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

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Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Trairi Wind Power Plant CDM Project

PDD Version number: 03

Date: 30 January 2012

A.2. Description of the project activity:

Trairi Wind Power Plant CDM Project, hereinafter referred to as Trairi Project, consists of the construction and operation of a wind power plant with 25.4MW of installed capacity that will supply clean electricity to the Brazilian National Interconnected System (Sistema Interligado Nacional - SIN). The project is located in the northeast of Brazil, on the coast of Ceará State, in the city of Trairi. The investment is being realized on the basis of an innovative commercial strategy as the electricity generated is sold to the Brazilian Free Electricity Market. Though the free market offers specific incentives and advantages for renewable energies, this strategy also implies higher commercial risks when compared to the regulated market environment, thus increasing the exposure of the entrepreneur.

The implementation and operation of the CDM project activity will reduce greenhouse gases (GHG) emissions as the additional electricity generated and dispatched to the system will allow diminishing electricity generated by fossil fuelled thermal power plants at the SIN's operational margin, or by avoiding or postponing addition of new GHG intensive generation sources to the system.

In spite of a great potential for their development, Wind Power generation activities, such as the Trairi Project, so far only represent a small share of the Brazilian electric matrix. According to ANEEL (National Electric Energy Agency / Agência Nacional de Energia Elétrica)[1], wind power plants represent only 0.81% of country's installed capacity. Given this context, projects like Trairi represent an important renewable and clean non-conventional alternative for electricity generation and a valuable contribution to the diversification of the Brazilian energy matrix.

The project activity is of special relevance when considering the necessity to satisfy the fast growth in Brazil's electricity demand, which, according to the Ministry of Mines and Energy[2], is projected to be 52.22% between 2010 and 2020. In the Northeast region, where the project activity is located, this growth is even higher (56.84%) and the Trairi Wind Power Plant will contribute to the improvement of the regional energy infrastructure by providing additional electricity supply to sustain the expansion of economic activities and population growth.

Besides the contribution to the diversification of the Brazilian energy matrix, the Trairi Project promotes sustainable development in the following ways:

[1] Available at: http://www.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.asp. Accessed on 19 May 2011.

[2] Decennial Plan for Electric Energy Expansion 2010-2019. Page 32, table 16. Available at: http://www.epe.gov.br/PDEE/Forms/EPEEstudo.aspx. Accessed on 4 July 2011.

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

The baseline scenario is the same scenario existing before the implementation of the project activity, that is, the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin calculations according to "Tool to calculate the emission factor for an electric system".

A.3. Project participants:

The Trairi Project belongs to Central Eólica Trairi S.A, a Special Purpose Company (SPC) which was created especially for the construction and operation of the Trairi Project.

This SPC is controlled by Tractebel Energia, the largest private energy generator in Brazil. Tractebel Energia is dedicated to the development and operation of power plants and is also an active agent in the electricity power market.

The company's headquarter is in Florianópolis, Santa Catarina, and its plants are located in all five regions of Brazil, specifically in the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Minas Gerais, Mato Grosso do Sul, Mato Grosso, Goiás, Tocantins, Maranhão, Piauí and Ceará.

The installed capacity of the company is 6,908 MW, which represents nearly 7% of Brazil's total installed capacity. In total, the company operates 22 plants, nine of them are hydroelectric power plants, six thermal power stations and seven are based on complementary energy sources: two biomass power plants, two wind power plants and three small hydro power Plants (SHP).

The complementary power plants, as well as the Project Activity, are result of Tractebel Energia's policy to expand and complement its power generation capacity through investments in alternative electricity sources. To pursue this objective, the company makes active use of mechanisms such as the CDM or the Brazilian Program for the support of Alternative Energy Sources (PROINFA). As a result, the Wind power plants Beberibe and Pedra do Sal, as well as the small hydropower plants José Gelazio da Rocha, Areia Branca and Rondonopolis have been developed under the PROINFA, while the Cogeneration Plant Lages is registered as a CDM project.

Tractebel Energia[3], a public company with its shares traded on the Bovespa stock exchange, is controlled by International Power – GDF SUEZ (IPR-GDF SUEZ), which holds 68.7% of its share capital. In Latin America, IPR-GDF SUEZ provides innovative energy solutions in Argentina, Brazil, Chile, Costa Rica, Panama and Peru, accompanying this emerging continent in its economic growth, respecting the environment and providing essential services to its people.

The group manages and operates a diversified energy matrix with an installed capacity of 10.7 GW, and an additional 6 GW installed capacity in construction. Two-thirds of the electricity generated is from renewable sources.

International Power – GDF SUEZ[4] is part of the GDF SUEZ Group, one of the leading energy providers in the world and active across the energy value chain, in electricity and natural gas upstream to downstream. The Group develops its businesses (energy, energy services and environment) around a responsible-growth model to respond to energy needs, ensure the security of supply, fight against climate change and maximize the use of resources.

The table below represents the parties and entities involved in the Trairi Wind Power Plant Project.

Table 01 – Private and public parties and entities involved in the 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 wishes to be considered as project participant (Yes/No)
Brazil (host)	• Private Entity: Tractebel Energia S.A	No
	• Private Entity: Central Eólica Trairi S.A	
(*) 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 information for contact with the party (ies) and with the public/private entities involved in the project activity are provided in Annex 1.

A.4. Technical description of the project activity:

[3] For more information about Tractebel, access: http://tractebel.investor-relations.com.br

[4] For more information about International Power plc, visit www.iprplc-gdfsuez.com. For more information about GDF SUEZ, visit www.gdfsuez.com.

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

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

Region: Northeast of Brazil
State: Ceará

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

Municipality of Trairi

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity:

The Trairi Wind Power Plant is located in the city of Trairi, on the coast of Ceará state, northeastern Brazil. The project implementation site is 124 km from Fortaleza, the capital of Ceará. Leaving Fortaleza, the main access route to the project site is via CE-085[5]. The following figure[6] represents the localization of the Trairi Wind Power Plant.

Figure 01 – Location of Trairi Wind Power Plant enterprise

Source: Consistency Certificate of the Anemometric Measurement Campaign and of the Annual Production Estimative. Page 08.

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[5] Data Source: Descriptive Memorial – Trairi Wind Power Plant. Page 08. Environmental Impact Report – RIMA. Page 03.
[6] Consistency Certificate of the Anemometric Measurement Campaign and of the Annual Production Estimative. Page 09. Issued on 16 March 2011.

The area of the Trairi Wind Power Plant project activity is referenced below by the coordinates (SIRGAS 2000, UTM 24M) of the 11 wind turbines that are part of the plant[7].

Table 02 - Coordinate of the wind turbines Trairi Wind Power Plant

Wind Turbine #	Decimals		SIRGAS 2000, UTM 24M	
	Latitude (S)	Longitude (W)	Latitude	Longitude
1	-3,221627	-39,289701	467 814	9 643 905
2	-3,223436	-39,290223	467 756	9 643 705
3	-3,225200	-39,290809	467 691	9 643 510
4	-3,227118	-39,291430	467 622	9 643 298
5	-3,228882	-39,292079	467 550	9 643 103
6	-3,230574	-39,292664	467 485	9 642 916
7	-3,232455	-39,293187	467 427	9 642 708
8	-3,234147	-39,293709	467 369	9 642 521
9	-3,235920	-39,294241	467 310	9 642 325
10	-3,238182	-39,294890	467 238	9 642 075
11	-3,240425	-39,295583	467 161	9 641 827

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

Sectorial Scope 1 – Energy Industries (Renewable Source)

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

Trairi Wind Power Plant has an installed capacity of 25.4 MW distributed on 11 (eleven) wind turbines with unitary installed capacity of 2.308MW. The wind power plant uses the renewable wind energy potential from the coast of Ceará State to generate electricity from a non polluting energy source. The table below represents the main technical parameters of the plant.

[7] Source data: Consistency Certificate of the Anemometric Measurement Campaign and of the Annual Production Estimative. Page 09.

Table 03 - Technical characteristics of Trairi Wind Power Plant

Description	Values	Reference
1. Electricity data		
Installed capacity	25.4 MW	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, page 05
Net Electricity	97.211 MWh/year	1) Consistency Certificate of the Anemometric Measurement Campaign and of the Annual Production Estimative, page 01. 2) Megajoule Letter – Systematic Losses
Plant Load Factor	43.71%	1) Consistency Certificate of the Anemometric Measurement Campaign and of the Annual Production Estimative, page 01. 2) Megajoule Letter – Systematic Losses
2. Wind turbine		
Model	SWT 2.3-101	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, Page 8
Provider	Siemens	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, page 8
Nominal capacity (Unit)	2.308 MW	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, page 8
Units	11	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, page 8
Frequency	60 Hz	RIMA (Environmental Impact Report/Relatório de Impacto Ambiental), page 7
Power generation	0.69 kV elevated to 34.5 kV	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, page 9
Lifetime[8]	20 years	Certified issued by Det Norske Veritas, Danmark A/S, page 2.
Rotor diameter	101 m	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, page 8
Hub height	80 m	Technical Specification ("Memorial Descritivo") of the Trairi Wind Power Plant, page 8

The equipment used for the project is in compliance with IEC 61400-1 which defines requirements and criteria for the engineering of wind turbine. In addition, the electromechanical equipment meets the standards NBR 6979, IEC 62271-200, IEC 60298 and 60694. For power measurement, two power meters will be installed in the substation and two power meters at the connection bay at the Trairi WindPower Plant[9]. The company in charge of the construction works is located in Fortaleza, the capital of Ceará, the state where the project activity takes place, which contributes to the training and hiring of local labor.

The experience and know-how of the manufacturer combined with Tractebel Energia's expertise and experience in the development and operation of power generation plants will warrant that the project implementation and operation will occur in a technically and environmentally sound and safe manner.

As referenced in Table 03, the Trairi Plant Load Factor is 43.71%. This load factor was determined ex ante, i.e. before the project starting date by a specialized company. Consequently the plant load factor defined meets the criterion "b" provided by the "*Guidelines for the reporting and validation of plant load factors*", version 01:

[8] Source: Document issued by the certifier company Det Norske Veritas Danmark A/S.

[9] The equipment is in accordance with technical standards valid at the time of the start of validation. Any changes in the standards that require the adaptation of the project's equipment will be properly implemented without prejudice or need for revision of this project design document.

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

In addition the determination of the load factor follows the criteria and requirements established by the BNDES (Banco Nacional de Desenvolvimento Econômico e Social/National Bank of Social and Economic Development) as a basis for financing Wind Power Projects, as referenced to the DOE.

The baseline scenario, according to ACM 0002, version 12.2.0, is the following: "Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin calculations described in the *Tool to calculate the emission factor for an electricity system*".

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

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

The implementation of the Trairi Wind Power Plant connected to the Brazilian Interconnected System will generate an estimated average annual reduction of **38,310 tCO_2e** and a total reduction of **268,169 tCO_2e** during the first crediting period, of 7 (seven) years, described in the table below:

Table 04 - Estimation of Trairi Wind Power Plant Emissions Reduction

Year	**Annual estimation of emission reductions in tones of CO_2e**
2012	6,384
2013	38,310
2014	38,310
2015	38,310
2016	38,310
2017	38,310
2018	38,310
2019	31,925
Total Estimated Reductions (tCO_2e)	**268,169**
Total Number of Crediting Years	**7 years**
Annual average of the estimated reductions over the crediting period (tCO_2e)	**38,310**

Notes:

- EG_y and $EG_{baselin}$e projections were made assuming Trairi Wind Power Plant operation during 8,760 hour per year;
- Electricity generation is projected according with the Plant Load factor of the Trairi Wind Power Plant;
- The operation starting date of the last wind turbine of Trairi Wind Power Plant is expected to be, according to the company's Schedule, on 2 November 2012. However, the projection assumed, for simplification purposes, the starting date of the first crediting period 1 November 2012.

