specifically for this project activity the project owner is planning to sign an EPC contract. This type of contract fixes the price to build a plant and any variation either in favor or against the project is in charge of the construction company which means that no variation in project IRR can be attributed to a variation in the investment costs

Outcome

The IRR of the project activity without being registered as a CDM project is significantly below the sector benchmark, evidencing that project activity is not financially attractive to investor. Then, scenario 1 would be the most plausible alternative to the project activity, *i.e.* the continuation of the current situation with additional electricity supplied by the Brazilian Interconnected Grid.

SATISFIED/PASS – Proceed to Step 3

Step 3. Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity

Not applicable. Step 2 was applied in order to determine project's additionality.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives:

Not applicable. Step 2 was used to determine project's additionality.

SATISFIED/PASS – Proceed to Step 4

Step 4. Common practice analysis

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

According to the additionality tool, "*projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc*".

Based on the definition presented above, the tool provides a stepwise approach to be applied while conducting the common practice in order to identify similar projects to the proposed CDM Project Activity. Furthermore, the tool establishes that this approach shall be used if the proposed CDM Project Activity complies with one of the measures listed below:

(a) Fuel and feedstock switch;
(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);
(c) Methane destruction;
(d) Methane formation avoidance.

The proposed CDM Project Activity matches option (b) since it consists of a switch from grid electricity to electricity generation from wind power plants[35]. Therefore, only wind power plants were considered in this common practice analysis.

Step 1: *Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.*

The plant has 28 MW of installed capacity. Hence, only projects between 14 and 42 MW of installed capacity are going to be taken into consideration.

Step 2: *In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities shall not be included in this step;*

As per the guidance of step 2, the plants considered in the analysis were selected following the definitions for output and geographical area as presented in the additionality tool.

[35] Analogously to the example provided in the Annex 8 of the EB 62.

(i) Output

The additionality tool defines output as "*goods or services with comparable quality, properties, and application areas (e.g. clinker, lighting, residential cooking)*". Therefore, in the case of the project, the output considered is the renewable electricity generated by grid-connected wind power plants.

(ii) Applicable geographical area

The additionality tool states:

> *"Applicable geographical area covers the entire Host Country as a default; if the technology applied in the project is not country specific, then the applicable geographical area should be extended to other countries".*

The technology to be applied in the project is not country specific. Nevertheless, Brazil has an extension of 8,514,876.599 square kilometres[36] (with over 4,000 km distance in the north-south as well as in the east-west axis) and 6 distinct climate regions: sub-tropical, semi-arid, equatorial, tropical, highland-tropical and Atlantic-tropical (humid tropical).

These climatic variations obviously have a strong influence in the technical aspects related to the implementation of wind farms since meteorological events have strong influence in the wind regime. As cited by VESELKA[37], the *climate affects all major aspects of the electric power sector from electricity generation, transmission and distribution system to consume demand for power*. Therefore, it is reasonable to assume that the technology may vary considerably from location to location within the country.

According to the Brazilian Electricity Regulatory Agency all regions of the country have some potential to generate electricity using wind, however the highest wind power potential is located in the northeast region of the country, where the majority of operational projects are located (Figure 6).

[36] Available at: http://www.ibge.gov.br/home/geociencias/areaterritorial/principal.shtm.

[37] VESELKA, T. D. Balance power: A warming climate could affect electricity. Geotimes. Earth, energy and environment news. American Geological Institute: August, 2008. Available at: < http://www.agiweb.org/geotimes/aug08/article.html?id=feature_electricity.html>.

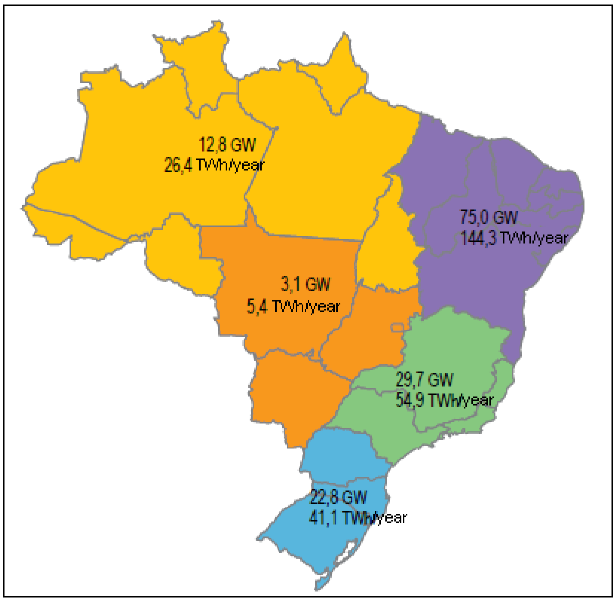

Figure 6 – Brazilian wind resource potential[38].

