CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

Horizonte Wind Power Generation Project (hereinafter HWPGP).
Version 1
Date of the document: December 15th, 2005.

A.2. Description of the small-scale project activity:

The HWPGP is promoted by the "Central Nacional de Energia Eolica" (hereinafter CENAEEL), a Brazilian private wind power developer.

The HWPGP activity consists in generating renewable energy through wind power resource and in selling the generated output to the Brazilian South-Southeast-Midwest (S-SE-CO) Grid through a Power Purchase Agreement (hereinafter PPA). The wind power project contributes to the reduction of greenhouse gas (GHG) emissions substituting fossil fuel power plants generated electricity with clean wind energy.

The HWPGP is already operational. It started generating in 2004. The wind farm consists of 8 turbines of 600kW for a total generating capacity of 4,8 MW. The proposed project is expected to generate approximately 84,2 GWh of electricity during the first credit period, that is between 2004 – 2010. The electricity is and will continue to be sold the Celesc – Centrais Elétricas de Santa Catarina, the local distributor – through a PPA signed between CENAEEL and Celesc.

The project will foster and stimulate the commercialization of Brazil's grid connected renewable energy technologies and markets. It will also contribute to the reduction of GHG emissions by the displacement of power generation produced through fossil fuels combustion. Furthermore, by demonstrating the viability of larger grid connected wind farms, the projects will contribute to the strengthening of the national energy supply, to the improvement of air quality, to the development of sustainable energy technologies, and to the enhancement of local living standards.

Specific goals of the project are:

- Fostering sustainable development through generation of renewable energy power;
- Increasing the share of renewable power generation at the regional and national grid;
- Preventing lack of power supply, especially in the State of Santa Catarina, Brazil;
- Strengthening Brazil's electrification areas coverage;
- Reducing GHG emissions compared to a business-as-usual scenario;
- Reducing other power generation industry pollutants (SOx, NOx, particulate material (PM) etc.);
- Stimulating the growth of the wind power industry in Brazil;
- Preserving natural resources including land, forests, minerals, water and ecosystems;
- Creating job opportunities in the project area.

In the context of employment creation, it is of the utmost importance to highlight that the construction, implementation and operation of the HWPGP has already created 181 job opportunities:

Employment Creation	Horizonte
Implementation – direct	50
Implementation – indirect	100
Operation – direct	1
Operation – indirect	30

A.3. Project participants:

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)	CENAEEL – Central Nacional de Energia Eólica S.A. (Brazilian private entity) Econergy Brasil Ltda. (Brazilian private entity)	No
(*) 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.		

Econergy Brasil Ltda. is the official contact for the CDM project activity.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Brazil

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

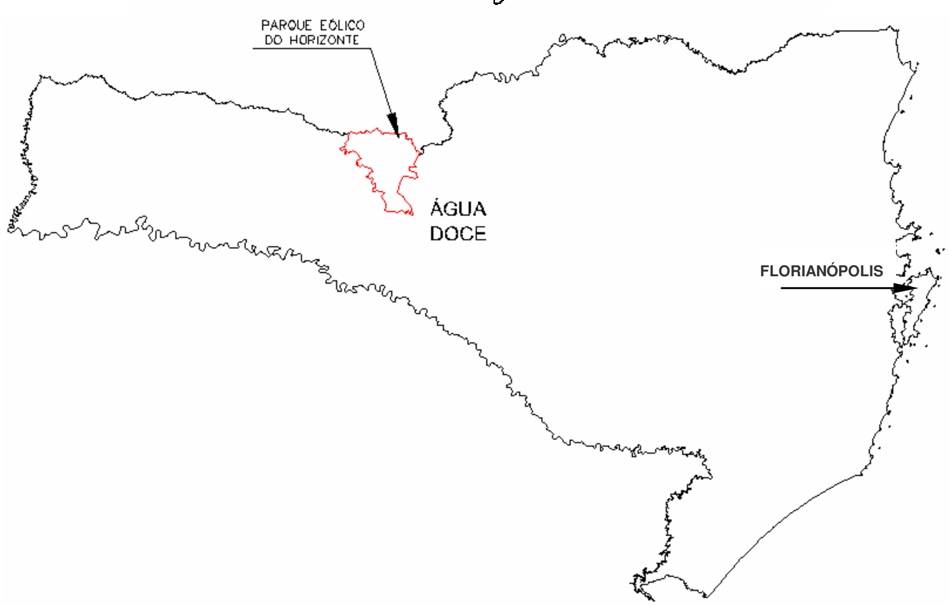
Santa Catarina State - SC

A.4.1.3. City/Town/Community etc:

Água Doce

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

The HWPGP is located at Rodovia PRT 280 – km 94,3 (km 94,3 of PRT 280 Highway), in the city of Água Doce, in the Northwest of the State of Santa Catarina (Brazil), at a distance of about 500 km from the state capital, Florianópolis. Maps 1 and 2 give more specific details on the location.



Maps 1 and 2: Location of the State of Santa Catarina State and of the city of Água Doce.

A.4.2. Type and category(ies) and technology of the small-scale project activity:

Type (i): Renewable energy projects.
Category D: Renewable electricity generation for a grid.

The project is a small scale project activity and falls under the category I.D as per the Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities. It is a renewable electricity generation for a grid.

The aforementioned is fully justified by the following:

1. Electricity generation capacity is lower than 15 MW;
2. Fuel type is wind force (a natural and renewable fuel source).

The CDM project only refers to the electricity generation to the grid system. It does not include the generation of electricity for the wind farm's own consumption.

When considering the installation of a wind farm, the single most important characteristic is the wind speed. With a doubling of average wind speed, the power in the wind increases by a factor of 8 so even small changes in wind speed can produce large changes in the economic performance of a wind farm. Once the wind resource is established, the engineering challenge is to harness the energy and convert it into electricity.

The rotors of modern wind turbines generally consist of three blades, and their speed and power are controlled by either stall or pitch regulation. The rotor may be attached to its generator via a gearbox and drive train, or the generator may be coupled directly to the rotor in an arrangement known as direct drive. Turbines operating at varying speeds are becoming increasingly common because this feature increases compatibility with electricity grid. Rotor blades are typically manufactured from glass polyester or glass epoxy, sometimes in combination with wood and carbon. The tubular towers supporting the nacelle and rotor are made of steel and taper from their base to the nacelle at the top.

Mechanical noise has been practically eliminated and aerodynamic noise vastly reduced. Wind turbines are highly reliable, with operating availabilities of about 98%: they are able to run during 98% of the hours in a year.

The HWPGP operates 8 600 kw Wobben (Brazilian subsidiary of German turbine manufacturer Enercon) aero-turbines for a total installed capacity of 4,8MW. The E40-600 kw has the following technical specifications:

- pitch controlled rotor;
- 3 blade system in fiberglass;
- 3 fiberglass blades;
- generator with drive train;
- 3 independent pitch control systems with emergency supply;
- 12,5 m/s rated wind speed;
- 28 m/s cut-out wind speed;
- 2,5 m/s cut-in wind speed.