A.4.5. Public funding of the project activity:

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

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:

- Approved consolidated baseline and monitoring methodology ACM0002, version 12.2.0 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources.[10]"
- Tool for the Demonstration and Assessment of Additionality, version 06.0.0.
- Tool to calculate the emission factor for an electricity system, version 2.2.1.

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

The consolidated methodology ACM0002, version 12.2.0, is applicable to Trairi Wind Power Plant CDM Project, because the project is a grid-connected renewable power plant that will consist of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity.

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

Thus, the ACM0002 methodology, version 12.2.0, is applicable to the Trairi Wind Power Plant Project.

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

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

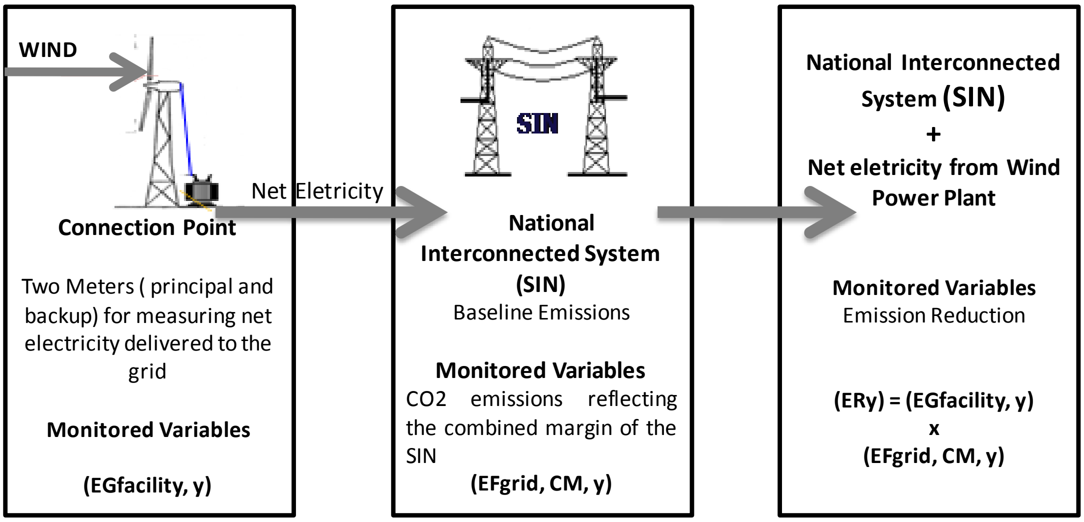
Based on the effective power generation availability and consumption behavior and demand in each region, the ONS defines the dispatch of each individual power plant, as well as the inter-regional energy exchange and mid and long term operational policies to warrant reservoir management and energy security,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

According to ACM0002, version 12.2.0, the spatial extension of the project boundary includes the project power plant and all power plants physically connected to the electricity system that the CDM project

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

power plant is connected to. The Trairi Wind Power Plant is connected to National Interconnected System (SIN).

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



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

Table 05 - Greenhouse gases involved in the Project Activity

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_20	No	Minor emission source.
Project Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non condensable gases contained in geothermal steam.	CO_2	No	Not applicable to this project activity.
		CH_4	No	Not applicable to this project activity.
		N_20	No	Not applicable to this project activity.
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants.	CO_2	No	Not applicable to this project activity.
		CH_4	No	Not applicable to this project activity.
		N_20	No	Not applicable to this project activity.
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Not applicable to this project activity.
		CH_4	No	Not applicable to this project activity.
		N_20	No	Not applicable to this project activity.

*According ACM0002, version 12.2.0, the wind power plants are project activities that do not generate GHG emissions.

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

In the absence of the project activity, the clean electricity supplied by Trairi Wind Power Plant to the Brazilian National Interconnected System (SIN) would have been generated by other existing or new power plants connected to the grid. Accordingly, the baseline scenario for new renewable grid-connected power generation plant defined by methodology ACM0002, version 12.2.0, is the following:

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

The baseline scenario presented by the ACM 0002, version 12.2.0, is perfectly applicable to Trairi Wind Power Plant. The combined margin emission factor of the National Interconnected System will be calculated, according to the methodological tool “*Tool to calculate the emission factor for an electricity system*”, approved by the CDM Executive Board.

The Combined Margin (CM) emission factor is calculated from the generation record of all plants connected to the National Interconnected System (SIN) and centrally dispatched by the National Interconnected Power System Operator (Operador Nacional do Sistema - ONS). Based on this generation data as provided by the ONS, the Brazilian Designed National Authority (DNA) commonly calculates emission factors of the SIN according to the “*Tool to calculate the emission factor for an electricity system”* and makes them available to the public. In case in the future these data are no longer calculated and published by the DNA, they will be readily calculated by the project participants.

The combined margin emission factor for the National Interconnected System will be, therefore, used to determine the emission reductions generated as a result of project's implementation.

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):

This section is elaborated based on the *"Tool for the demonstration and assessment of additionality"* version 06.0.0[11] which defines a step-wise procedure to assess and demonstrate the additionality of the project.

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

Table 06 - Timeline Trairi Wind Power Plant CDM Project

Date	Type of evidence	Evidence/Reference
30 June 2010	CDM consideration	Prior CDM Communication letter sent to UNFCCC to document the intention to develop Trairi as a CDM project activity.
12 July 2010	CDM consideration	Publication of the Project activities' Prior CDM Consideration communication form on the UNFCCC website[12]
16 July 2010	CDM consideration	Communication to the Executive Secretary of the Interministerial Commission on Global Climate Change – the Brazilian DNA - about the intention to develop Trairi as a CDM project activity.
20 August 2010	Project Milestone	Signing of the preliminary Wind Turbine Supply (WTS) contract for supply, installation and commissioning of wind turbines between Central Eólica Trairi S.A and Siemens. Clause 20 of this contract defines the sale of the project's electricity or the issuing of a Notice to Proceed by Trairi as conditions precedent for the contract to come into force.
18 March 2011	CDM consideration	CDM potential assessment report developed by CDM Cell of GDF Suez.
06 May 2011	Project Milestone /Starting date Project activity/ Investment Decision date	Emission of the Notice to Proceed[13] for supply and construction works for the Trairi Project according to Clause 20 of the WTS contract signed between Central Eólica Trairi Wind S.A and Siemens. This Clause formally defines the WTS contract entry into force.
18 May 2011	CDM consideration	Contract signed between Tractebel Energia S.A. and the Enerbio Consultoria Ltda – ME for CDM Project development.
01 October 2012	Project Milestone	Expected start of commissioning period according to Central Eólica Trairi S.A project implementation schedule.
02 November 2012	Project Milestone	Expected start of Commercial Operation of the last wind turbine, according to Central Eólica Trairi S.A project implementation schedule.

[11] Information available in http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

[12] Available on http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html?s=140

[13] The validity of the contract was extended three times once the conditions precedent had not been fulfilled.

<u>Starting date of the project activity definition</u>

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

As referenced above, the Wind Turbine Supply Contract, which covers supply, construction and commissioning of the Wind Turbines on site and represents the major amount of the projects capital investment, was signed by Central Eólica Trairi S.A and Siemens Company on 20 August.

The WTS Contract was established to define reliable conditions as a basis for the development of the projects, but according to Article 20, it only enters into force upon one of the following Conditions Precedent:

i) the effective sale of electricity under a Power Purchase Agreement (PPA)[14] (Article 20.1)

ii) in case Central Eólica Trairi Wind S.A issues an order authorizing the beginning of works (*Notice to Proceed*) (article 20.3)

The original WTS contract and therefore the Conditions Precedent defined were only valid until 1 December 2010 and by that date Central Eólica Trairi S.A had not signed any PPA nor issued any *Notice to Proceed* and consequently the contract was amended and its validity extended to[15]. 06 May 2011.

Finally, on 06 May 2011 and therefore before the validity of the contract would have expired, Central Eólica Trairi S.A issued a *Notice to Proceed* for the beginning of the construction, therefore setting the Starting Date of the Project Activity as this implies not only the effective start of the implementation and construction of the project activity, but also the main capital expenditures related to the implementation of the wind power plant.

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

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

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

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

The realistic alternatives to the project activity are:

- Alternative 1: The project activity undertaken without being registered as a CDM project;

[14] The project participated energy auctions promoted by the Brazilian government on 25 and 26 of August 2010, but did not sell any energy under those auctions.

[15] A first amendment extended the contract validity until 01 March 2011, a second amendment, signed on 25 February 2011 extended the contract validity until 31 March 2011 and on 12 April 2011 a third amendment extended the contract validity until 06 May 2011.

- Alternative 2: The continuation of the current situation. The additional electricity generated by the project would be generated by existing or new power plants connected to the national electric system.

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

The Regulatory Environment

The Brazilian Regulatory Framework went through important structural and conceptual changes over the past 2 decades, resulting in three different electricity regulatory models: the state-based model (until 1995); the free market model (1995 to 2003) and the new model, implemented in 2004 and valid up to date. Under the state owned model, the energy sector was dominated by almost exclusively state-owned and verticalized companies that covered the segments of generation, transmission and distribution. During the period of state monopoly, the major part of the currently existing generation capacity has been built, mostly consisting of large hydropower plants with important energy reservation capacity.

From 1995 on, due to lack of capacity to further finance the necessary investments for the expansion in energy generation, transmission and distribution, the government initiated a partial privatization process, structured by four main pillars: i) creation of a competitive environment (free market), with a gradual elimination of the captive consumers; ii) partial dismantling of the state owned verticalized companies by dividing and privatizing the segments of generation, transmission and distribution; iii) allowing free access to the transmission lines for generators and consumers; and iv) placing the operation and planning responsibilities to the private sector.[16]

The adoption of the free market model allowed the participation of private entities and the implementation of the Concession Law (Law No 8,987 of February 13, 1995) and promoted the construction of some renewable plants in Brazil.

Unfortunately, the model did not provide the investment in generation capacity needed to satisfy the growing demand and it resulted in an energy crisis in 2001, when energy consumption of consumers and industry was rationed and Brazil's economic development was badly hit. As a response to this crisis, a new regulatory framework was put in place in 2004, resulting in a more active role of Brazil's government by virtually suspending the privatization process initiated in the 1990's and centralizing the functions of electricity planning at national government level,[17] while promoting private sector investments to fund the required expansion in generation capacity. This new regulatory model provided a more efficient mechanism of power procurement between generators and distributors, primarily by creating two parallel electricity trading environments: the Regulated Contracting Environment, referred to as ACR (*Ambiente de Contratação Regulada),* where energy is finally contracted based on the lowest tariffs defined by a regulated auctioning process, and the Free Contracting Environment, referred to as ACL, or *Ambiente de Contratação Livre*) (ACL).[18]

When evaluating the initial effects of these regulatory changes since 2005 it must be observed that the immediate demand for energy and capacity has been satisfied mostly with the installation of thermal

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[16] Aguiar F.L. *Modelo Institucional do Setor Elétrico Brasiliero*, 2007, available at http://www.realestate.br/images/File/arquivosPDF/DST_FernandoAguiar.pdf, last access on March 5, 2010

[17] For further information, please refer to *Moody's Global Infrastructure – Regulatory Environment Improves for Brazilian Electric Utilities*, August 2008

[18] For further information, please refer to Section B.5.

power plants. In fact, between 2005 and 2007, 63% of the new generation capacity added/contracted stems from fossil fuel burning plants, while non conventional resources like biomass, wind, and small hydro power plants accounted for only 3% of the new capacity under development, the rest being represented by the installation of large hydropower plants[19]. This situation only changed once additional policies and incentives for promotion of clean energies, as described below, were established.