Nevertheless, the climate conditions are not the only distinguishing feature among the several regions of the country. In Brazil, project developers connecting to the transmission or distribution network are charged a fee called Tariff for the Use of the Transmission/Distribution System. This tariff varies depending on the state where the power plant is connected to. TUST/TUSD is established by specific ANEEL regulation and has strong impact in the financial analysis of a project. Just for reference, for the second semester of 2011 until the first semester of 2012, TUSD in Alagoas state (located in the same region of Rio Grande do Norte) was BRL7.35/kW and BRL3.51/kW in Rio Grande do Norte state (more than two times lower than Alagoas).

In addition, it is worth mentioning that each state has a specific environmental agency responsible for determining the technical standards required to obtain all environmental licenses, with regional regulations and distinct administrative process established by each state region.

Therefore, when evaluating the different climate conditions of each region, the specific environmental regulatory framework of each state, the energy price subdivision per markets and different values of TUSD/TUST applied at each Brazilian state, it's clear that the national territory does not consist of the same "comparable environments" as required by the methodological tool "*Demonstration and assessment of additionality*". Undoubtedly, these differences among the Brazilian states (climate, energy price, transmission/distribution costs and environmental legislation) have technical, financial and regulatory impacts for the implementation of wind power plants.

In summary, taking into account the definitions presented above, only grid-connected wind power plants; with an installed capacity between the range established in *Step 1* above and located in Rio Grande do Norte state were considered. Other CDM Project Activities, defined by the tool as the ones *registered (...)* and that *have been published on the UNFCCC website for global stakeholder consultation as part of the validation*

[38] ANEEL - Agência Nacional de Energia Elétrica. **Atlas de energia elétrica do Brasil**. 3ed. – Brasília: Aneel, 2008. Available at <http://www.aneel.gov.br/biblioteca/EdicaoLivros2009atlas.cfm>.

process were not taken into consideration. In addition, only plants that became operational before 28/07/2011 (starting date of the project activity) were considered.

A list of all plants considered in the analysis was supplied to the DOE. The result of N_{all} for each range identified above in step 1 (14MW – 42MW), is that there is no operational wind power plant with an installed capacity between the identified range located in the Rio Grande do Norte state. Therefore, $\mathbf{N_{all} = 0}$.

Step 3: *Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number* N_{diff}.

As discussed above in *Step 2*, no similar wind power plant located in Rio Grande do Norte was identified. Hence, $\mathbf{N_{diff} = 0}$.

Step 4: *Calculate factor* $F=1-N_{diff}/N_{all}$ *representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.The proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and* $N_{all}-N_{diff}$ *is greater than 3.*

From the results discussed above, we have:

$N_{all} - N_{diff} = 0 < 3$ and,

$F = 1- N_{diff} / N_{all} = 0 < 0.2$

Therefore, the proposed CDM Project Activity is not a common practice.

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

The common practice analysis was conducted despite of the small share of electricity generated by the operational wind power plants. As of today, wind power projects represent only 1.24% of the operational plants in the country (***Erro! Fonte de referência não encontrada.***).

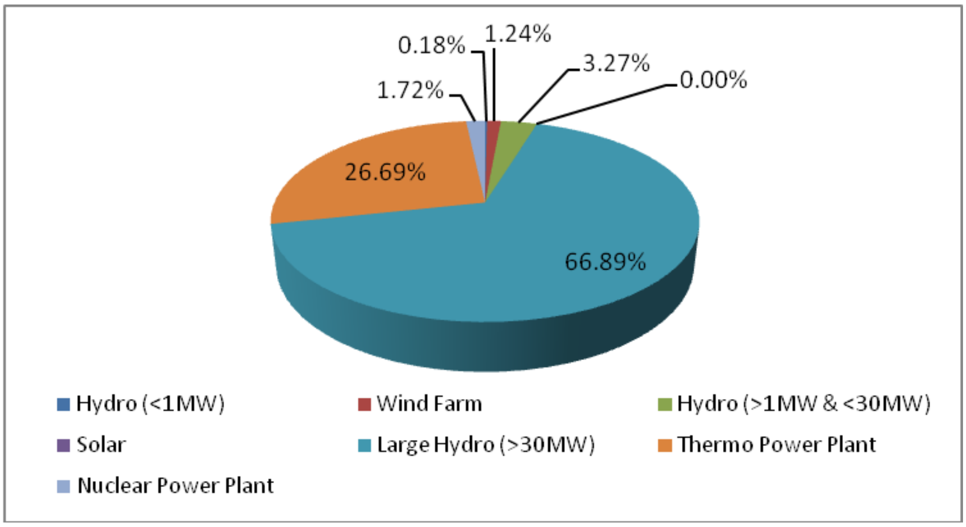

Figure 7 - Brazil's generation capacity per type of energy source, as of January 2012.