CENAEEL started the construction of the wind farm in 2003 and the facility became operational in 2004. The first energy sale occurred in February 2004.

Specific information on the siting of the HWPGP follows. The layout of the wind turbines has been developed by Wobben Windpower.

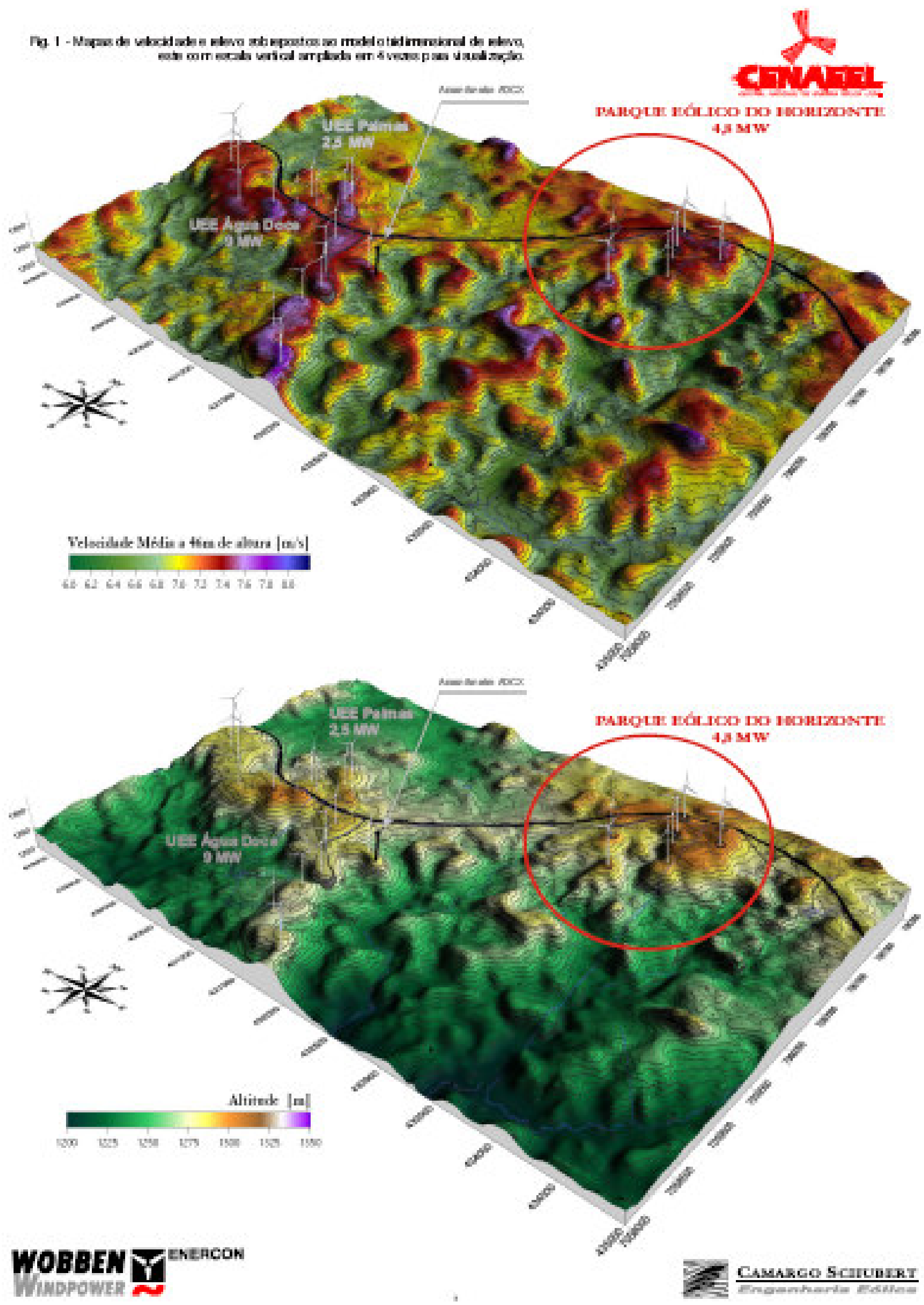


Figure - 4: Maps of average wind speed (m/s) and height (m).