The table below summarizes the evolution of the regulatory framework for the Brazilian electric sector:

Table 07- Energy regulatory frameworks in Brazilian history

Former Model (until 1995)	Free Market Model (1995 to 2003)	New Model (2004)
Financing using public funds	Financing using public and private funds	Financing using private and public funds
Verticalized companies	Companies classified by activity: generation, transmission, distribution and commercialization	Companies classified by activity: generation, transmission, distribution, commercialization, imports and exports.
Predominantly State-controlled companies	Opening up of the market and emphasis on the privatization of the companies.	Coexistence between State-controlled and private companies.
Monopolies – No competition	Competition in generation and commercialization	Competition in generation and commercialization
Captive Consumers	Both Free and Captive Consumers	Both Free and Captive Consumers
Tariffs regulated throughout all sectors	Prices are freely negotiated for the generation and commercialization	Free environment: Prices are freely negotiated for the generation and commercialization
Regulated Market	Free Market	Coexistence between Free and Regulated Market
Determinative Planning – Coordinator Group for the Planning of Electricity Systems (GCPS)	Indicative Planning coordinated by the National Council for Energy Policy (CNPE)	Indicative Planning coordinated by the Energy Research Company (EPE)

Characteristics of the different market environments: The free and the regulated Market:

Within this new regulatory framework, the Power Generators, which can be state owned companies or privately owned Independent Power Producers have two options to sell their energy and thus to finance their projects. Under the ACR, the investors offer the electricity to be generated by their investments under regulated auctions. The rules, terms and eligible technologies for these auctions are defined by the Ministry of Mines and Energy (MME) and the Brazilian Electricity Regulatory Agency (Agência Nacional de Energia Elétrica - ANEEL); while the auction is executed by the Electric Power Commercialization Chamber (Câmara de Comercialização de Energia Elétrica - CCEE). Main modalities for such auctions refer to different duration and starting date of the respective *Power Purchase*

[19] *Novas Regras e Perspectivas para os Leilões de Energia*, Luiz Henrique Alves Pazzini, CCEE Technical Adviser, presentation at Energy Summit, Rio de Janeiro, Brazil, 12 August 2009

Agreements (PPAs), which may have duration of 20 or 30 years, depending on the economic or operational lifetime of the underlying energy source and technology. After conclusion of the Auction the PPAs are signed between the respective energy generator and a pool of regulated distribution companies which are defined by the regulators. Such long-term PPAs with a pool of distribution companies represent a convenient option to define a reliable long term cash flow, which is not only important to protect the equity investor from unexpected market variations, but also a key requirement to obtain appropriate conditions for third party financing.

The auctions are defined and designed for one or a set of specific technologies and resources and therefore allow the government to influence the expansion of the Brazilian generation park. In December 2009 the first exclusive auction for purchasing wind power electricity was organized and subsequently, in August 2010 a second auction exclusively designed for non conventional renewable energies took place, where Wind, Small Hydro Power and Biomass Plants could participate. Recently, in August, 2011, two new auctions were held for Wind, Small Hydro Power and Biomass Plants and natural gas fired CCGT plants.

Alternatively, Independent Power Producers have the option to sell electricity to the Free Electricity Market ACL where authorized electricity purchasers and electricity sellers negotiate among themselves the conditions and clauses of their PPAs, such as price, duration, guarantees, off take and delivery obligations and payment conditions.

The consumers which are eligible to participate in the free market are usually medium and large industrial clients with significant power demand. According to their specifications and the applicable regulations, they can be classified into two groups:

- Consumers A1, A2, and A3: Organizations with a load higher or equal to 3,000 kW and supplied at tensions higher or equal to 69 kV (New consumers installed after 27 May 1998 may be supplied at any tension). These consumers may buy any kind of electricity from any eligible power generator;

- Special Consumers A4: Organizations with a minimum load of 500 kW and supplied at any tension. Special consumers are only allowed to purchase so called incentivized electricity (*energia incentivada*) from eligible renewable sources, such as Wind power plants, small hydro power plants, biomass fired power plants and landfill gas fired power plants.

In the free market, PPA durations are short to medium term, covering mostly between one and three years, which is completely different from the long duration of the 20 or 30-year PPAs as defined in the captive market and which implies an important risk of contract renovation and renegotiation. In addition, contracts are signed with individual industrial clients and not with a portfolio of regulated distribution companies, a fact that implies increased exposure to the client’s credit risk. In conclusion, selling electricity to the Free Electricity Market implies an increased level of risk and exposure to the oscillation of the demand and electricity price.

The figure follow represents a comparison of the Free and the Captive Energy Markets:

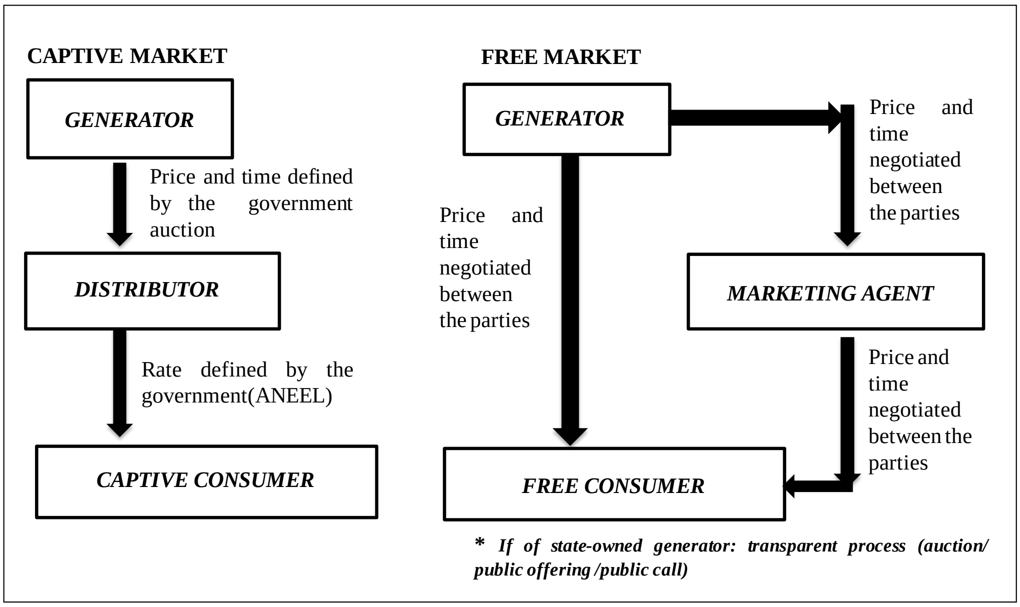

Figure 02: Captive and Free Market

Policies and incentives for the promotion of renewable energies:

As mentioned above, initially renewable energies and especially the non conventional resources such as wind played a very limited role in the expansion of the Energy matrix. Especially the insertion of wind energy is a result of subsequent support policies. The first incentive was the creation, in 2002, of the Program for the Support of Alternative Energy Sources (PROINFA/ Programa de Incentivo às Fontes Alternativas de Energia). PROINFA is a federal government program that defines attractive feed in tariffs for investments in complementary energies such as biomass, small hydropower and wind energy.

To complement the attractive feed in tariffs, the PROINFA program offers a special financing package from the National Bank of Social and Economic Development (Banco Nacional de Desenvolvimento Econômico e Social – BNDES), and the 20 year PPAs offer important mechanisms to protect the investors against oscillation of wind and market conditions.
Another important incentive created for wind power electricity (and also applicable to other renewable sources such as the small hydro power plants and biomass) was the establishment of discounts in the fees for using the electricity transmission system, the so called TUST/TUSD – G. This discount was established for complementary energies which supplies to the National Interconnected Grid up to 30 MW.

In addition, the legislation also provides discounts on the payable TUSD[20] for consumers in the Free Electricity Market, providing they buy the so called incentivized energies (*energia incentivada*). The incentivized energies purchase entitles the company to a reduction of at least 50% in the distribution system fees. This discount, when compared to the normal electricity pool, again provides complementary

[20] ANEEL (2004). Normative Resolution 77. Available at http://www.aneel.gov.br/cedoc/ren2004077.pdf . Last accessed on 14 September 2011.

renewable energies with a comparative advantage as it attracts consumers to preferably contract such resources.

In addition to policies presented, the most important incentive for a clean expansion of the Brazilian electricity generation matrix is being offered by the BNDES. Traditionally the BNDES, which is the Brazilian state owned development bank and as such implements the government's policies for economic development, is the main source of third party infrastructure funding and of special importance to the capital incentive required by the electricity sector. Now since late 2007, the BNDES established a general policy to incentivize renewable and low GHG emitting electricity sources by providing more attractive financing conditions when compared to GHG intensive technologies such as coal and fuel oil fired thermal power plants.

The policies and incentives here presented will be further analyzed in Sub-step 2b to assure their adequate treatment in the definition of the projects baseline and additionality discussion.

Within the context presented, the project activity Trairi will benefit from preferential BNDES financing, the reduction in the TUST/TUSD-G and it will seek to commercialize its electricity in the Brazilian Free Electricity Market, targeting consumers of the Free Electricity Market which are eligible to purchase such incentivized energy. This represents an innovative strategy, which differentiates the Trairi project from other wind power projects currently in operation in Brazil.

The project and the strategy presented is in full compliance with the applicable laws of Brazil and the regulations of the electricity sector.

The alternative scenario also does not suffer any restrictions and is in full compliance with Brazil's laws and the mentioned norms and regulations.

Step 2. Investment analysis

The "*Tool for the demonstration and assessment of additionality*" (Version 06.0.0) states that project participants may choose to apply Step 2 (Investment analysis) or Step 3 (Barrier analysis) to demonstrate the additionality of the project activity. Accordingly, the Investment Analysis shall determine whether the proposed project activity is not:

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

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

Sub-step 2a. Determine appropriate analysis method

According to the "*Tool for the demonstration and assessment of additionality*" (version 06.0.0), three options can be applied to conduct the investment analysis. These are the simple cost analysis (Option I), the investment comparison analysis (Option II) and the benchmark analysis (Option III). Since this project will generate financial/economic benefits other than CDM-related income, through the sale of generated electricity, Option I (Simple Cost Analysis) is not applicable.

Both Option II and Option III are applicable for the Project Activity, however, as the option is to invest or not to invest, Option III – benchmark analysis is the most appropriate for assessing the financial attractiveness of the project activity.

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

According to the *"Tool for the demonstration and assessment of additionality"*, among other options, discount rates and benchmarks shall be derived from "*(a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data"*.
Based on this provision, Project Developers defined a benchmark using the Capital Asset Pricing Model (CAPM) and official and publicly available parameters that are standard in the market, while taking into account the specific provisions of the "*Guidelines on the Assessment of Investment Analysis – Version 05*". According to Guidance 15, "*If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors."*

Based on provision (b) of this guidance, the PPs present a specific CAPM for the calculation of the cost of equity under the specific consideration of the third party financing and an industry beta which reflects the specific risk of investments in the power sector, as well as the impact of financial leverage on the equity investor's risk. The necessity to contemplate the specific impact of third party financing from the BNDES is readily addressed by the use of the CAPM where the calculation of the leveraged beta allows capturing the impact of third party finance on the equity investor's exposure to systemic market risk.