Source: ANEEL (2011)[39]

Rio Grande do Norte state accounts for almost 14% (10 out of 72) of the operational wind power plants in the country. Nevertheless, as demonstrated previously, none of these plants can be considered similar to the proposed project activity.

In summary, this project cannot be considered common practice and therefore is not a business as usual type scenario. And it is clear that, in the absence of the incentive created by the CDM this project would not be the most attractive scenario.

SATISFIED/PASS – Project is ADDITIONAL

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission Reductions (ER_y)

According to ACM0002 emission reductions by the proposed project activity are calculated as follows.

$$ER_y = BE_y - PE_y$$ **Equation 1**

Where,

ER_y = Emission reductions in year *y* (t CO_2e/yr);

BE_y = Baseline emissions in year *y* (t CO_2/yr);

PE_y = Project emissions in year *y* (t CO_2e/yr).

[39] ANEEL (2010). Banco de Informações de Geração - BIG. Capacidade de Geração. http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp. Accessed on 24 January 2012.

Baseline emissions (BE_y)

Baseline emissions are calculated as follows:

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

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).

For Greenfield projects as it is the case of the proposed project activity $EG_{PJ,y}$ is determined as follows.

$$EG_{PJ,y} = EG_{facility,y}$$ **Equation 3**

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).

Explanations as to how the quantity of net electricity generation supplied by the project plant/unit to the grid ($EG_{facility,y}$) was estimated is presented below in section B.6.3. The calculation of the combined margin CO_2 emission factor for grid connected power generation ($EF_{grid,CM,y}$) follows, as recommended by ACM0002, the procedures established in the methodological tool "*Tool to calculate the emission factor for an electricity system*".

According to this tool Project Participants shall apply six steps in order to calculate the baseline emission factor as further detailed below.

- **STEP 1 -** Identify the relevant electricity systems

According to the tool, "*If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. If such delineations are not available, project participants should define the project electricity system and any connected electricity system and justify and document their assumptions in the CDM-PDD*".

Brazilian DNA published Resolution #8, issued on 26th May, 2008, defines the Brazilian Interconnected Grid as a single system that covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest). Hence this figure will be used to calculate the baseline emission factor of the grid.

- **STEP 2** – Choose whether to include off-grid power plants in the project electricity system (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 Brazilian DNA made available the emission factor calculation based on information of the grid power plants only – option (i) – following the "Tool to calculate the emission factor for an electricity system". More information of the methods applied can be obtained at the DNA's website (http://www.mct.gov.br/index.php/content/view/4016.html).

- **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 OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

Since there is no preferable method for the calculation of the OM emission factor, the Project Participants have chosen the method and calculation made available by the Brazilian DNA (*Comissão Interministerial de Mudança Global do Clima – CIMGC*), using option (c) Dispatch data analysis OM. More information of the OM emission factor can be obtained at the DNA's website (http://www.mct.gov.br/index.php/content/view/74689.html).

According to the "Tool to calculate the emission factor for an electricity system", in the "dispatch data analysis OM" method, it shall be considered the year in which the project activity displaces grid electricity and update the emission factor annually during monitoring. Therefore, Arizona I applies the *ex-post* data vintage.

- **STEP 4 -** Calculate the operating margin emission factor according to the selected method

According to the tool "*the dispatch data analysis OM emission factor ($EF_{grid,OM\text{-}DD,y}$) is determined based on the grid power units that are actually dispatched at the margin during each hour h where the project is displacing grid electricity*". It shall be calculated using the formulae below:

$$EF_{grid,OM-DD,y} = \frac{\sum_{h} EG_{PJ,h} \times EF_{EL,DD,h}}{EG_{PJ,y}}$$ **Equation 4**

Where,

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour *h* of year *y* (MWh)

$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh)

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year *y* (MWh)

h = Hours in year *y* in which the project activity is displacing grid electricity

y = Year in which the project activity is displacing grid electricity

Calculation of hourly CO_2 emission factor for grid power units ($EF_{EL,DD,h}$)

The Brazilian DNA made available the calculation of the operating margin emission factor based on option (c) dispatch data analysis. Therefore, the project participants used this figure for Arizona I project activity.

However, the project participants neither have access to the decisions that the Brazilian DNA took in order to calculate the hourly CO_2 emission factor nor to the spreadsheet used. Only final values are available for public consultation. Hence, the project participants are not able to describe which method has been used to calculate the hourly emission factor.