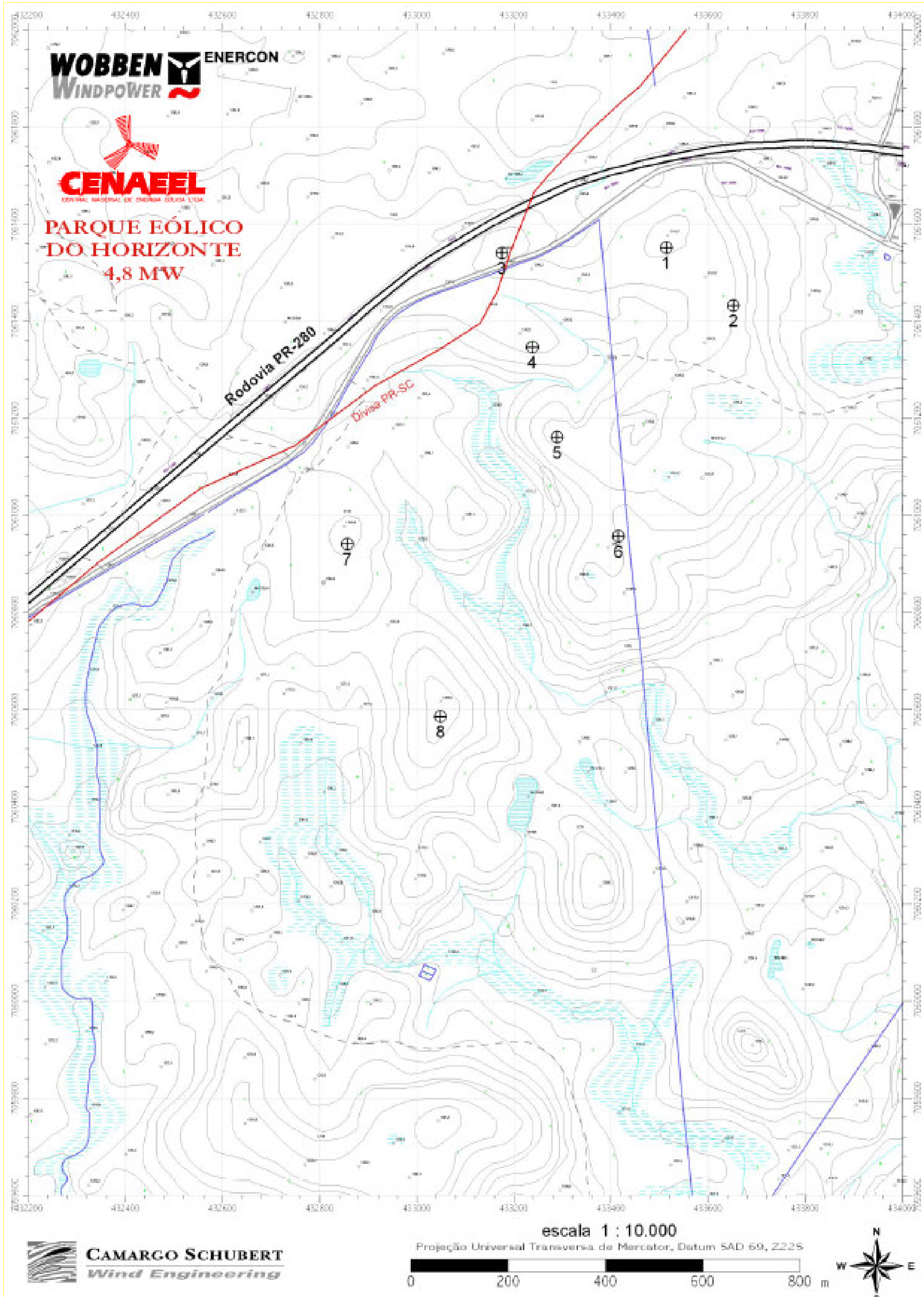


Figure - 5: Aero-turbines position

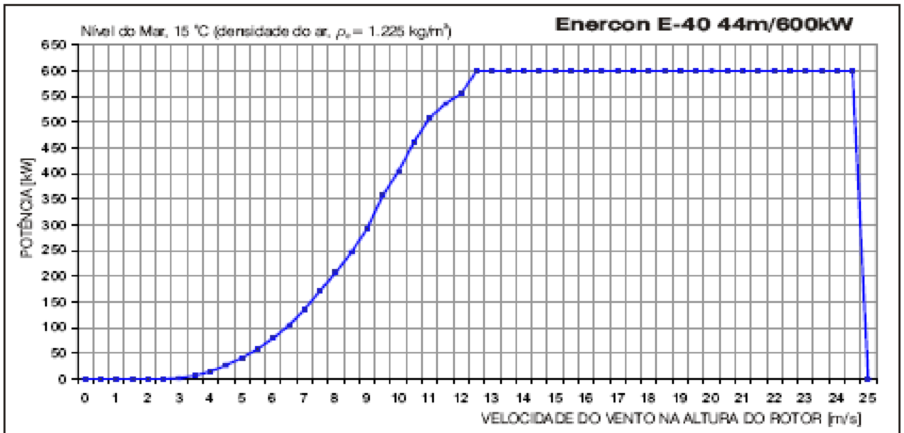


Fig. 3 - Curva de Potência da turbina Enercon E-40/600kW, ao nível do mar e a 15°C.

Figure - 6: Power curve of the aero-turbines installed in Horizonte Wind Farm.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

By dispatching renewable electricity to a grid, the electricity that would otherwise be produced using fossil fuel is displaced. This electricity displacement will occur at the system's margin, i.e. this CDM project will displace electricity that is produced by marginal sources (mainly fossil fueled thermal plants).Thermal plants have higher electricity dispatching costs and are called upon through dispatch orders only when base-load sources (low-cost or must-run sources) cannot supply the grid (due to higher marginal dispatching costs or fuel storage – in case of hydro sources – constraints).

The very first experiences with wind power generated electricity date back to the nineties. In 1976, a little less than a century after the start of the studies, the first commercial wind power turbine linked to the public power grid began operations in Denmark. Nowadays there are over than 30,000 MW of wind power installed capacity worldwide. Most projects are located in Germany, Denmark, Spain and in the United States. In Brazil, the first computerized anemometers and wind power potential measuring sensors were installed in the State of Ceara and on the isle Fernando de Noronha in the State of Pernambuco at the beginning of the 90´s.

Data from the Brazilian wind potential Atlas estimate the Brazilian wind potential at 143.000 MW. Today, Brazil's wind power installed capacity is of 26,8 MW, with the State of Ceara answering for almost 65% of this total capacity. According to the Agência Nacional de Energia Elétrica[1] (ANEEL - Brazilian Electric Energy National Agency) the areas with the greatest wind potential are found in the Northeastern, Southern and Southeastern regions of Brazil

The worldwide gross wind power potential is estimated in 500.000 TWh/year, which means over than 30 times the actual world consumption of electricity. Of this potential, at least 10% is technically useable, representing about four times the world consumption of electricity (MME[2]).

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[1] ANEEL – Agência Nacional de Energia Elétrica (Brazilian Electric Energy National Agency).

[2] MME – Ministério de Minas e Energia (Brazilian Energy and Mines Ministry).

Brazilian legislation recognizes and disciplines independent power producers. The continuously increasing electricity demand opens opportunities for renewable power generation plants in Brazil. Wind power generates electricity during the entire year period and this feature makes it extremely interesting in the Brazilian context. Brazil's most important electricity source is represented by hydroelectric generation system and the system falls under stress during the dry season of the year. Therefore, wind power represents an interesting complementary power source and an attractive solution for many purchasers. It also has to be said that the extra revenues and benefits associated with wind power project developed under the CDM also represent a stimulus and financial incentive for wind power developers and operators.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2004	4.513
2005	6.627
2006	6.627
2007	6.627
2008	6.627
2009	6.627
2010	6.627
Total estimated reductions (tonnes of CO_2e)	44.275
Total Number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	6.325

Actual emission reductions are only for the year 2004. The emission reduction for the following years are estimates.

A.4.4. Public funding of the small-scale project activity:

There is no public funding from Annex I Parties.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

The HWPGP refers to the construction of the wind farm. Therefore, the situation existing prior to the implementation of the construction activity has never been considered as a CDM project activity. The aforementioned is a confirmation that this small-scale project activity is not a debundled component of a larger project activity.

SECTION B. Application of a baseline methodology:

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

Title of baseline methodology: "Renewable Electricity Generation for a Grid", Type I.D in Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities.

B.2 Project category applicable to the small-scale project activity:

This category is applicable to HWPGP due to the fact that the project produces renewable energy from wind natural energy and supplies renewable electricity to a grid.

The project is a renewable energy project that produces electricity for an electricity grid system by using wind force as a fuel source. The project type is therefore a Type I category D that covers renewable energy projects for electricity generation for a system.

Emission reductions are obtained by supplying wind power generated electricity to the grid system.The supply of renewable electricity to the grid system avoids those emissions generated by traditional fossil fuel plants. Wind energy generating units (turbines) are covered by the selected methodology.

The HWPGP installed capacity is of 4,8 MW. Thus, since the electricity output does not exceed the threshold of 15 MWe, the project falls within the small scale CDM projects' category.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The proposed project activity qualifies the HWPGP to use simplified methodologies. Furthermore, project additionality is demonstrated below in terms of the options listed in "Attachment A to Appendix B" of the simplified modalities and procedures for small-scale CDM project activities.