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Table 08 provides an overview about the calculation and the specific references that were used.

Table 08- CAPM and references for the calculation of the cost of equity for Brazilian Power investments

Variable	Value	Parameter / Formula / Comment	Reference
Rfn - Risk-Free Rate nominal	4.46%	30-year US Treasury Yield	[1]
π' - US inflation	2.18%	CPI Index (US Consumer Price Index)	[2]
Rfr Risk-Free Rate Real	2.23%	Rfr = [(1+Rf)/(1+π)-1]	Calculated
Rm Equity Risk Premium	6.03%	Equity Risk Premium as calculated and published by Damadoran	[3]
Rc Country Risk Premium	3.00%	Country Risk Premium as calculated and published by Damadoran	[3]
βU Unleverged Industry Beta	0.78	Unlevered Beta for Power Sector as calculated and published by Damadoran	[4]
Wd Debt / Total Capital	50.00%	Default Value defined by Guidance 18	[5]
We Equity / Total Capital	50.00%		[5]
T Marginal Tax Rate	0.00%	Interest payments do not reduce tax payments under the relevant fiscal regulation	[6]
βL leveraged Industry Beta	1.56	βL =βU*[1+(1-t)*(D/E)]	Calculated
Ke Cost of Equity – real terms	14.64%	Ke = Rf + β*Rm + Rc	Calculated

[1] Federal Reserve: 30-year US Treasury Yield (2006-2010), available from: http://www.federalreserve.gov/datadownload/Output.aspx?rel=H15&series=b56abb6d9cc35f28ccf86b8a0188e948&lastObs=&from=&to=&filetype=csv&label=include&layout=seriescolumn

[2] US Department of Labor: Consumer Price Index (CPI Index) (2010-2016), available from: ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt

[3] Damadoran Website: Historical data on Stocks, Bonds and Bills – US, data as January 2011, available from http://pages.stern.nyu.edu/~adamodar/

[3] Damadoran Website: Country Risk Premium for other markets, data as January 2011, available from http://pages.stern.nyu.edu/~adamodar/

[4] Damadoran Website: Betas by Sector, data as of January 2011, calculated from 5 year historic data. Line “Power”, available from http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/Betas.html

[5] UNFCCC website: Guidelines on the Assessment of Investment Analysis – Version 05, available from: http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[6] Fiscal Office Brasil: http://www.receita.fazenda.gov.br/Aliquotas/ContribCsll/Aliquotas.htm

The result of 14.64% (real terms/post tax) obtained on the basis of the CAPM for calculating the return on equity for the energy industry is compatible with the recent publication *“Economia da Mudança do Clima no Brasil: Custos e Oportunidades”*[21], from January 2010, which defines that the internal rate of return (IRR) for equity investments in Wind Power Generation is 15% (real terms).

In conclusion, the equity benchmark was obtained from the CAPM and on the basis of variables that are standard in the market, while taking into account the project specific circumstances and financing conditions. The resulting benchmark is also obtained in real terms and therefore compatible with the investment analysis as presented below. In addition, the benchmark is comparable with relevant

[21] Sergio Margulis, Carolina Burle Schmidt Dubeux (ed.); “*Economia da Mudança do Clima no Brasil: Custos e Oportunidades*”. Available at: http://pt.scribd.com/doc/34595160/Economia-Do-Clima. Last access on 21 July 2011.

prestigious references that were developed and published in cooperation with Brazilian governmental entities and that address specifically the cost of GHG mitigation with Wind generation.

Compatibility of the benchmark with the financial indicator calculated

As the equity Internal Rate of Return (IRR) will be used as a benchmark for the additionality discussion the financial return of the project will be calculated accordingly, in compliance with the criteria and provisions defined by the "*Tool for the Demonstration and Assessment of Additionality*".

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

The equity cash flow analysis of the Trairi Wind Power Plant in real terms and all underlying references and assumptions are made available to the DOE (Designated Operational Entity) that will perform validation.

All input values and data used in the investment analysis were valid and applicable at the time of the investment decision. The effects of taxing on the cash flow were taken into consideration according to the applicable legislation. Following an overview and of the key assumptions and features of the investment analysis in response to the key criteria, requirements and orientations as provided by the CDM Executive Board (EB).

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

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

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

- **Depreciation:** the period of depreciation of the assets is also 20 years according to orientations from the Manual of Power Sector Asset Control (Manual de Controle Patrimonial do Setor Elétrico, page 209), published by the ANEEL[22]. Because it is an accounting item which does not involve disbursements, depreciation has been deducted for tax calculations and added to net profit for purposes of equity cash flow IRR calculation.

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

[22] ANEEL (2009). Manual de Controle Patrimonial do Setor Elétrico. Annex of Normative Resolution nº 367/2009, 02 June 2009. Available at: http://www.aneel.gov.br/cedoc/aren2009367_2_primeira_Ver.pdf. Last access on 21 July 2011.

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

- **Nature of the Cash Flow:** The cash flow to equity analysis has been performed in real terms, i.e. without considering the impact of inflation, and after payment of taxes. The resulting financial indicator therefore is a post-tax equity IRR given in real terms and therefore compatible with the benchmark defined above.

Sectoral Policies E-

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

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

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

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

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

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

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

The focus on the development of non conventional renewable sources and structuring hydropower projects was consolidated in the energy sector mitigation strategy presented by the Brazilian Government's Communication to UNFCCC during the CMP5 in December 2009, which was later endorsed by the Climate Change National Policy Law (Law 12.187 from 29 December 2009) and its Regulation Decree 7.390 from 09 December 2010. These two legal instruments established the necessary regulatory environment for the adoption of Nationally Appropriate Mitigation Actions (NAMAs) and confirmed the CDM as an important mechanism to achieve Brazilian's voluntary emission reduction targets. As a preparation for the publication of Regulation Decree 7.390, the Energy Research Company

(Empresa de Pesquisa Energética – EPE) launched a detailed GHG abatement plan for the energy sector which also emphasized the relevance of CDM and the incentives provided by the BNDES for a cleaner expansion of the Brazilian energy matrix[23].

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

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

Through Resolution N°77, of 18 August 2004[24], ANEEL established a discount of 50% of the applicable transmission fee for complementary renewable energy projects, such as wind power generation projects, with installed capacity injected in the grid lower or equal to 30,000 kW.

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

[23] "Abatimento das Emissões relacionadas à produção e ao uso da energia no Brasil até 2020"Versão 2.03 Preliminar, 25/10/2010.

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

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

The BNDES has historically[25] played a fundamental role in the implementation of the governmental policies for economic development by providing a long-term financing for private sector investments in general infrastructure and specifically in the national electricity sector.

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

The bank's central role shall be assessed in the context of the Brazilian Climate Change Policy. The fact that BNDES is an instrument of Brazilian policy and, specifically, of the Climate Change Mitigation Policy[26] (Política Nacional de Combate às Mudanças Climáticas) is referenced by the Climate Change National Plan (Plano Nacional de Mudanças Climáticas) and by the Climate Change National Policy Law (Política Nacional Sobre Mudança do Clima – PNMC)[27]. The specific activity in the electricity sector is further referenced by the Energy Research Company (EPE – Empresa de Pesquisa Energética), institution related to the Brazilian Ministry of Mines and Energy, which has issued the policy paper "Abatement of GHG emissions due to the production and use of energy in Brazil up to 2020". The publication clearly describes the importance of the BNDES to implement the Brazilian mitigation policies and to pursue a clean expansion trajectory in the energy sector.

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

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

Where:

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

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[25] Lage de Sousa (BNDES) and Ottaviano (Bolonha University): *The effects of BNDES loans on the productivity of Brazilian manufacturing firms*, July 2009, available at http://www.merit.unu.edu/MEIDE/papers/2009/1236186324_FS.pdf & http://virtualbib.fgv.br/ocs/index.php/sbe/EBE09/paper/view/1023/354, last accessed on March 6, 2010.

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

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

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

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

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

As can be referenced for all variables presented above, in 2006 and before, the BNDES applied identical conditions and criteria for all energy sources and there was no preference for coal, oil or gas fired thermal sources, neither for renewable sources. This means that Financing Cost, Basic Spread and the criteria for the definition of the Credit Risk Spread as well as period for amortization and maximum participation were always equal for all type of energy sources, regardless of their GHG intensity. An overview of the conditions applicable in 2006 is provided by Table 09.

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

In addition, the operational policy of BNDES defined a financial cost of funding of 100% TJLP for GHG efficient energy and renewable sources, while coal and oil fueled power plants are financed on the basis of a mix of 50% TJLP and 50% TJ-452[28]. According to data provided by the BNDES website, the TJ-452 is equal to TJLP + 1%[29], resulting in a slightly higher financial cost.

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

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

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

[29] Source: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Apoio_Financeiro/Custos_Financeiros/Composicao/. Accessed on 28 June 2011.

Table 09 - Evolution of BNDES Financing Condition (2006-2010)

Analysis Component	**Evolution of BNDES policies and comparative advantages to Electricity Sources less GHG emissions intensive**	
	2006	**2010**
BNDES Participation of the Financing		
Financing Cost		
BNDES financing cost for GHG intensive energy sources	80% TJLP and 20% IPCA (NTN-B)	50% TJLP and 50% TJ-452
BNDES financing cost for GHG efficient energy sources	80% TJLP and 20% IPCA (NTN-B)	100% TJLP
Comparative advantages for GHG efficient energy sources	0	100% TJLP
BNDES Remuneration		
BNDES remuneration for GHG intensive energy sources	1.5%	1.8%
BNDES remuneration for GHG efficient energy sources	1.5%	0.9%
Comparative advantages for GHG efficient energy sources	0%	0.9%
Credit Risk		
Credit risk for GHG intensive energy sources	Calculated according credit risk, of 0.8% to 1.8%	Calculated according credit risk, of 0.46% to 3.57%
Credit risk for GHG efficient energy sources		
Comparative advantages for GHG efficient energy sources	0	0

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

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

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

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

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

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

Table 10 - Main Differences between conditions to intensive and efficient GHG energies sources

Conditions	Conditions for GHG efficient energy sources	Conditions for GHG intensive energy sources	Conditions applied to the CDM Project investment analysis
Financing Cost	100% TJLP	50% TJLP + 50% TJ-452	50% TJLP + 50% TJ-452
BNDES Remuneration	0.9% per year	1.8% per year	1.8% per year

Assumptions used in the Cash Flow

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

Table 11 - Financial Inputs used in Investment Analysis

Revenues			
Item	**Description**	**Unit**	**Values**
Electricity generated for Sale	The electricity generation was projected on the basis of the Plant Load Factor of the Trairi Wind Power Plant determined by a specialized certifier company according to the requirements of the BNDES for financing Wind Power generation activities. This assumption is in compliance with the provisions of the "*Guidelines for report and validation of the plant load factor.*"	GWh/year	97.211
Electricity Price	As no long term PPAs are available in the free market, the average prices achieved in the "Alternatives Sources Auction" promoted by ANEEL (Electric Energy National Agency /Agencia Nacional de Energia Elétrica), occurred in 26 August 2010 were used as a reference.	BRL/MWh	130.00
Investment			
Item	**Description**	**Unit**	**Values**
Investment (CAPEX)	CAPEX is largely defined by preliminary contracts signed with suppliers of wind turbines, electrical equipment and civil works. Costs for owner engineering, insurance, materials, outsourced services and contingencies were included in the total budget as estimated at the time of investment decision.	MBRL	110.950
Land Lease – implementation phase	According to contract established with land owners.	kBRL/year	63.00
Operations costs			
Item	**Description**	**Unit**	**Values**