Calculation to determine the set of grid power units n in top of the dispatch

The Brazilian DNA made available the calculation of the operating margin emission factor based on option (c) dispatch data analysis. Therefore, the project participants used this figure for Arizona I project activity.

However, the project participants neither have access to the decisions that the Brazilian DNA took in order to determine the set of power units *n* nor to the spreadsheet used. Only final values for the hourly emission factor ($EF_{EL,DD,h}$) are available for public consultation. Hence, the project participants are not able to describe which method has been used to determine the set of power units *n*.

- **STEP 5 -** Calculate the build margin (BM) emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which electricity generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$ **Equation 5**

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which electricity generation data is available

Calculation to determine the set of power units m included in the build margin

The Brazilian DNA made available the calculation of the build margin emission. Therefore, the project participants used this figure for Arizona I project activity.

However, the project participants neither have access to the decisions that the Brazilian DNA took in order to determine the set of power units *m* nor to the spreadsheet used. Only final values are available for public consultation. Hence, the project participants are not able to describe which method has been used to determine the set of power units *m*.

Calculation of the CO_2 emission factor for each power unit m ($EF_{EL,m,y}$)

The Brazilian DNA made available the calculation of the build margin emission. Therefore, the project participants used this figure for Arizona I project activity.

However, the project participants neither have access to the decisions that the Brazilian DNA took in order to calculate the CO_2 emission factor for each power unit *m* nor to the spreadsheet used. Only final values are available for public consultation. Hence, the project participants are not able to describe which method has been used to calculate the CO_2 emission factor for each power unit *m*.

- **STEP 6 –** Calculate the combined margin (CM) emission factor.

The calculation of the combined margin (CM) emission factor may be based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) is not applicable since it can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered CDM projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$ **Equation 6**

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 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 (owing to their intermittent and non-dispatchable nature) 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.

According to the tool, for wind power generation project activities, as is the case of the proposed project activity, weights are w_{OM} = 0.75 and w_{BM} = 0.25.

Project emissions (PE_y)

According to ACM0002, *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 for as project emissions by using the following equation:*

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$ **Equation 7**

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).

Emissions from fossil fuel combustion ($PE_{FF,y}$)

According to the methodology, only geothermal and solar thermal projects have to account emissions from the consumption of fossil fuels. Therefore, in the case of the proposed project activity, $PE_{FF,y}$ = 0 tCO_2/year.

Emissions from the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y}$)

Considering that the proposed project activity consists on the construction of a wind power plant, there are no emissions related to non-condensable gases from the operation of geothermal power plants. Therefore, $PE_{GP,y}$ = 0 tCO_2/year.

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

New hydro electric power projects resulting in new reservoirs, shall account for CH_4 and CO_2 emissions from reservoirs. Considering that the proposed project activity consists of the construction of a wind power plant, there are no emissions from water reservoirs. Therefore, $PE_{HP,y}$ = 0 tCO_2/year.

Leakage calculation (LE_y)

According to the methodology, "*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 (e.g. extraction, processing, and transport). These emissions sources are neglected".* Therefore, leakage emissions related to the implementation of the proposed project activity are 0 tCO_2.

B.6.2. Data and parameters that are available at validation:

All parameters will be monitored (*ex-post*). For more details, please refer to the section B.7.1.

B.6.3. Ex-ante calculation of emission reductions:

Baseline emissions (BE_y)

The quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* ($EG_{faciclity,y}$, in MWh/yr) was determined, for the purpose of *ex-ante* estimative as being equal to the average assured power as estimated by a third party[40] multiplied by the number of hours in the year. The result is that the electricity generation by the plant considered in this CDM Project Activity is equal to 113,004MWh/year (Table 11).

Table 11 – Net electricity generation by the wind plants of the CDM Project Activity

Wind Power Plant	*Assured Energy (MW_{ave}/yr)*	*Net electricity generation (MWh/yr)*
Arizona 1	12.9	113,004

Additionally, the calculation of the combined margin CO_2 emission factor for grid connected power generation ($EF_{grid,CM,y}$) follows the steps established in the "*Tool to calculate the emission factor for an electricity system*". The results are presented below.

- **STEP 1 -** Identify the relevant electricity systems

Following Resolution #8, issued by the Brazilian DNA on 26th May, 2008, the Brazilian Interconnected Grid (from the Portuguese *Sistema Interligado Nacional – SIN*) corresponds to the system to be considered. It covers all the five macro-geographical regions of the country (North, Northeast, South, Southeast and Midwest) as presented in the figure below.