The options are:

"(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of new technology adopted to the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led the implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher".

A. Investment barrier

It has been proven to be very difficult to find partners and potential investors for the project development due to perceived risks associated with wind energy in a region where no wind farms are commercially operating.

Wind energy in Brazil is at the beginning of its development and many important factors are not easily predictable: final cost of project development, construction, infrastructure, all of them well known in the developed wind energy markets, but currently quite unknown in Brazil due to the lack of experience and the country's political and financial risk.

The possibility of requesting a loan to finance the project had also been taken into account at the very beginning, during the project design phase. More specifically, the opportunity of requesting a loan from the Banco Nacional de Desenvolvimento Economico e Social (hereinafter BNDES) had been evaluated. However, the procedures to request this particular loan and the time needed to obtain it would have been longer than the project construction itself.

Given the aforementioned considerations, the loan was not requested and the project was developed through CEANEEL funds.

B. Technological barrier

Technological barriers represent a very important issue. There are very few transmission and communication lines in the region where the farm is operating Thus, the development and installation resulted to be much harder than it would have been under normal circumstances. It has been necessary to construct a 65 km transmission line, which led to an increase of the project costs.

Furthermore, since manufacturing technology is rather new in Brazil it is hard to find qualified individuals in the construction, operations and maintenance of the wind farm. This represents a more than obvious barrier to the operation and maintenance of the project.

C. Barrier due to prevailing practice

Being roughly 0,03% of the electricity generation installed capacity in the country in 2005, wind electricity is far from being adequately exploited. One of the reasons for such situation is that wind electricity costs are significantly higher than the predominantly used hydropower energy, especially in a country with such a big surface area and high number of rivers and falls. Moreover, barriers relating to the technicalities of designing, implementing and operating such facilities are clearly present, as there is not enough local knowledge on the matter.

D. Other barriers

Wind energy carries relatively high risks as compared to thermal or hydro energy power plants, because wind energy is intermittent and it is almost impossible to calculate the energy output with detail. CENAEEL is the first Brazilian private company to have invested in wind energy in Brazil, without any prior experience in this energy sector. CENAEEL received Wobben Wind Power (Brazilian subsidiary of German turbine manufacturer Enercon) technical support throughout the entire process.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

The definition of the project boundary related to the baseline methodology is applied to the project activity in the following way:

Baseline energy grid: For the HWPGP, the South-Southeast subsystem of the Brazilian grid is considered as a boundary. The wind farm is connected to the South-Southeast subsystem and supplies all the wind power to this subsystem

HWPGP: The HWPGP is the electricity generation plant considered as boundary and comprises the whole site where the generation facility is located.

B.5. Details of the baseline and its development:

The baseline methodology has followed the one specified in the Project Category I.D.

The baseline is the MWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh or in ton CO_2equ/MWh) calculated in a transparent and conservative manner as:

(a) The average of the “approximate operating margin” and the “build margin”, where:

(i) The “approximate operating margin” is the weighted average emissions (in kg CO_2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

(ii) (ii) The “build margin” is the weighted average emissions (in kg CO_2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20%5 of existing plants or the 5 most recent plants.”;

OR,

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

The method that will be chosen to calculate the Operating Margin (OM) for the electricity baseline emission factor is the option (a) *The average of the “approximate operating margin” and the “build margin”*.

The Brazilian electricity system has been historically divided into two subsystems: the North-Northeast (N-NE) and the South-Southeast-Midwest (S-SE-CO). This is due mainly to the historical evolution of the physical system, which was naturally developed nearby the biggest consuming centers of the country.

The natural evolution of both systems is increasingly showing that integration is to happen in the future. In 1998, the Brazilian government was announcing the first leg of the interconnection line between S-SE-CO and N-NE. With investments of around US$700 million, the connection had the main purpose, in the government's view, at least, to help solve energy imbalances in the country: the S-SE-CO region could supply the N-NE in case it was necessary and vice-versa.

Nevertheless, even after the interconnection had been established, technical papers still divided the Brazilian system into three (Bosi, 2000)[3]:

"… where the Brazilian Electricity System is divided into three separate subsystems:

(i) The South/Southeast/Midwest Interconnected System;
(ii) The North/Northeast Interconnected System; and
(iii) The Isolated Systems (which represent 300 locations that are electrically isolated from the interconnected systems)"

Moreover, Bosi (2000) offers a strong argument for the so-called *multi-project baselines*:

"For large countries with different circumstances within their borders and different power grids based in these different regions, multi-project baselines in the electricity sector may need to be disaggregated below the country-level in order to provide a credible representation of 'what would have happened otherwise'".

Finally, one has to take into account that even though the systems today are connected, the energy flow between N-NE and S-SE-CO is heavily limited by the transmission lines' capacity. Therefore, only a fraction of the total energy generated in both subsystems is sent one way or another. It is natural that this fraction may change its direction and magnitude (up to the transmission line's capacity) depending on the hydrological patterns, climate and other uncontrolled factors. But it is not supposed to represent a significant amount of each subsystem's electricity demand. It has also to be considered that only in 2004 the interconnection between SE and NE was concluded, i.e., if project proponents are to be coherent with the generation database they have available as of the time of the PDD submission for validation, a situation where the electricity flow between the subsystems was even more restricted is to be considered.

The Brazilian electricity system is of approximately 91,3 GW of installed capacity and a total of 1.420 electricity generation power plants From those, nearly 70% are hydropower plants, around 10% are natural gas-fired power plants, 5,3% are diesel and fuel oil plants, 3,1% are biomass sources (sugarcane bagasse, black liquor, wood, rice straw and biogas), 2% are nuclear plants, 1,4% are coal plants. Also, there are 8,1 GW of installed capacity in neighboring countries (Argentina, Uruguay, Venezuela and Paraguay) that may dispatch electricity to the Brazilian grid. (http://www.aneel.gov.br/aplicacoes/capacidadebrasil/OperacaoCapacidadeBrasil.asp). This latter capacity is mainly represented by the 6,3 GW of the Paraguayan part of *Itaipu Binacional*, a hydropower plant operated by both Brazil and Paraguay, but whose energy is almost entirely sent to the Brazilian grid.

The approved methodology asks project proponents to account for "all generating sources serving the system". In that way, when applying one of these methodologies, project proponents in Brazil should search for, and research, all power plants serving the Brazilian system.

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[3] Bosi, M. *An Initial View on Methodologies for Emission Baselines: Electricity Generation Case Study*. International Energy Agency. Paris, 2000.

Information on all generating sources is not publicly available in Brazil. The national dispatch center, Operador Nacional do Sistema (hereinafter ONS), argues that dispatching information is strategic to the power agents and therefore cannot be made publicly available. On the other hand, ANEEL, the electricity agency, provides information on power capacity and legal issues but not on dispatch matters.