Operation and Maintenance costs	Budgeted according to recommendations of General Guidelines published by Eletrobrás/Centro de Pesquisas em Energia Elétrica.	kBRL/MW.year	88.00
Land Lease – Operational phase	According to contracts established with land owners.	%	1.5% gross revenue
TUST - G	Budgeted as estimated by Tractebel's Regulatory and Market Department on the basis of applicable regulations. Projects can be connected to the distribution line or to transmission line. If the project is connected to distribution line, TUSD-G is applicable and if it is connected to transmission line TUST-G is applicable. This plant is connected to the transmission line.	BRL/KWh. month	2012 – 6.05 2013 – 6.35 2014 – 5.17 2015 – 3.90 2016 – 3.79 2017 – 3.78 from 2018 – 3.58
Total of Sectoral Taxes	The Inspection Fee of Electric Energy Services according to Law N° 9427/1996; the rates with the ONS (National System Operator / Operador Nacional do Sistema) and with the Commercialization Energy Chamber (CCEE – Câmara de Comercialização de Energia) were budgeted according to previous experience of the company with the Ibitiúva Biomass Power Plant.	kBRL/year	56.7
Financing Conditions			
Item	**Description**	**Unit**	**Values**
Interest Rates	Budgeted in accordance with the conditions provided by BNDES to more intensive GHG technologies as described in the presentation of E-policy. A conservative credit risk spread of 1.1% was assumed.	%/year	9.4
Amortization Period	Budgeted in accordance with BNDES financing policies to energy sector.	Years	14
Grace period	Budgeted in accordance to BNDES financing policies to the energy sector.	Years	0.5
Leverage of the project	Since the project does not have a defined capital structure yet, it was adopted the 50% leverage standard, as proposed by UNFCCC in the item 17 of *Guidelines on the Assessment of Investment Analysis*, Version 05.	%	50
Taxes			
Item	**Description**	**Unit**	**Values**
PIS/COFINS	Budgeted as applicable Brazilian law.	%	3.65% on Gross revenue
Income Tax	Budgeted as applicable Brazilian law.	%	25% on 8% Gross revenue
Social contribution	Budgeted as applicable Brazilian law.	%	9% on 12% Gross revenue

The Equity Internal Rate of Return, in real terms, resulting of the cash flow elaborated based on the assumptions is **3.31%**.

Investment analysis results

The table below shows a summary comparison between the project financial indicator and the benchmark:

Equity Internal Rate of Return of 3.31% < Benchmark of 14.64%

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

Sub-step 2d. Sensitivity analysis

The main variables that can affect the project's finances are (i) revenues of the project; (ii) the CAPEX, (iii) the O&M cost (OPEX) and the (iv) loan cost.

The sensitivity analysis is conducted to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis. The objective is to confirm how solid the analysis of sub-steps 2b and 2c is.

Project Revenues:

The wind power project's revenue depends solely on two factors: the electricity generated and the electricity sales price, which will be discussed individually, but in effect are related as uncertainties and variations in the electricity generation have an impact on the commercial conditions, electricity pricing and thus revenues and fines.. As mentioned before, Trairi Wind Power Plant will adopt an innovative strategy of electricity commercialization in the free electricity market. In this market, the contracting terms are signed for a period of short and medium term, thus exposing the investment to fluctuations in demand and price. With the unpredictability of revenue, the project is exposed to a greater risk than wind projects that sign long-term contracts in the regulated contracting environment.

With regards to the volume of energy generated the project is subject to significant variations and uncertainties as well as risk for wind resource related structural underproduction. In this respect it is important to note that, according to information provided by Eletrobrás[30], in 2009 and 2010 the performance of the wind power generation projects of the PROINFA , which represents the only available wind generation experience in Brazil, is significantly below the volume of energy expected and sold by these investments. This is also confirmed by the generation monitoring reports published by Brazil's National Interconnected System Operator[31] (Operador Nacional do Sistema Elétrico - ONS), for the period from 2007 until October 2011.

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

[31] ONS Report "Acompanhamento mensal da geração de energia das usinas eolioelétricas com programação e despacho centralizado pelo ONS" and Excel spreadsheet "Geração Eólicas", Outubro/2011. Document

The data shows that, among 13 wind power plants centrally dispatched, 11 plants have a verified capacity factor below the original load factor projection. If considering just plants located in the northeast region, where this project activity is located, effectively all plants have shown significant underperformance when compared to the original capacity factor estimation. In fact, over their entire generation period, their performance is only 67% of the plant load factor originally projected.

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

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

In addition, such underperformance does not only reduce revenues, but implies a material risk fines if electricity sold under the regulation of the free market as it does not offer any flexibility to compensate for underperformance. For example, under the standard PROINFA PPA, Eletrobrás is required to buy 100% of the energy produced at a fixed price which is indexed to inflation (IGPM). The PPA assures that the project will receive at least 70% of the initially Contracted Energy set in the PPA during the financing period with BNDES.

In the free Market, if the electricity contracted is not delivered, the buyer has the right to terminate the contract. Generally, when this situation occurs, the seller can either (i) to buy electricity in the market (being exposed to the market price variation) or (ii) to pay penalties due to delivery failure.

Now in contrast, under the regulation of the Free Market, if the electricity contracted is not delivered, the buyer has the right to terminate the contract. Generally, when this situation occurs, the seller can either (i) buy electricity in the market (being exposed to the market price variation) or (ii) to pay contractual penalties to compensate for delivery failure. Both options obviously represent a material risk to the investor.

In conclusion it can be shown that the risk and impact of under generation on the revenues is much bigger than the probability and potential for increased revenues due to overproduction.

Now with regards to the electricity price paid for each MWh delivered according to the contractual arrangement, the investor projected that the average price of the last auction prior to the project starting date, the "Alternatives Sources Auction" promoted by ANEEL (Electric Energy National Agency /Agencia Nacional de Energia Elétrica) on 26 August 2010, is an adequate indicator for the future and thus used it as a base for the cash flow projection. Although some price fluctuations in the free energy market are inherent to the scheme, it must be assumed that the free market conditions converge to those of the regulated market. Consequently the average price achieved before the investment decision of our project activity is an appropriate reference for the present evaluation.

Boletim_Eolica_out-2011, available in the data room, folder < Findings\CAR 03>, as well as from http://www.ons.org.br/resultados_operacao/boletim_mensal_geracao_eolica/index.aspx

Now to further reference that this assumption was conservative in the terms of the CDM it is of interest to analyse market data which was obtained after the project starting date. Three auctions[32] organized by the Government happened in 2011 after this “Alternative Sources Actions”. The average price were R$ 102.07/MWh (Auction 02/2011); R$ 99.61/MWh (Auction 03/2011) and R$ 102.18/MWh (Auction 07/2011). In conclusion, all auctions presented values significantly below R$ 130/MWh estimated for this project and thus the investors price assumption at the project starting date were ambitious and thus conservative in the terms of the CDM.

This means that it is unlikely that the revenues will significantly increase due to higher electricity prices and that there is a significant probability that less attractive prices deteriorate the revenues when compared to the original projections.

Looking at the data above, it is notably unlikely that the scenario of revenue generation will be consistently 10% above those projected in the investment analysis.. Now even if this would occur for an unexpected reason, an effective revenue of 53.1% above the one projected is necessary to achieve the benchmark. In other words, either the price or the volume of electricity sold would have be on average 53.1% above the value projected for the entire lifetime of the project activity. These calculations demonstrate that it is very unlikely that variations in the revenue could lead to a profitability above the equity IRR benchmark defined.

CAPEX

Infrastructure investments are prone to cost overruns due to unforeseen events, while significant cost savings are not very common. Consequently, a sensitivity of 10% reduction in capital expenditure is a reasonably conservative assumption in the context of the CDM. Under such a scenario, the equity IRR would increase, but not reach the benchmark. This would only occur if the CAPEX was 43.54% below the original projections, which is not a realistic scenario due to the fact that main construction and equipment supplying contracts have already been established at the investment decision date. On the other hand, an increase in 10% in the capital invested, which is a much more probable scenario, would further deteriorate the Project’s IRR as expected in the base case.

O&M Cost

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

Loan Cost

The loan cost took into consideration the E- sectorial policy, described before. The loan cost does not significantly affect the equity IRR either. Even considering financing without cost, the IRR does not reach the benchmark.

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[32] Available at: http://www.aneel.gov.br//aplicacoes/editais_geracao/edital_geracao.cfm

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

The following tables represent the results for the main parameters variations that can affect the equity cash flow of Trairi Wind Power Plant.

Table 12 - Sensitivity Analysis of the Trairi Wind Power Plant

ELECTRICITY PRICE VARIATION	
Projected Situation	**Equity IRR**
0%	**3.31%**
-10%	0.79%
+10%	5.65%
CAPEX VARIATION	
Projected Situation	**Equity IRR**
0%	**3.31%**
-10%	5.13%
+10%	1.73%
O&M COST VARIATION	
Projected Situation	**Equity IRR**
0%	**3.24%**
-10%	4.03%
+10%	2.57%
LOAN COST VARIATION	
Projected Situation	**Equity IRR**
0%	**3.31%**
-10%	3.57%
+10%	3.05%

The sensitivity analysis shows that the Trairi Wind Power Plant is not financially attractive, because its equity internal rate of return (IRR) is lower than the benchmark in all scenarios analyzed.

The tool for demonstration and assessment of additionality indicates that:

"If after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be the most financially attractive (item 2.c – 8.a) or is unlikely to be financially attractive (item 2c-8b), then proceed to Step 4 (Common practice analysis)."

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

Step 4. Common practice analysis

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

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

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

Step 01: Installed capacity (Scale)

The “Tool for the demonstration and assessment of additionality”**,** version 06.0.0, paragraph 47 step 01 defines that Project Participants must calculate applicable output range as +/-50% of the design or capacity of the proposed project activity. Therefore, the applicable output range for this project activity is 12.7 MW to 38.1MW. Based on this recommendation 320 energy generation plants have been identified, among small hydropower plants, wind power plants, thermal plants, biomass and large hydropower plants[33].

Step 02: Identification of Project Activities developed as CDM Projects

The Step 02 of the Tool requires project participants to identify in the applicable geographical area and within the applicable output range calculated in Step 1 the plants that started commercial operation before the start date of the project activity, excluding the project activities registered as CDM projects or undergoing validation. According to ANEEL (National Energy Electric Agency), among the 320 operational plants identified in Step 1, 79 plants are being developed as CDM project activities (registered or under validation) and 19 have started commercial operation after the start date of the project activity.

Following the tool, these plants were excluded from the common practice analysis. Thus, N_{all} = 220. The table below presents the amount of plants within the applicable capacity range and excluded as per Step 2:

Table 13 - Operational plants within the applicable output range according to ANEEL[34]

Energy source/ Fuel	Quantity within the range	CDM Plants	Plants with commercial operation before start date of project	N_{all}
HCG	0	0	0	**0**
WPP	18	6	6	**6**
SHP	121	56	9	**56**
SPP	0	0	0	**0**
HPP	36	0	0	**36**
TPP	145	17	6	**122**
TNPP	0	0	0	**0**
Total	**320**	**79**	**19**	**220**

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

Step 03: Identification of Different Technologies

[33] A full list of plants is presented in the Excel spreadsheet “Common Practice Analysis_trairi” provided to the auditors.

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

(a) **Energy Source/fuel**;
(b) Feed Stock;
(c) Size of installation (…);
(iv) Investment climate in the time of the investment decision, inter alia:
    i) access to technology;
    ii) subsidies or other financial flows;
    iii) **promotional policies**;
    iv) legal Regulation.
v) Other features, inter alia:
    - Unit cost of output (unit costs are considered different if they differ by at least 20 %).