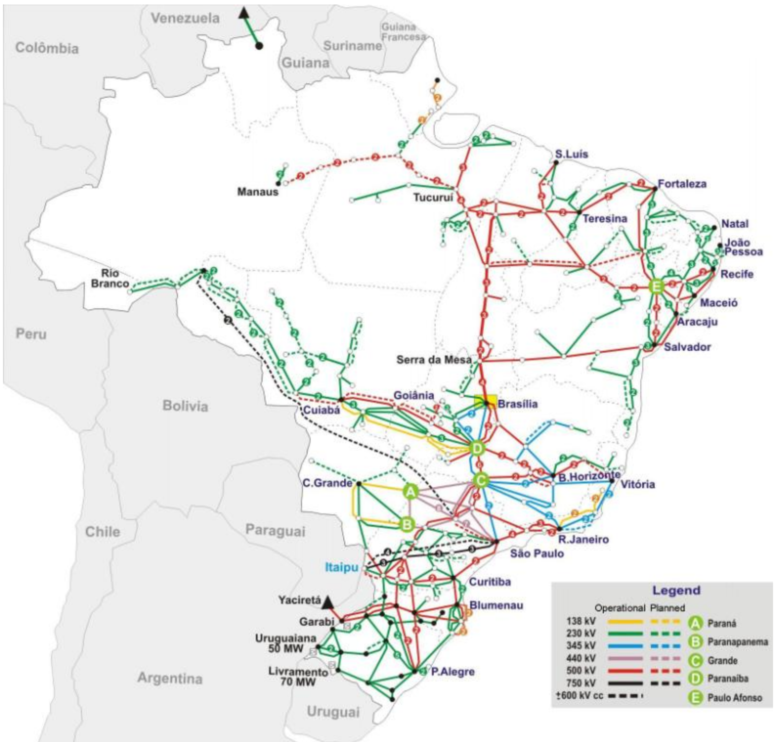

Figure 8 – Brazilian Interconnected System. (*Source:* Electric System National Operator)

[40] Documents presented to the financial institution (BNDES) as well as approved by the government as referred to in the ANEEL Ordinance #144, dated March 3rd, 2011. This is in line with **option a** provided by the "*Guidelines for the reporting and validation of plant load factors*" (Annex 11, EB48). The estimated energy production considered a probability of 50% (P50).

- **STEP 2** – *Choose whether to include off-grid power plants in the project electricity system (optional)*

Option I was chosen and only grid connected power plants are considered.

- **STEP 3 -** *Select a method to determine the operating margin (OM)*

The Brazilian DNA made publicly available the OM through the dispatch data analysis OM (option C). Therefore, this method was used for the proposed project activity. Please refer to section B.6.1. for explanation of the methodological choices.

- **STEP 4 -** Calculate the operating margin emission factor according to the selected method

The Brazilian DNA made publicly available the OM emission factor through the dispatch data analysis OM (option c). Therefore, data of 2010 was used (the most recent data available by the time GSP started) as presented below.

$EF_{grid,OM\text{-}DD,y}$ = 0.4787 tCO_2e/MWh

- **STEP 5 -** Calculate the build margin (BM) emission factor

The Brazilian DNA made publicly available the build margin emission factor. Therefore, data of 2010 was used (the most recent data available by the time GSP started) as presented below.

$EF_{grid,BM,y}$ = 0.1404 tCO_2e/MWh

- **STEP 6** – Calculate the combined margin (CM) emission factor

Applying the results presented above in STEPS 4 and 5 above to the Equation 6 presented in section B.6.1. and considering the weights w_{OM} = 0.75 and w_{BM} = 0.25 we obtain,

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

$EF_y = 0.75 \times 0.4787 + 0.25 \times 0.1404$

$EF_{grid,CM,y}$ = 0.3941 tCO_2e/MWh

Finally, baseline emissions can be determined applying the results of $EG_{facility,y}$ and $EF_{grid,CM.y}$ to Equation 2 as follows,

$BE_y = EG_{PJ,y}$ x $EF_{grid,CM,y}$

$EG_{PJ,y} = EG_{facility,y}$ = 113,004MWh/year

BE_y = 113,004MWh/year x 0.3941tCO_2/MWh

BE_y = 44,535tCO_2/year

Project Emissions (PE_y)

As explained above in section B.6.1. project emissions by the proposed project activity are **zero**.

PE_y = 0tCO_2e/year

Leakage emissions (LE_y)

The calculation of leakage emissions is not required by the methodology.