In this context, project proponents looked for a plausible solution in order to be able to calculate the emission factor in Brazil in the most accurate way. Since real dispatch data is necessary, the ONS was contacted, in order to let participants know until which degree of detail information could be provided. After several months of talks, plant's daily dispatch information was made available for the years 2002, 2003 and 2004.

Project proponents, discussing the feasibility of using such data, concluded it was the most appropriate information to be considered when determining the emission factor for the Brazilian grid. According to ANEEL, in fact, ONS centralized dispatched plants accounted for 75.547 MW of installed capacity at 31/12/2004, out of the total 98.848,5 MW installed in Brazil at the same date (http://www.aneel.gov.br/arquivos/PDF/Resumo_Gráficos_mai_2005.pdf). The installed capacity figure includes capacity available in neighboring countries to export to Brazil and emergency plants capacity, that are dispatched only during times of electricity constraints in the system. Such capacity is constituted by plants with 30 MW or above of installed capacity, connected to the system through 138kV power lines, or at higher voltages. Therefore, even though the emission factor calculation is carried out without considering all generating sources serving the system, about 76,4 % of the installed capacity serving Brazil is taken into account, which is a fair amount if one looks at the difficulties in getting dispatch information in Brazil. Moreover, the remaining 23,6% are plants that do not have their dispatch coordinated by ONS, since: either they operate based on power purchase agreements which are not under control of the dispatch authority; or they are located in non-interconnected systems to which ONS has no access. In that way, this portion is not likely to be affected by CDM projects, and this is another reason for not taking them into account when determining the emission factor.

Therefore, following the aforementioned rationale, project developers opted for the database considering ONS information only, as it was capable of properly addressing the issue of determining the emission factor and doing it in the most conservative way possible.

The fossil fueled plants efficiencies were taken from an International Energy Agency (hereinafter IEA) paper because of the lack of more detailed information on such efficiencies from public and other reliable sources.

From the above mentioned IEA paper follows that:

> *"The fossil fuel conversion efficiency (%) for the thermal power plants was calculated based on the installed capacity of each plant and the electricity actually produced. For most of the fossil fuel power plants under construction, a constant value of 30% was used as an estimate for their fossil fuel conversion efficiencies. This assumption was based on data available in the literature and based on the observation of the actual situation of those kinds of plants currently in operation in Brazil. The only 2 natural gas plants in combined cycle (totaling 648 MW) were assumed to have a higher efficiency rate, i.e. 45 %."*

Therefore only data for plants under construction in 2002 (with operation starting in 2002, 2003 and 2004) were based on estimations. All other efficiencies were calculated. To the best of our knowledge there was no retrofit/modernization of the older fossil-fuelled power plants in the analyzed period (2002 to 2004). For that reason project participants believe the application of such numbers is not only the most reasonable but also the best available option.

The Low-cost/Must-run generation was determined as the total generation minus fossil-fuelled thermal plants generation, this one determined through daily dispatch data provided by ONS. All this information has been provided to the validators, and extensively discussed with them, in order to make all points crystal clear.

A summary of the analysis is provided on the following tables. The first table lists the 130 plants dispatched by the ONS. Then, a table with the summarized conclusions of the analysis, with the emission factor calculation is displayed.