As demonstrated in the table 13, among the 220 plants identified after applying Steps 1 and 2 of the Tool, 214 have different energy sources from the project activity. Therefore, there are just six operational wind power plants with installed capacities between 12.7 MW and 38.1 MW that are not CDM and have started commercial operation before the start date of the project activity.

According to the Step 3 of the Tool, different technologies are also identified as the ones implemented in a different investment climate in the date of investment decision when compared to the project activity.
All six wind power plants within the capacity range of Trairi Wind Power Plant relied on subsides and incentives from PROINFA[35]. PROINFA is a federal government program that defines attractive feed-in-tariffs for investments in non-conventional renewable energies such as biomass, small hydropower and wind energy[36]. Besides the attractive feed-in-tariffs, the PROINFA offers a special financing package from BNDES and a 20 year Power Purchase Agreements (PPAs) with Eletrobrás, a state-owned company. The PPAs signed with Eletrobras guarantees to the investors, at least, 70% of the electricity contracted during the overall duration of the PPA.

Hence, the program offers important mechanisms to protect the investors against oscillation of wind and market conditions[37] which are substantially different from those identified for the project activity, as described in section B.5.

Now following the Climate Change National Plan (Plano Nacional de Mudanças Climáticas – page 33) [38], the PROINFA program, which was established in 2001/2002 as the first investment incentive for

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[35] Document "Empreendimentos Contratados-PROINFA-Contratos". Available on http://www.eletrobras.com/elb/data/Pages/LUMISABB61D26PTBRIE.htm#Dados. Accessed on 24 November 24th 2011.

[36] Source: MME Ordinance 45, 30 march 2004, Page 01 (article 2º - Annex II).

Source: PROINFA Programa de Incentivo às Fontes Alternativas de Energia Elétrica (Eletrosul), slide 05.

Source: http://www.mme.gov.br/programas/proinfa/. Accessed on 29 November 2011.

[37] http://www.mme.gov.br/programas/proinfa/galerias/arquivos/programa/resolproinfa.pdf . Accessed on 29 November 2011.

[38] Available from http://www.forumclima.org.br/index.php/biblioteca/documentos-fbmc

complementary renewable energies was substituted by dedicated tenders for the purchase of alternative energy sources, as well as by the special conditions offered in the liberalized markets. Due to this policy to phase out the PROINFA program and limit it to projects that were contracted before April 29, 2004 as defined by the National Decree 4,541[39]. As the starting date of the project activity is much later, on 06 May 2011, the project activity was developed according to the new regulatory framework and not under the PROINFA program. For further details please refer to the description of the new regulatory framework offered on sub-step 1b.

Therefore, there are just 06 power plants which generate electricity from the same energy source within the applicable output range of the project activity in the country, but they relied on very attractive incentives from PROINFA.These six projects have only been materialized with special contractual arrangements, improved financing conditions and privileged access to the wind technology, which was still an incipient technology option at that moment. For this reason, WPPs that relied on the aforementioned incentives as part of the PROINFA cannot be compared to Trairi Wind Power Plant.

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

Table 14 – Operational WPPs within the applicable output range

Operational Wind Power Plants	Installed Capacity	Promotional policies - PROINFA
Parque Eólico de Beberibe	25,6 MW	X
Praia do Morgado	28,8 MW	X
Eólica Praias de Parajuru	28,8 MW	X
Pedra do Sal	18 MW	X
Parque Eólico Enacel	31,5 MW	X
Taíba Albatroz	16,5 MW	X

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

Table 15 - Parameters and values applied in the common practice analysis

Parameters	Values/Results
N_{all}	220
N_{dif}	220
$F = 1-(N_{diff}/N_{all})$	0
N_{all}-Nd_{iff}	0

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

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

[39] Article 08 of the National Decree 4,541, from December 22, 2012. Available at: http://www.planalto.gov.br/ccivil_03/decreto/2002/d4541.htm .

The information provided in sub-step 4a, evidences that, in a country of continental dimensions like Brazil, WPPs projects like Trairi Wind Power Plant are not considered a common practice in energy generation as per the criteria defined in sub-step 4a.

According to the Methodology ACM0002 version 12.2.0, if Sub-steps 4a and 4b are satisfied, (i) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional.

SATISFIED/APPROVED – Project is ADDITIONAL

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to ACM0002 methodology (version 12.2.0), the emission reduction (ER_y) are calculated as follows:

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

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

<u>BEy Calculation (Baseline emissions in year y (tCO$_2$/yr))</u>

The baseline methodology ACM0002, version 12.2.0, establishes that baseline emissions include only CO_2 emissions from electricity generation by fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emission is calculated as follows:

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

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

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

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

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

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr).

The Plant Load Factor of Trairi Wind Power Plant was considered to determine the ***ex-ante*** calculation of $EG_{facility,y}$.

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

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

Step 1: Identify the relevant electricity systems

The National Interconnected System (SIC) is defined as the relevant grid to the project activity. The definition of the SIC as the relevant electricity system is also recommended by the DNA[40] through Resolution N° 08 of May/2008, which defines the National Interconnected System as a single system that shall be used for the calculation of CO_2 emission factors. This definition will be applied to Trairi Wind Power Plant Project.

[40] Source: http://www.mct.gov.br/upd_blob/0024/24719.pdf. Accessed on 24 May 2011.

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

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

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

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

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

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

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

The method chosen to the calculation Operation Margin emission factor of the Trairi Wind Power Plant is the dispatch data analysis operation margin method.

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

The method chosen for the calculation of the operation margin emission factor of the Trairi Wind Power Plant is the dispatch data analysis calculated on an ***ex-post*** basis for the operation margin.

As previously stated, the emission factor OM ($EF_{grid,OM-DD,y}$) calculation based on the dispatch data analysis method is currently conducted by the Brazilian DNA, in accordance with the dispatch data provided by the National Interconnected Power System Operator (ONS).

According to the "*Tool to calculate the emission factor for an electricity system*" the dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) 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. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$.

Dispatch data OM emission factors for 2010 will be used for an ***ex-ante*** estimation of CERs that will be generated as a result of project's implementation. All data used to calculate the operating margin emission factor are available in the annex 3 of this PDD.

Step 5: Calculate the build margin emission factor

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

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

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

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

The build margin emission factor is calculated by Brazilian DNA[41] and in case the Brazilian AND discontinues the publication of these data during the monitoring period, the required data will be calculated by the project participants.

Build Margin emission factor for 2010, as published by the Brazilian DNA, will be used for an ***ex-ante*** estimation of CERs that will be generated as a result of project's implementation. The 2010 data vintage was adopted for build margin calculation as they are the latest data available.

Step 6: Calculate the combined margin emission factor

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

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

Trairi Wind Power Plant project activity used option (a) to calculate the combined margin emission factor.

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

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

Equation 04

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

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

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

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

This way, for Trairi Wind Power Plant was adopted the following weights: W_{OM} = 0.75 and W_{BM} = 0.25.

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

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

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

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

For Trairi Wind Power Plant project $PE_{FF,y,}$ $PE_{GP,y}$ and $PE_{GP,y}$ are zero, therefore, the project do not generate any associated project emissions.

Leakage

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

Project Emissions Reductions

In summary, as there are no project emissions (PE_y) for wind power plants as the Trairi Project, project activity emission reductions, can be calculated according to equation 2 of this PDD, where $ER_y = BE_y = EG_{PJ,y} * EF_{grid,CM,y.}$

Consequently, the emission reductions generated by the project activity are calculated as the simple product between the quantity of net electricity supplied by Trairi project to the grid and the combined margin emission factor, where the operating margin emission factor will be calculated according to the Dispatch Data Analysis operation margin and the build margin emission factor (Option 2), both of them updated annually (***ex-post***).

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

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

According the consolidated baseline methodology ACM0002, version 12.2.0, there are no data and parameters available at validation for Wind Power Plants.

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

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

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

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

The ER calculation as a result of Trairi Wind Power Plant project activity implementation is presented below.

$EG_{PJ,y}$ Calculation

The table below shows the net electricity that will be produced by Trairi Wind Power Plant.

Table 16 - $EG_{PJ,y}$ Calculation

Years	Trairi $EG_{PJ,y}$ (MW/year)
2012	16,201
2013	97,211
2014	97,211
2015	97,211
2016	97,211
2017	97,211
2018	97,211
2019	81,009
Total	**680,476**

Assumptions:

- $EG_{PJ,y}$ projection was performed assuming the operation of the Trairi Wind Power Plant during 8,760 hours per year;
- Electricity generation is projected according to Plant Load Factor of the wind power plant.
- The company schedule expects the commercial operation starting date of Trairi Wind Power Plant to be 02 November 2012. However, it was considered 01 November [t] 2012 as the starting date of the crediting period.

Emission Factor Calculation

The emission factor that will be used for ***ex-ante*** estimation of Trairi Wind Power Project emission reductions is **0.3941**. Table below shows a summary of the main parameters involved on the emission factor calculation:

Table 17 – EFgrid,CM 2010 Calculation

Emission Factor	2010
$EF_{grid,OM}$ (tCO_2/MWh)	0.4787
$EF_{grid,BM}$ (tCO_2/MWh)	0.1404
WOM	0.75
WBM	0.25
$EF_{grid,CM}$ (tCO_2/MWh)	**0.3941**

Observations:

- The daily data for operation margin emission factor is available at: http://www.mct.gov.br/index.php/content/view/327118.html#ancora.
- Annual $EF_{grid,OM}$ used for CERs projections was calculated through the simple arithmetic average of the monthly $EF_{grid,OM}$ published by Brazilian DNA

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

Table 18 - *Ex-ante* Emission Reductions Estimation for the Trairi Wind Power Project (tCO_2e)

Years	Total Emission Reductions (tCO_2e)
2012	6,384
2013	38,310
2014	38,310
2015	38,310
2016	38,310
2017	38,310
2018	38,310
2019	31,925
Total	**268,169**

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

Table 19 – Summary of the *ex-ante* Estimation of Emission Reduction

Year	**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)**
2012	-	6,384	0	6,384
2013	-	38,310	0	38,310
2014	-	38,310	0	38,310
2015	-	38,310	0	38,310
2016	-	38,310	0	38,310
2017	-	38,310	0	38,310
2018	-	38,310	0	38,310
2019	-	31,925	0	31,925
Total (tonnes of CO_2e)	-	**268,169**	0	**268,169**

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

B.7.1 Data and parameters monitored:

The consolidated baseline methodology for grid-connected electricity generation from renewable sources, ACM0002, version 12.2.0, must be applied together with the monitoring methodology present in the same methodology.

Based on the applied methodology and on what was described on the item B.6.1, there are no leakages, nor project emissions to be monitored. The energy measurement is essential to verify and monitor the GHGs emission reduction. It is necessary, therefore, to use metering equipment to register and check the electricity generated by the units. The Monitoring Plan (item B.7.2) allows the calculation of GHG emissions generated by the project activity in a direct manner, by applying the combined margin emission factor.