$LE_y = 0tCO_2/year$

Emission reductions (ER_y)

Applying the results discussed above to Equation 1 we obtain,

$ER_y = BE_y – PE_y$

$ER_y = 44{,}535tCO_2/year$

B.6.4 Summary of the ex-ante estimation of emission reductions:

Table 12 – Summary of the ex-ante estimation of emission reductions

Years*	**Estimation of project activity emissions** (tonnes of CO_2e)	**Estimation of baseline emissions** (tonnes of CO_2e)	**Estimation of leakage** (tonnes of CO_2e)	**Estimation of overall emission reductions** (tonnes of CO_2e)
Year 1	0	38,986	0	38,986
Year 2	0	44,535	0	44,535
Year 3	0	44,535	0	44,535
Year 4	0	44,535	0	44,535
Year 5	0	44,535	0	44,535
Year 6	0	44,535	0	44,535
Year 7	0	44,535	0	44,535
Total (tonnes of CO_2e)	**0**	**306,196**	**0**	**306,196**

**From May 7th until May 6th of the subsequent year*

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	***$EG_{facility,y}$***
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*.
Source of data to be used:	Onsite measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	113,004
Description of	The quantity of electricity delivered to the grid by the project will be quantified

measurement methods and procedures to be applied:	through the energy meter located at the substation. Information provided by Project Participants van be crosschecked using the reports issued the local power utility and/or CCEE – Câmara de Comercialização de Energia Elétrica, a Brazilian governmental entity which monitors the quantity of electricity in the national interconnected grid.
QA/QC procedures to be applied:	Energy metering QA/QC procedures are explained in section B.7.2 (the equipments used have by legal requirements extremely low level of uncertainty – 0.2 precision class). In addition, there will be another meter at the substation (backup) to ensure that electricity will be properly measured.
Any comment:	Since the proposed project activity is a greenfield plant, as explained above in section B.6.1. this parameter corresponds to $EG_{PJ,y}$ used to determine baseline emissions.

Data / Parameter:	$EF_{grid,OM\text{-}DD,y}$
Data unit:	tCO_2/MWh
Description:	Dispatch data analysis operating margin CO_2 emission factor in year *y*
Source of data used:	Brazilian DNA website (http://www.mct.gov.br/index.php/content/view/74689.html)
Value applied:	For the purpose of the emissions reductions estimation the value used is 0.4787 tCO_2/MWh based on 2010 data published by the Brazilian DNA.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *ex-post* calculation vintage of this parameter was chosen as per the procedures of the *"Tool to calculate the emission factor for an electricity system"*.
Any comment:	For methodological choices details, please refer to section B.6.1.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	Build Margin CO_2 emission factor in year *y*
Source of data used:	Brazilian DNA website (http://www.mct.gov.br/index.php/content/view/74689.html)
Value applied:	For the purpose of the emissions reductions estimation the value used is 0.1404 tCO_2/MWh based on 2010 data published by the Brazilian DNA.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The *ex-post* calculation vintage of this parameter was chosen as per the procedures of the *"Tool to calculate the emission factor for an electricity system"*.
Any comment:	For methodological choices details, please refer to section B.6.1.

B.7.2. Description of the monitoring plan:

The Project owner will proceed with the necessary monitoring measures as established in the procedures from the Electric System National Operator (ONS – from the Portuguese *Operador Nacional do Sistema*), Brazilian Electricity Regulatory Agency (ANEEL from the Portuguese *Agência Nacional de Energia Elétrica*) and the Electric Power Commercialization Chamber (CCEE form the Portuguese *Câmara de Comercialização de Energia Elétrica*).

The ONS is the entity responsible for coordinating and controlling the operation of generation and transmission facilities in the National interconnected Power System (NIPS) under supervision and regulation of ANEEL[41] which is the regulatory agency providing favourable conditions for the electric power market to develop a balance between the agents and the benefit of society[42]. CCEE is a not-for-profit, private, civil organization company that is in charge of carrying out the wholesale transactions and commercialization of electric power within the NIPS, for both Regulated and Free Contracting Environments and for the spot market[43].

The total electricity exported to the grid will be monitored following the procedures and requirements established by ONS which defines the technical characteristics and precision class (0.2% of maximum permissible error) of the electricity meters to be used[44]. In addition, ONS also rules about the electricity meter calibration requirements (every two years)[45].

There will be two energy meters (principal and backup) located at the substation, as specified by CCEE. Before the operation starts, CCEE demands that these meters are individually registered within their system and calibrated by an entity with Rede Brasileira de Calibração (RBC) credential. Beyond that, energy information will be controlled in real time by CCEE. Once the measurement points are physically defined and the invoice measurement system and the communication infrastructure are installed, the measurement points will be registered in the SCDE (System of Energy Data collection) managed by CCEE.