ONS Dispatched Plants

	Subsystem*	Fuel source**	Power plant	Operation start [2, 4, 5]	Installed capacity (MW) [1]	Fossil fuel conversion efficiency (%) [2]	Carbon emission factor (tC/TJ) [3]	Fraction carbon oxidized [3]	Emission factor (tCO2/MWh)
1	S-SE-CO	H	Jauru	Sep-2003	121.5	1	0.0	0.0%	0.000
2	S-SE-CO	H	Gauporé	Sep-2003	120.0	1	0.0	0.0%	0.000
3	S-SE-CO	G	Três Lagoas	Aug-2003	306.0	0.3	15.3	99.5%	0.670
4	S-SE-CO	H	Funil (MG)	Jan-2003	180.0	1	0.0	0.0%	0.000
5	S-SE-CO	H	Itiquira I	Sep-2002	156.1	1	0.0	0.0%	0.000
6	S-SE-CO	G	Araucária	Sep-2002	484.5	0.3	15.3	99.5%	0.670
7	S-SE-CO	G	Canoas	Sep-2002	160.6	0.3	15.3	99.5%	0.670
8	S-SE-CO	H	Piraju	Sep-2002	81.0	1	0.0	0.0%	0.000
9	S-SE-CO	G	Nova Piratininga	Jun-2002	384.9	0.3	15.3	99.5%	0.670
10	S-SE-CO	O	PCT CGTEE	Jun-2002	5.0	0.3	20.7	99.0%	0.902
11	S-SE-CO	H	Rosal	Jun-2002	55.0	1	0.0	0.0%	0.000
12	S-SE-CO	G	Ibirité	May-2002	226.0	0.3	15.3	99.5%	0.670
13	S-SE-CO	H	Cana Brava	May-2002	465.9	1	0.0	0.0%	0.000
14	S-SE-CO	H	Sta. Clara	Jan-2002	60.0	1	0.0	0.0%	0.000
15	S-SE-CO	H	Machadinho	Jan-2002	1,140.0	1	0.0	0.0%	0.000
16	S-SE-CO	G	Juiz de Fora	Nov-2001	87.0	0.28	15.3	99.5%	0.718
17	S-SE-CO	G	Macaé Merchant	Nov-2001	922.6	0.24	15.3	99.5%	0.837
18	S-SE-CO	H	Lajeado (ANEEL res. 402/2001)	Nov-2001	902.5	1	0.0	0.0%	0.000
19	S-SE-CO	G	Eletrobolt	Oct-2001	379.0	0.24	15.3	99.5%	0.837
20	S-SE-CO	H	Porto Estrela	Sep-2001	112.0	1	0.0	0.0%	0.000
21	S-SE-CO	G	Cuiaba (Mario Covas)	Aug-2001	529.2	0.3	15.3	99.5%	0.670
22	S-SE-CO	G	W. Arjona	Jan-2001	194.0	0.25	15.3	99.5%	0.804
23	S-SE-CO	G	Uruguaiana	Jan-2000	639.9	0.45	15.3	99.5%	0.447
24	S-SE-CO	H	S. Caxias	Jan-1999	1,240.0	1	0.0	0.0%	0.000
25	S-SE-CO	H	Canoas I	Jan-1999	82.5	1	0.0	0.0%	0.000
26	S-SE-CO	H	Canoas II	Jan-1999	72.0	1	0.0	0.0%	0.000
27	S-SE-CO	H	Igarapava	Jan-1999	210.0	1	0.0	0.0%	0.000
28	S-SE-CO	H	Porto Primavera	Jan-1999	1,540.0	1	0.0	0.0%	0.000
29	S-SE-CO	D	Cuiaba (Mario Covas)	Oct-1998	529.2	0.27	20.2	99.0%	0.978
30	S-SE-CO	H	Sobragi	Sep-1998	60.0	1	0.0	0.0%	0.000
31	S-SE-CO	H	PCH EMAE	Jan-1998	26.0	1	0.0	0.0%	0.000
32	S-SE-CO	H	PCH CEEE	Jan-1998	25.0	1	0.0	0.0%	0.000
33	S-SE-CO	H	PCH ENERSUL	Jan-1998	43.0	1	0.0	0.0%	0.000
34	S-SE-CO	H	PCH CEB	Jan-1998	15.0	1	0.0	0.0%	0.000
35	S-SE-CO	H	PCH ESCELSA	Jan-1998	62.0	1	0.0	0.0%	0.000
36	S-SE-CO	H	PCH CELESC	Jan-1998	50.0	1	0.0	0.0%	0.000
37	S-SE-CO	H	PCH CEMAT	Jan-1998	145.0	1	0.0	0.0%	0.000
38	S-SE-CO	H	PCH CELG	Jan-1998	15.0	1	0.0	0.0%	0.000
39	S-SE-CO	H	PCH CERJ	Jan-1998	59.0	1	0.0	0.0%	0.000
40	S-SE-CO	H	PCH COPEL	Jan-1998	70.0	1	0.0	0.0%	0.000
41	S-SE-CO	H	PCH CEMIG	Jan-1998	84.0	1	0.0	0.0%	0.000
42	S-SE-CO	H	PCH CPFL	Jan-1998	55.0	1	0.0	0.0%	0.000
43	S-SE-CO	H	S. Mesa	Jan-1998	1,275.0	1	0.0	0.0%	0.000
44	S-SE-CO	H	PCH EPAULO	Jan-1998	26.0	1	0.0	0.0%	0.000
45	S-SE-CO	H	Guilmam Amorim	Jan-1997	140.0	1	0.0	0.0%	0.000
46	S-SE-CO	H	Corumbá	Jan-1997	375.0	1	0.0	0.0%	0.000
47	S-SE-CO	H	Miranda	Jan-1997	408.0	1	0.0	0.0%	0.000
48	S-SE-CO	H	Noav Ponte	Jan-1994	510.0	1	0.0	0.0%	0.000
49	S-SE-CO	H	Segredo (Gov. Ney Braga)	Jan-1992	1,260.0	1	0.0	0.0%	0.000
50	S-SE-CO	H	Taquaruçu	Jan-1989	554.0	1	0.0	0.0%	0.000
51	S-SE-CO	H	Manso	Jan-1988	210.0	1	0.0	0.0%	0.000
52	S-SE-CO	H	D. Francisca	Jan-1987	125.0	1	0.0	0.0%	0.000
53	S-SE-CO	H	Itá	Jan-1987	1,450.0	1	0.0	0.0%	0.000
54	S-SE-CO	H	Rosana	Jan-1987	369.2	1	0.0	0.0%	0.000
55	S-SE-CO	N	Angra	Jan-1985	1,874.0	1	0.0	0.0%	0.000
56	S-SE-CO	H	T. Irmãos	Jan-1985	807.5	1	0.0	0.0%	0.000
57	S-SE-CO	H	Itaipu 60 Hz	Jan-1983	6,300.0	1	0.0	0.0%	0.000
58	S-SE-CO	H	Itaipu 50 Hz	Jan-1983	5,375.0	1	0.0	0.0%	0.000
59	S-SE-CO	H	Emborcação	Jan-1982	1,192.0	1	0.0	0.0%	0.000
60	S-SE-CO	H	Nova Avanhandava	Jan-1982	347.4	1	0.0	0.0%	0.000
61	S-SE-CO	H	Gov. Bento Munhoz - GBM	Jan-1980	1,676.0	1	0.0	0.0%	0.000
62	S-SE-CO	H	S.Santiago	Jan-1980	1,420.0	1	0.0	0.0%	0.000
63	S-SE-CO	H	Itumbiara	Jan-1980	2,280.0	1	0.0	0.0%	0.000
64	S-SE-CO	O	Igarapé	Jan-1978	131.0	0.3	20.7	99.0%	0.902
65	S-SE-CO	H	Itauba	Jan-1978	512.4	1	0.0	0.0%	0.000
66	S-SE-CO	H	A. Vermelha (Jose E. Moraes)	Jan-1978	1,396.2	1	0.0	0.0%	0.000
67	S-SE-CO	H	S.Simão	Jan-1978	1,710.0	1	0.0	0.0%	0.000
68	S-SE-CO	H	Capivara	Jan-1977	640.0	1	0.0	0.0%	0.000
69	S-SE-CO	H	S.Osório	Jan-1975	1,078.0	1	0.0	0.0%	0.000
70	S-SE-CO	H	Marimbondo	Jan-1975	1,440.0	1	0.0	0.0%	0.000
71	S-SE-CO	H	Promissão	Jan-1975	264.0	1	0.0	0.0%	0.000
72	S-SE-CO	C	Pres. Medici	Jan-1974	446.0	0.26	26.0	98.0%	1.294
73	S-SE-CO	H	Volta Grande	Jan-1974	380.0	1	0.0	0.0%	0.000
74	S-SE-CO	H	Porto Colombia	Jun-1973	320.0	1	0.0	0.0%	0.000
75	S-SE-CO	H	Passo Fundo	Jan-1973	220.0	1	0.0	0.0%	0.000
76	S-SE-CO	H	Passo Real	Jan-1973	158.0	1	0.0	0.0%	0.000
77	S-SE-CO	H	Ilha Solteira	Jan-1973	3,444.0	1	0.0	0.0%	0.000
78	S-SE-CO	H	Mascarenhas	Jan-1973	131.0	1	0.0	0.0%	0.000
79	S-SE-CO	H	Gov. Parigot de Souza - GPS	Jan-1971	252.0	1	0.0	0.0%	0.000
80	S-SE-CO	H	Chavantes	Jan-1971	414.0	1	0.0	0.0%	0.000
81	S-SE-CO	H	Jaguara	Jan-1971	424.0	1	0.0	0.0%	0.000
82	S-SE-CO	H	Sá Carvalho	Apr-1970	78.0	1	0.0	0.0%	0.000
83	S-SE-CO	H	Estreito (Luiz Carlos Barreto)	Jan-1969	1,050.0	1	0.0	0.0%	0.000
84	S-SE-CO	H	Ibitinga	Jan-1969	131.5	1	0.0	0.0%	0.000
85	S-SE-CO	H	Jupiá	Jan-1969	1,551.2	1	0.0	0.0%	0.000
86	S-SE-CO	O	Alegrete	Jan-1968	66.0	0.26	20.7	99.0%	1.040
87	S-SE-CO	G	Campos (Roberto Silveira)	Jan-1968	30.0	0.24	15.3	99.5%	0.837
88	S-SE-CO	G	Santa Cruz (RJ)	Jan-1968	766.0	0.31	15.3	99.5%	0.648
89	S-SE-CO	H	Paraibuna	Jan-1968	85.0	1	0.0	0.0%	0.000
90	S-SE-CO	H	Limoeiro (Armando Salles de Oliviera)	Jan-1967	32.0	1	0.0	0.0%	0.000
91	S-SE-CO	H	Caconde	Jan-1966	80.4	1	0.0	0.0%	0.000
92	S-SE-CO	C	J.Lacerda C	Jan-1965	363.0	0.25	26.0	98.0%	1.345
93	S-SE-CO	C	J.Lacerda B	Jan-1965	262.0	0.21	26.0	98.0%	1.602
94	S-SE-CO	C	J.Lacerda A	Jan-1965	232.0	0.18	26.0	98.0%	1.869
95	S-SE-CO	H	Bariri (Alvaro de Souza Lima)	Jan-1965	143.1	1	0.0	0.0%	0.000
96	S-SE-CO	H	Funil (RJ)	Jan-1965	216.0	1	0.0	0.0%	0.000
97	S-SE-CO	C	Figueira	Jan-1963	20.0	0.3	26.0	98.0%	1.121
98	S-SE-CO	H	Furnas	Jan-1963	1,216.0	1	0.0	0.0%	0.000
99	S-SE-CO	H	Barra Bonita	Jan-1963	140.8	1	0.0	0.0%	0.000
100	S-SE-CO	C	Charqueadas	Jan-1962	72.0	0.23	26.0	98.0%	1.462
101	S-SE-CO	H	Jurumirim (Armando A. Laydner)	Jan-1962	97.7	1	0.0	0.0%	0.000
102	S-SE-CO	H	Jacui	Jan-1962	180.0	1	0.0	0.0%	0.000
103	S-SE-CO	H	Pereira Passos	Jan-1962	99.1	1	0.0	0.0%	0.000
104	S-SE-CO	H	Tres Marias	Jan-1962	396.0	1	0.0	0.0%	0.000
105	S-SE-CO	H	Euclides da Cunha	Jan-1960	108.8	1	0.0	0.0%	0.000
106	S-SE-CO	H	Camargos	Jan-1960	46.0	1	0.0	0.0%	0.000
107	S-SE-CO	H	Santa Branca	Jan-1960	56.1	1	0.0	0.0%	0.000
108	S-SE-CO	H	Cachoeira Dourada	Jan-1959	658.0	1	0.0	0.0%	0.000
109	S-SE-CO	H	Salto Grande (Lucas N. Garcez)	Jan-1958	70.0	1	0.0	0.0%	0.000
110	S-SE-CO	H	Salto Grande (MG)	Jan-1956	102.0	1	0.0	0.0%	0.000
111	S-SE-CO	H	Mascarenhas de Moraes (Peixoto)	Jan-1956	478.0	1	0.0	0.0%	0.000
112	S-SE-CO	H	Itutinga	Jan-1955	52.0	1	0.0	0.0%	0.000
113	S-SE-CO	C	S. Jerônimo	Jan-1954	20.0	0.26	26.0	98.0%	1.294
114	S-SE-CO	O	Carioba	Jan-1954	36.2	0.3	20.7	99.0%	0.902
115	S-SE-CO	O	Piratininga	Jan-1954	472.0	0.3	20.7	99.0%	0.902
116	S-SE-CO	H	Canastra	Jan-1953	42.5	1	0.0	0.0%	0.000
117	S-SE-CO	H	Nilo Peçanha	Jan-1953	378.4	1	0.0	0.0%	0.000
118	S-SE-CO	H	Fontes Nova	Jan-1940	130.3	1	0.0	0.0%	0.000
119	S-SE-CO	H	Henry Borden Sub.	Jan-1926	420.0	1	0.0	0.0%	0.000
120	S-SE-CO	H	Henry Borden Ext.	Jan-1926	469.0	1	0.0	0.0%	0.000
121	S-SE-CO	H	I. Pombos	Jan-1924	189.7	1	0.0	0.0%	0.000
122	S-SE-CO	H	Jaguari	Jan-1917	11.8	1	0.0	0.0%	0.000
				Total (MW) =	**64,478.6**				