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

The following data and parameters will be monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data to be used:	Project Activity Site
Value of data applied for the purpose of calculating expected emission reduction in	The value used to calculate the expected emission reductions is 97,211 MWh/yr. This data was defined accordingly to the Plant Load Factor of the Trairi Wind Power Plant

section B.5	
Description of measurement methods and procedures to be applied (if any)	The information can be confronted with information of generation provided by CCEE – Chamber of Electrical Energy Commercialization. Class 0.2S power meters will be used in accordance with the established Grid Procedures defined by the Electric System National (ONS)[42] and Commercialization Procedures by the CCEE. Continuous measurement and, at least monthly, recording will be the monitoring frequency. The quantity of net electricity supplied to the grid by the plant is registered every 5 minutes. Meters calibration will be performed according to the ONS Grid Procedures (Sub-module 12.3).
QA/QC procedures to be applied:	Measurements of the electricity generated and provided to the grid will be electronically monitored through the use of on-site metering equipment. The operations department for generation activities will continuously monitor the electricity supplied to the grid ($EG_{facility}$) by following up and automatically storing data from the (main and backup) metering devices. Data stored on the meters is also collected by the System of Energy Data Collection (*Sistema de Coleta de Dados de Energia – SCDE*) of CCEE, remotely and automatically through direct access to the meters of the project participant. These collected data are processed in SCDE for electricity accounting by CCEE and are available to all energy market participants. The net electricity supplied to the grid is measured in the concessionaire's substation connected to the grid. In this substation, there are two meters (one principal and one back up) that are responsible for measuring the net electricity generation supplied to the grid by four plants (Fleixeiras I WPP, Guajiru WPP, WPP Trairi and WPP Mundau). Therefore, these two meters located at the connection point will register the net electricity suppllied to the grid by all plants together. The information of the net electricity supplied by each plant individually is not available in the meters located in the concessionaire substation.Therefore, to account the net electricity supplied to the grid by each plant individually, it will be taken into account information provided the meters located at the Tractebel collector substation. The level of uncertainty of these data is low. They will be used to calculate emission reductions. Data of electricity generation will be monitored by Tractebel Energia and counter-checked with spreadsheets provided by CCEE. Principal meters of the plant have backup meters. In case of failure, the backup meter will register the electricity. Regarding the class of accuracy of energy meters, they will meet all relevant metrological requirements prescribed in Metrological Technical Regulation (*Regulamento Técnico Metrológico – RMT*) for Class 0.2 of energy meters, approved by INMETRO. Calibration of energy meters is regulated by the National Interconnected Power System Operator (ONS) and shall be conducted by a qualified organization in compliance with national standards and industrial regulations to ensure accuracy.

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

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

	ONS Grid Procedures (Sub-module 12.3) establishes calibration frequency and other maintenance procedures. More details related to measurement procedures are described in the item B.7.1.

Data / Parameter:	**$EF_{grid,CM,y}$**
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".
Source of data to be used:	***Ex-post*** emission factor will be calculated by the Brazilian DNA, by Tractebel Energia or third parties, through ONS data. The variables $_{EFgrid,OM,y}$ and $EF_{grid,BM,y,}$ necessary for $EF_{grid,CM,y}$ calculation, will also be monitored and calculated through the Dispatch Data of the National Interconnected System. In case the Brazilian DNA discontinues the publication of these data during the monitoring period, they will be calculated by the project participants.
Value of data applied for the purpose of calculating expected emission reduction in section B.5	The value of Combined Margin CO_2 Emission Factor ($EF_{grid,CM,y}$) which was used for ***ex-ante*** estimation of emission reductions of Trairi Wind Power Plant Project is **0.3941,** as per the Brazilian DNA.
Description of measurement methods and procedures to be applied (if any)	As per the "Tool to calculate the emission factor for an electricity system".
QA/QC procedures to be applied:	As per the "Tool to calculate the emission factor for an electricity system". The uncertainty level for these data is low.
Any comment:	

B.7.2. Description of the monitoring plan:

The Monitoring Plan is elaborated according to the Monitoring Methodology presented in the consolidated baseline methodology for grid-connected electricity generation from renewable sources ACM0002, version 12.2.0.

Monitoring General Organization

Overall responsibility for the monitoring and reporting activities lies within Tractebel Energia Operation Department for Generation Activities and Tractebel's Technical Team. The staff allocated for conducting monitoring activities will be directly involved with plants daily operation, supervision of the collection, storage, review and reporting of measured project data and other monitoring activities, such as maintenance, follow-up of calibration procedures and calculation of emission reductions as per this monitoring plan. The main activities executed by each of abovementioned departments/agents are described below:

- Operation Department for Generation Activities (Departamento de Operação da Produção - DOP): responsible for activities related to the plant's operation and maintenance and also for collecting and/or supervising generation data which is directly disclosed by the project's meters.

- Tractebel Energia Technical team (Central Eólica Trairi S.A) or third party: responsible for calculating the greenhouse gases emission reductions in compliance with the monitoring plan.

Process Description

I – Procedure for Collection of Generation Data

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

All meters related to the project are model ION 8600A. Trairi WPP has two meters located in the sales measurement panel located at the Tractebel collector substation: one principal meter and one back up meter. In this same substation, there are other six meters (three principal and three back up) related to other three wind power plants of the group (Guajiru WPP, Fleixeiras I WPP and Mundau WPP). In the meters located at the Tractebel Energia's collector substation, it is possible to determine the amount of electricity generated by each individua plant.

However, the net electricity supplied to the grid is measured in the concessionaire's substation connected to the grid. In this substation, there are two meters (one principal and one back up) that are responsible for measuring the net electricity generation supplied to the grid by four plants (Fleixeiras I WPP, Guajiru WPP, WPP Trairi and WPP Mundau). Therefore, these two meters located at the connection point will register the net electricity suppllied to the grid by all plants together. The information of the net electricity supplied by each plant individually is not available in the meters located in the concessionaire substation.

Therefore, to determine the net electricity supplied to the grid by each plant individually, it will be taken into account information provided by the meters located at the Tractebel Energia's collector substation. Consequently, the share of each plant in the electricity generation measured in the Tractebel Substation will be multiplied by the total net electricity generation registered in the connection point (concessionaire substation). This procedure will be applied to measure the net electricity of this project activity.The figure below shows the measurement arrangement apply.

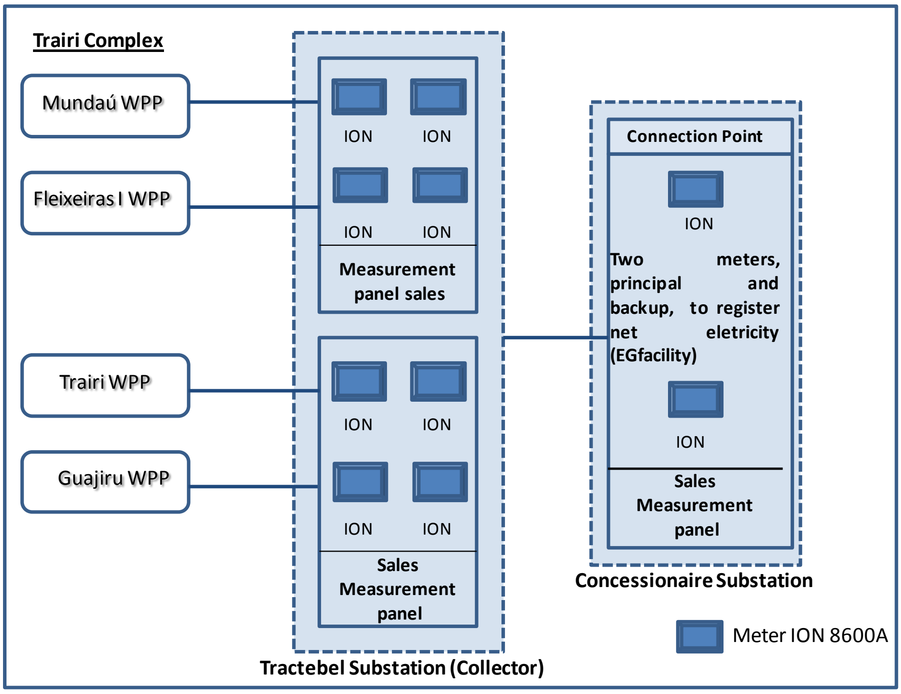

Figure 03 - Meters Arrangement
Source: Tractebel Energia

As each principal meter has a backup meter, if the principal meter fails, the backup meter will register the electricity generated by the project.

II – Data Storage

Generation data will be electronically stored by the Operation Department for Generation Activities in Tractebel Energia's corporative database. In order to assure that relevant generation is appropriatelly and securally stored, the Information Technology Area will conduct an insurance *backup* for all company`s data through a Data Server *backup*. Following these procedures, Project participants will assure that all relevant data is kept at least 2 years after the end of the crediting period or the last issuance of CERs, whichever occurs later.

III – Procedure for Reporting of Generation Data

In the first day of each month, the Operation Department will generate a spreadsheet file with generation data. Information of this spreadsheet does not account for losses until the delivery point. Therefore, it can be considered that the spreadsheet provides "gross electricity" data. CCEE reports/invoices provides information regarding electricity after losses. This information will be provided to Tractebel Energia's technicial team for allowing the calculation of project activity's emission reductions on a monthly basis.

IV – Procedure for Controlling of Generation Data

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

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

V – Meters Accuracy and Calibration Procedures:

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

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

The plant has two electricity meters (main and backup meters) located at the collector substation and other two metering devices installed at the grid connection point. These two meters located at the grid connection point will register the electricity dispatched to the grid by the Central Eólica Trairi S.A. and other three wind power plants that compose the Trairi complex (Guajiru WPP, Fleixeiras I WPP and Mundau WPP).

VI - Emission Factors Calculation:

Tractebel Energia Technical team (Central Eólica Trairi S.A) or third party will be responsible for GHGs emission reductions calculation during the monitoring period of the project, as described in the item B.6.1. For emission factors calculation, it will be used data supplied by the Brazilian DNA. In case the Brazilian DNA discontinues the publication of these data during the monitoring period, they will be calculated by the project participants.

VII - Project Emission Reductions Calculation:

Emission reductions will be monitored monthly by Tractebel Energia's team (Central Eólica Trairi S.A) based on the spreadsheet provided by the operation department. The emission reductions calculation will follow the equations described in this PDD.

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):

The baseline study and monitoring methodology for the project activity were elaborated by Enerbio Consultoria and completed on 05 September 2011. The Enerbio Consultoria is not a project participant.

Responsible for the project information:

Enerbio Consultoria Ltda - ME
Porto Alegre. Brazil
Tel: 55 51 3392-1505
Email: eduardo@enerbio-rs.com.br
www.grupoenerbio.com.br

The project participants are listed on Annex I with the respective contact information.

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:

06/05/2011. Issuance date of the Notice to Proceed for supply and construction works , as established in the contract signed between the Central Eólica Trairi S.A and Siemens (Clause 2.2 of the *Third Amendment signed on 20 August 2010 for extending the validity of the Wind Turbine Generator And Tower Supply, Transportation , Instalation And Comissioning Agreement* of 12 April 2011.

The item B.5 of this PDD presented a table with a detailed timeline that shows all actions taken by the Project Participants concerning the definition of the project starting date as per the CDM rules.

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

20 years

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

The project activity will use renewable crediting period.

C.2.1. Renewable crediting period:

7(seven) years

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

02/11/2012[43] or the project's registration date (whichever is later).

C.2.1.2. Length of the first crediting period:

7 (seven) years.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

[43] Predicted date Trairi Wind Power Plant commercial operation beginning, according Tractebel schedule.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The Brazilian Federal Constitution and the environmental legislation in force require preliminary environmental studies and compulsory environmental licences for the execution of works and activities that have the potential to cause pollution or environmental degradation.

On a federal level, The National Environment Council (CONAMA Conselho Nacional do Meio Ambiente) establishes standards, guidelines and the criteria for the licencing process for the previous studies. Because the Flexeiras I Wind Power Plant is a wind energy production venture, it is subject to the environmental licencing as stated in Resolution n° 237 of CONAMA. In order to obtain the necessary licenses, the Project Participants undertook an Environmental Impact Assessment (EIA/RIMA), as required by the state agency, the Ceará Environment Superintendence – SEMACE.