As mentioned before, CCEE makes feasible and regulates the electricity energy commercialization in Brazil. In a process called Accounting Commensuration Aggregation (from the Portuguese, *Agregação Contábil da Medição*) CCEE compares the energy generation reported by every seller connected to the national grid with the consumption registered during the month under consideration. After the adjustments due to energy losses occurring in the transmission system are made, CCEE issues several official reports certifying the amount of energy generated by each seller.

Moreover, to confirm CCEE's information, every month the company auditing CCEE's reports randomly selects a sample of sellers that have to provide detailed information of their Power Purchase Agreement(s) and energy generation during the month being analyzed. Then the auditors analyse the information, check whether CCEE's calculation is correct and issue an opinion. The independent auditors' statements confirming CCEE's information are available at CCEE's website.

[41] Information available at <http://www.ons.org.br/institucional/modelo_setorial.aspx?lang=en>.
[42] Information available at <http://www.aneel.gov.br/>.
[43] Information available at <http://www.ccee.org.br/cceeinterdsm/v/index.jsp?vgnextoid=25afa5c1de88a010VgnVCM100000aa01a8c0RCRD>.
[44] ONS – Operador Nacional do Sistema. **Procedimentos de Rede – Módulo 12: medição para faturamento / Submódulo 12.2: Instalação do sistema de medição para faturamento.** Available at http://www.ons.org.br/procedimentos/modulo_12.aspx.
[45] ONS – Operador Nacional do Sistema. **Procedimentos de Rede – Módulo 12: medição para faturamento / Submódulo 12.3: Manutenção do sistema de medição para faturamento.** Available at http://www.ons.org.br/procedimentos/modulo_12.aspx.

The final results of electricity generation are published at CCEE's website and are publicly available. Hence, CCEE's information - which is an official and publicly available source – is going to be used to cross-check information monitored by the project participant.

The company that owns the wind farm will be the responsible for data collection and archiving as well as the calibration and maintenance of the monitoring equipment, for dealing with possible monitoring data adjustments and uncertainties, review of reported results/data, internal audits of GHG project compliance with operational requirements and corrective actions. Also, it is responsible for the project management, as well as for the organising and training of the staff in the appropriate monitoring, measurement and reporting techniques.

It is important to mention that ANEEL can visit the plant to inspect the operation and maintenance of the facilities at any time.

Studies done during the design phase of the project activities have shown the environmental impacts and the interference on the social development in the region of the plant, indicating the mitigation measures to be adopted during the construction phase. These measures are being taken rigorously. Data about environmental impact is being archived by the power plant and the environmental agencies.

Additionally, the Project predicts an environmental plan that involves different programs during its operation. Further, after the beginning of the commercial operations, renovation of degraded areas and permanent preservation areas will be carried out according to the regulations of the environmental agencies, through a team of environment experts.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

Date of completing the final draft of this baseline section and the monitoring methodology (DD/MM/YYYY): 25/02/2011.

Name of person/entity determining the baseline:

Company:	Ecopart Assessoria em Negócios Empresariais Ltda.
Address:	Rua Padre João Manoel, 222
Zip code + city:	01411-000 São Paulo
Country:	Brazil
Telephone number:	+55 (11) 3063-9068
Fax number:	+55 (11) 3063-9069
E-mail:	info@eqao.com.br

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

According to the CDM Glossary of Terms the starting date of a CDM project activity is "*the earliest date at which either the implementation or construction or real action of a project activity begins*". Furthermore the guidance also clarifies that "*the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity (...), for example, the date on which contracts have been signed for equipment or construction/operation services required for the project activity*".

Considering the above information, in order to determine project activity's starting date the forecasted date for the following events were considered: **financing agreement, Power Purchase Agreement, major equipment orders and start of construction**. These dates were identified as below:

- **Financing agreement:** Financing contract has not been signed.
- **Power Purchase Agreement:** 28/07/2011. This is the date when the PPA was signed.
- **Major equipment orders:** 25/10/2011. This is the date when the contract with GAMESA (turbine manufacturer) was signed.
- **Start of construction:** scheduled to begin on 1 December 2011 as per the schedule presented in the ANEEL Ordinance #144/2011.

Commonly, several necessary steps to build the wind power plants, such as the financing contract, are only obtained after the signature of the Power Purchase Agreement. Nevertheless, if the company decides not to build the plant after the signature of the PPA there would be relevant penalties.

Hence, although this event neither can be considered as the financial closure nor represents a significant expenditure related to the implementation of the plant, the project developer have committed itself to the terms of the contract assuming that the wind power plant was in fact going to be implemented. Therefore, this must be considered the project starting date.

From the above, the identified starting date of the proposed project activity is 28/07/2011.