* Subsystem: S - south, SE-CO - Southeast-Midw est

** Fuel source (C, bituminous coal; D, diesel oil; G, natural gas; H, hydro; N, nuclear; O, residual fuel oil).

[1] Agência Nacional de Energia Elétrica. *Banco de Informações da Geração* (http://w w w .aneel.gov.br/, data collected in november 2004)

[2] Bosi, M., A. Laurence, P. Maldonado, R. Schaeffer, A.F. Simoes, H. Winkler and J.M. Lukamba. *Road testing baselines for GHG mitigation projects in the electric power sector.* OECD/IEA information paper, October 2002.

[3] Intergovernamental Panel on Climate Change. *Revised 1996 Guidelines for National Greenhouse Gas Inventories.*

[4] Operador Nacional do Sistema Elétrico. Centro Nacional de Operação do Sistema. *Acompanhamento Diário da Operação do SIN* (daily reports from Jan. 1, 2001 to Dec. 31, 2003).

[5] Agência Nacional de Energia Elétrica. Superintendência de Fiscalização dos Serviços de Geração. *Resumo Geral dos Novos Empreendimentos de Geração* (http://w w w .aneel.gov.br/, data collected in november 2004).

Summary table

SSC Emission factors for the Brazilian South-Southeast-Midwest interconnected grid		
Small-scale baseline (without imports)	OM (tCO2e/MWh)	Total generation (MWh)
2002	0,9304	276.731.024
2003	0,9680	295.666.969
2004	0,9431	301.422.617
	Average OM (2002-2004, tCO2e/MWh)	Total = 873.820.610
		BM 2004 (tCO2e/MWh)
	0,9472	0,1045
	OM*0.5+BM*0.5 (tCO2e/MWh)	
	0,5258	

The following table presents information and data used to determine the baseline scenario.

ID number	Data type	Value	Unit	Data Source
1. EG_y	Electricity supplied to the grid by the Project.	Obtained throughout project activity lifetime.	MWh	CENAEEL
2. EF_y	CO_2 emission factor of the Grid.	0,5258	tCO_2e/MWh	Calculated
3. $EF_{OM,y}$	CO_2 Operating Margin emission factor of the grid.	0,9472	tCO_2e/MWh	This value was calculated using data information from ONS, the Brazilian electricity system manager.
4. $EF_{BM,y}$	CO_2 Build Margin emission factor of the grid.	0,1045	tCO_2e/MWh	This value was calculated using data information from ONS, the Brazilian electricity system manager.