In the state of Ceará, the environmental licencing process is carried out by the Ceará Environment Superintendence – SEMACE, an institution created through the State Law N° 11,481 of 28 December 1987 and which is linked to the Environmental Policy and Management Council (Conselho de Política e Gestão do Meio Ambiente). SEMACE will proceed with the licensing after the agreement on Land Use Law with the local municipality council as well as, if applicable, with other Union and State authorities involved in the licensing process.

The environmental license system of Ceará State is composed by the following environmental licenses:

- Preliminary License: Granted by SEMACE in the preliminary phase of project implementation, approving its location and design, certifying the environmental viability and establishing basic requirements and conditions to be met in the next phases of its implementation;

- Installation License: Granted by SEMACE for the installation of the project in accordance with the specifications of the plans, programs and projects approved, including the environmental control measures and other conditions;

- Operation License: Granted by SEMACE for the project's operation after verifying compliance with the requirements set forth in previous licenses and establishment of environmental control measures and conditions to be observed during the operation.

The Operation License is renewed periodically according to its validity through the Renewal of Operating License (OFR): granted to allow continued activity operation provided that the conditions established for its renewal are met.

The project has obtained, at the time of PDD elaboration, Installation License n° 434/2011 issued by SEMACE valid until 26 October 2013.

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 environmental influence area of the project activity is defined as the physical, biotic and socioeconomic area likely to be changed as a consequence of its implementation, maintenance and operation. The identification of the impacts occurs in the three phases of the project implementation and it includes environmental impacts in abiotic, biotic and socio-economic components.

The implementation and operation of Trairi Wind Power Plant will use natural resources and for this reason the impacts on environment will be minimized. Additionally the production of effluents or waste during the operation of the wind power plant is non-existent and the traffic of vehicles and people will also be minimal. The environmental changes resulting from the installation of the project will be offset or reduced though the adoption of mitigation measures and environmental control. During the project construction phase the impacts will be more significant on the site due to vegetation removal, material handling and the assembly of towers and wind turbines.

The Trairi Wind Power Plant environmental impact study was developed under the current environmental legislation following the guidelines of the Terms of Reference of SEMACE. The analysis of the environmental impacts shows satisfactory results to the project implementation. Thus, the wind power plant presents more environmental benefits than negative impacts in its area of functional influence.

The mitigating measures include actions to be implemented by the project during the implementation and operational phases. The entrepreneur will develop environmental programs and plans to ensure the environmental quality of the area. These measures were designed in accordance with the environmental legislation to meet the legal requirements of SEMACE.

Table below presents the environmental impacts identified and the environmental control and monitoring plant that will be developed by project owner.

Table 20 - Environmental Impacts and Monitoring Plans

Phases	Environmental impacts identified	Environmental Control and Monitoring Plan
Implementation	**Noise:** The main source of noise is related to: (i) the set of machines used for excavation; (ii) earth works; (iii) traffic of trucks transporting the wind turbines and (iv) the operation of equipment used in the construction activities.	Noise and Vibration Levels Monitoring Plan; Plan for the Recovery of Degraded Areas; Environmental Audit Program; Risk Management Program; Health Program for the Population of the Enterprise Surrounding; Plan for Landscape Conservation; Fauna Monitoring Plan; Avifauna and Chiroptera Monitoring Program.
	Wild animals escape: In the construction site can occur escape of wild animals to areas that offer shelter.	
	Dust Release: It is caused by equipment and materials handling.	
Operational	**Local landscape alteration:** mainly in the area of direct influence and its surroundings.	
	Visual impact: The wind turbines can cause shading, resulting from the light intensity variation of its surroundings.	
	Accidents with Avifauna and Chiroptera: Avifauna and Chiroptera are the most affected species, mainly by the collision with wind turbines.	

	Noise: The most important source of noise is related to the operation of wind turbines.	

Source: RIMA Trairi Wind Power Plant, from page 78 to 103.

The Trairi Wind Power Plant Environmental Impact Report is available to DOE which will validate the project.

SECTION E. Stakeholders' comments

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

According to resolution n° 07 of 05/08[44], published by Brazilian Designated National Authority, the parties interested in the project should be invited to perform comments about CDM project.

Therefore, project proponents have sent letters at following interested parties:

1. Trairi City Hall;
2. Trairi City Assembly;
3. State Department of Environment (SEMACE)
4. Trairi Municipal Secretariat of Environment
5. State Federal Attorney of Public Interest
6. Federal Attorney of Public Interest
7. Forum of Brazilian NGO and Social Movements for Environment and Development
8. Residents Association

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

E.2. Summary of the comments received:

So far, it has not been received any comment about the project.

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

So far, it has not been received any comment about the project.

[44] Source: http://www.mct.gov.br/upd_blob/0023/23744.pdf. Accessed on 05 May 2011.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	CENTRAL EÓLICA TRAIRI S.A
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State/Region:	Santa Catarina
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Country:	Brazil
Telephone:	48 3221 7035
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URL:	http://www.tractebelenergia.com.br/
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

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

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

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

The tables below present the values considered to calculate the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$) which were used for Trairi Wind Power Plant ***ex-ante*** estimation of emission reductions. All these data were provided by the Brazilian DNA. In case the Brazilian DNA stops to publish these data during the monitoring period, they will be calculated by the project participants.

Table 21 - Monthly Medium Operating Margin Emission Factor of the year 2010
Brazilian Interconnected System

Medium Emission Factor (tCO_2/MWh) - MONTHLY												
2010	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
	0.2111	0.2798	0.2428	0.2379	0.3405	0.4809	0.4347	0.6848	0.7306	0.7320	0.7341	0.6348

Table 22 - Daily Medium Operating Margin Emission Factor of the year 2010 – Brazilian Interconnected System

Medium Emission Factor (tCO_2/MWh) – **Daily**												
2010	Month											
Day	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1	0.2270	0.2505	0.2447	0.2068	0.2831	0.3232	0.4227	0.5871	0.6880	0.7227	0.7493	0.6956
2	0.2084	0.2846	0.2496	0.2448	0.3043	0.3468	0.4148	0.5773	0.6952	0.7589	0.7947	0.7111
3	0.2022	0.2877	0.2275	0.2094	0.3500	0.3692	0.4359	0.5937	0.6901	0.7760	0.7448	0.7113
4	0.1821	0.3181	0.1965	0.2206	0.3592	0.3277	0.4906	0.5678	0.7479	0.7552	0.7166	0.7206
5	0.2019	0.2950	0.1873	0.2230	0.3084	0.3849	0.4810	0.5907	0.7721	0.7260	0.7086	0.7539
6	0.2398	0.1675	0.1659	0.2178	0.2942	0.4289	0.4752	0.5781	0.7509	0.6985	0.7404	0.7191
7	0.2370	0.1930	0.1943	0.2489	0.3012	0.3806	0.4518	0.7143	0.7578	0.7055	0.7611	0.7074
8	0.2247	0.2826	0.1909	0.2208	0.2394	0.3819	0.4388	0.7242	0.7495	0.7014	0.7342	0.6870
9	0.2228	0.3162	0.2264	0.2241	0.2806	0.3828	0.4563	0.6808	0.7354	0.7316	0.7407	0.6537
10	0.2253	0.2955	0.2629	0.2179	0.2207	0.4090	0.4175	0.6437	0.7334	0.7508	0.7413	0.6291
11	0.2103	0.3342	0.2882	0.2328	0.2060	0.4340	0.4570	0.7054	0.7356	0.7422	0.7575	0.5778
12	0.2480	0.2957	0.2861	0.2254	0.2102	0.4868	0.4061	0.7290	0,7629	0.7599	0.7544	0.6378
13	0.2357	0.3474	0.1842	0.2278	0.1994	0.5229	0.4591	0.7231	0.7325	0.7380	0.7498	0.7170
14	0.2244	0.4215	0.2053	0.2140	0.2087	0.4768	0.4707	0.7045	0.7347	0.7294	0.7879	0.6971
15	0.2223	0.3565	0.2265	0.1898	0.2625	0.4862	0.4659	0.7303	0.7402	0.7408	0.7654	0.6580
16	0.1870	0.3521	0.2388	0.1946	0.3456	0.4597	0.4631	0.6989	0.7386	0.6877	0.7532	0.6684
17	0.1990	0.2338	0.2312	0.1826	0.3688	0.4636	0.4103	0.7027	0.7322	0.6949	0.7277	0.6335
18	0.1570	0.2353	0.2408	0.2051	0.3861	0.4547	0.4660	0.7056	0.7428	0.7063	0.7326	0.6628
19	0.1710	0.1990	0.2558	0.2032	0.3948	0.5984	0.3979	0.6943	0.7447	0.7417	0.7145	0.6790
20	0.1705	0.1931	0.2163	0.2174	0.4052	0.4661	0.3904	0.6862	0.6964	0.7361	0.7396	0.6329
21	0.2092	0.2201	0.2467	0.2184	0.4031	0.7029	0.4103	0.7432	0.6934	0.7432	0.6628	0.5607
22	0.1914	0.2759	0.3139	0.2107	0.5271	0.7123	0.4087	0.7508	0.7223	0.7323	0.7266	0.5688
23	0.1643	0.3309	0.3657	0.2266	0.5461	0.7352	0.4095	0.7232	0.7046	0.7249	0.7273	0.5623
24	0.2191	0.3535	0.3053	0.2454	0.4643	0.7498	0.3981	0.7203	0.7326	0.7235	0.7229	0.5711
25	0.1892	0.3037	0.3083	0.2696	0.4505	0.6512	0.4237	0.7342	0.7422	0.7467	0.7219	0.5636
26	0.1875	0.2327	0.3182	0.2488	0.4371	0.4657	0.4165	0.7369	0.7745	0.7417	0.7208	0.5489
27	0.2247	0.2229	0.2081	0.3688	0.4150	0.5137	0.4284	0.7347	0.7459	0.7302	0.7368	0.5241
28	0.2419	0.2243	0.2169	0.3211	0.4327	0.4339	0.4289	0.7025	0.7307	0.7240	0.7519	0.5311
29	0.2536		0.2259	0.3664	0.2901	0.4115	0.3747	0.7186	0.7139	0.7233	0.6879	0.5331
30	0.2319		0.2286	0.3132	0.3346	0.4287	0.3737	0.6701	0.7153	0.7354	0.6847	0.5330
31	0.2364		0.2273		0.3290		0.5536	0.6816		0.7836		0.5531

The hourly average emission factors are also available at the following link: http://www.mct.gov.br/index.php/content/view/303076.html#ancora (Accessed on September 2011), the Emissions Factor Operating Margin is calculated for the Brazilian National Interconnected System every hour from the value of energy exported from each plant, the cost of generation of each plant (scheduling priority), schedules of exchanges with the neighboring subsystems and emission factors of thermal power plants.

The tables below present the emission factor for the build margin ($EF_{grid, BM, y}$) for 2010 used for the ***ex-ante*** estimation of emission reductions from the project.

Table 23- Build Margin Emission Factor of the year 2010 – National Interconnected System

Medium Emission Factor (tCO_2/MWh) - ANNUAL	
2010	**0.1404**

Source: Designated National Authority
http://www.mct.gov.br/index.php/content/view/303076.html#ancora. Accessed on September 2011.

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

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

Annex 4

MONITORING INFORMATION

Information about the monitoring plan is described on section B.7.2 of this PDD.