C.1.2. Expected operational lifetime of the project activity:

25y-0m

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

07/05/2012

C.2.1.2. Length of the first crediting period:

7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

In Brazil, the sponsor of any project that involves construction, installation, expansion or operation of any polluting or potentially polluting activity or any other capable to cause environmental degradation is obliged to secure a several permits from the relevant environmental agency (federal and/or local, depending on the project).

The environmental impact of the Project is considered small given the other sources of electricity generation. Power plants project with installed capacity greater than 10 MW must do the environmental impact assessment and respective environmental impact report in order to obtain the necessary licenses to the project.

Licenses required by the Brazilian environmental regulation (National Environmental Council Resolution – from the Portuguese CONAMA - *Conselho Nacional do Meio Ambiente* nr. 237/97[46]) are:

- The preliminary license (*Licença Prévia* or LP);
- The construction license (*Licença de Instalação* or LI); and
- The operating license (*Licenca de Operação* or LO).

The process starts with a previous analysis (preliminary studies) by the local environmental department. After that, if the project is considered environmentally feasible, the sponsors have to prepare the Environmental Assessment.

The result of those assessments is the Preliminary License (LP), which reflects the environmental local agency positive understanding about the environmental project concepts.

In order to obtain the Construction License (LI) it is necessary to present (a) additional information about previous assessment; (b) a new simplified assessment; or (c) the Environmental Basic Project, according to the environmental agency decision informed at the LP.

The Operation License (LO) is a result of pre-operational tests during the construction phase to verify if all exigencies made by environmental local agency were completed.

[46] Available at: http://www.mma.gov.br/port/ conama/res/res97/res23797.html.

The plant possess the Preliminary License nr 2010-036397/TEC/LP-41 which was issued by the Rio Grande do Norte Environmental Agency (from the Portuguese *Instituto de Desenvolvimento Sustentável e Meio Ambiente do Rio Grande do Norte - IDEMA*) on May 14th, 2010 and is valid through May 14th, 2012.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The growing global concern regarding the sustainable use of resources is driving a requirement for more sensitive environmental management practices. Increasingly this is being reflected in countries' policies and legislation. In Brazil the situation is no different; environmental rules and licensing process policies are very strict in line with the best international practices.

As mentioned in section D.1, power plants with installed capacity greater than 10 MW have to do an environmental impact assessment and a respective environmental impact report in order to obtain the necessary licenses to the project. Given the project already possesses the preliminary environmental license, it can be concluded that it does not indicate in significant negative transboundary environmental impacts; otherwise the license would not have been issued by the environmental agency.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

According to Resolution nr. 7, issued on March 5th 2008[47], Brazilian Designated National Authority (*Comissão Interministerial de Mudanças Globais do Clima – CIMGC)*, requests, among other documents, comments from local stakeholders in order to provide the Letter of Approval for a project.

The Resolution determines that the project proponent has to send invite for comments, at least, the following agents involved in and affected by project activity:

- Municipal governments and City Councils;
- State and Municipal Environmental Agencies;
- Brazilian Forum of NGOs and Social Movements for Environment and Development;
- Community associations;
- State Attorney for the Public Interest (state and federal);

The same resolution also requires that at the time these letters are sent, a version of the PDD in the local language and a declaration stating how the project contributes to the sustainable development of the country must be made available to these stakeholders at least 15 days previous to the starting of the Global Stakeholder

[47] Available at: <http://www.mct.gov.br/>.

Process (GSP). The Portuguese version of the PDD was published at the internet website <http://sites.google.com/site/consultadcp/> on 25/05/2011 which is also the date when the invitation letters were sent to the following agents:

- Federal Attorney for the Public Interest;
- State Attorney for the Public Interest of Rio Grande do Norte;
- Environmental Agency of Rio Grande do Norte (IDEMA);
- Brazilian Forum of NGOs and Social Movements for Environment and Development;
- *City Hall of Rio do Fogo*;
- *City Council of Rio do Fogo;*
- *Environmental Agency of Rio do Fogo;*
- *Community Association of Rio do Fogo;*

Copies of the letters and post office confirmation of receipt are available upon request and will be submitted to the DOE during the validation of the Project Activity.

E.2. Summary of the comments received:

No comments have been received yet.

E.3. Report on how due account was taken of any comments received:

No comments have been received yet.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the present project.

This project is not a diverted ODA from an Annex 1 country.

Annex 3

BASELINE INFORMATION

This section is intentionally left blank. For details please refer to section B.6.1. and B.6.3. above.

Annex 4

MONITORING INFORMATION

This section is intentionally left blank. For details please refer to section B.7.2. above.

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