1. Date of completing the final draft of this baseline section: 15/12/2005.

2. Name of person/entity determining the baseline:

   ECONERGY BRASIL, which is a project participant (Contact information in Annex 1), is responsible for the technical services related to the GHG emission reductions, and is therefore, on behalf of CENAEEL, the developer of this document and of all its contents.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

C.1.1. Starting date of the small-scale project activity:

01/02/2004.

C.1.2. Expected operational lifetime of the small-scale project activity:

20y-0m

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

C.2.1. Renewable crediting period:

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

01/02/2004.

C.2.1.2. Length of the first crediting period:

7y-0m.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

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C.2.2.2. Length:

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SECTION D. Application of a monitoring methodology and plan:

The monitoring will occur as follows:

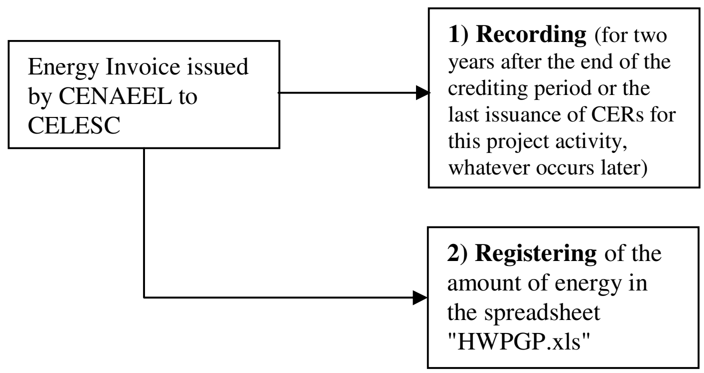

Figure 7: Monitoring procedures for Horizonte

The quantity of energy exported to the grid will be monitored through the energy invoice issued by CENAEEL to CELESC, the energy distributor. The recording will occur up to two years after the end of the crediting period or the last issuance of CERs for this project activity, whatever occurs later. The amount of energy will be registered in the spreadsheet "HWPGP.xls", which shall be the instrument for the further Verification.

The calibration of energy measurement instruments are made by CELESC – Centrais Elétricas de Santa Catarina S.A., the local utility. The calibration procedures shall be made annually.

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

Approved monitoring methodology:“Renewable Electricity Generation for a Grid”, Type I.D in Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

According to the methodology, monitoring shall consist of metering the electricity generated by the renewable technology. In the case of co-fired plants, the amount of biomass and fossil fuel input shall be monitored.

The aforementioned fully applies to the HWPGP: the project exploits a natural and renewable resource (wind) to produce and commercialize renewable electricity connected to a regional Brazilian grid.

D.3 Data to be monitored:

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be filed? (electronic/ paper)	For how long are the filed data going to be kept?	Comment
1.	Electricity supplied to the grid by the Project.	EGy	MWh	m	Monthly	100%	Electronic and paper	Double check by receipt of sales. Will be archived according to internal procedures, until 2 years after the end of the crediting period.	Double through sales invoices..
2.	CO_2 emission factor of the Grid.	EFy	tCO_2e/ MWh	c	At the validation and yearly after registration	0%	Electronic and paper	Will be archived according to internal procedures, until 2 years after the end of the crediting period.	These values are to be recalculated at the time of each baseline renovation
3.	CO_2 Operating Margin emission factor of the grid.	$EF_{OM,y}$	tCO_2e/ MWh	c	At the validation and yearly after registration	0%	Electronic and paper	Will be archived according to internal procedures, until 2 years after the end of the crediting period.	These values are to be recalculated at the time of each baseline renovation
4.	CO_2 Build Margin emission factor of the Grid.	$EF_{BM,y}$	tCO_2e/ MWh	c	At the validation and yearly after registration	0%	Electronic and paper	Will be archived according to internal procedures, until 2 years after the end of the crediting period.	These values are to be recalculated at the time of each baseline renovation

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	*Low*	These data will be directly used for calculation of emission reductions. Sales records and other records are used to ensure consistency.
2	*Low*	Data does not need to be monitored
3	*Low*	Data does not need to be monitored
4	*Low*	Data does not need to be monitored

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

The monitoring structure of the project will basically consist in recording the quantity of energy exported to the grid (EG_y) from year 2004 up to the end of the last crediting period. Since no leakage and no off-grid emissions change were identified in this project activity, there will be no need to monitor these variables. There are two operations that the project participants must perform to ensure data consistency, despite the fact that this will actually consist of the monitoring of one single variable.

1. The monthly readings of the gauged equipment must be recorded in an electronic spreadsheet;
2. Sales invoices must be filed to double check the data. In the event of inconsistency, these will be the data to use.

Moreover, in compliance with national legislation, the metering equipment shall be periodically calibrated as provided for in the regulations for independent power producers connected to the regional grid.

D.6. Name of person/entity determining the monitoring methodology:

ECONERGY BRASIL, which is a project participant (Contact information in Annex 1), is responsible for the technical services related to GHG emission reductions, and is therefore, on behalf of CENAEEL, the developer of this document and of all its content.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

Appendix B does not indicate a specific formula to calculate the GHG emission reductions by sources.

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

This project activity does not burn any additional quantity of fossil fuel due to the project implementation. Therefore, there is no GHG emission due to project activity.

Thus, $\mathbf{PE_y = 0}$

PE_y are the project emissions during the year y in tons of CO_2e.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

According to the leakage paragraph of Approved Monitoring Methodology "Renewable Electricity Generation for a Grid", Type I.D in Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities, the following applicability is shown:

"**Leakage**
8. If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered."

Since none of the conditions above are applicable to the HWPGP, there is no leakage to be considered in this project activity.

Thus, $\mathbf{L_y = 0}$
L_y are the leakage emissions during the year y in tons of CO_2e.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

$\mathbf{L_y + PE_y = 0}$

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

According to the baseline methodology I.D., the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh or in ton CO_2equ/MWh) calculated in a transparent and conservative manner as:

(a) The average of the "approximate operating margin" and the "build margin", where:

(i) The "approximate operating margin" is the weighted average emissions (in kg CO_2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

(ii) The "build margin" is the weighted average emissions (in kg CO_2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants.";

OR,

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

The method that will be chosen to calculate the Operating Margin (OM) for the electricity baseline emission factor is (a) *The average of the "approximate operating margin" and the "build margin"*.

The baseline methodology considers the determination of the emissions factor for the grid to which the project activity is connected as the core data to be determined in the baseline scenario. In Brazil, there are two main grids, South-Southeast-Midwest and North-Northeast, therefore the South-Southeast Grid is the relevant one for this project.

In order to calculate the Operating Margin, daily dispatch data from the Brazilian electricity system manager (ONS) needed to be gathered. ONS does not regularly provide such information, which implied in getting it through communicating directly with the entity.

The information gathered covered the years 2002, 2003 and 2004, and it is the most recent information available at this stage (At the end of 2005 ONS supplied raw dispatch data for the whole interconnected grid in the form of daily reports[4] from Jan. 1, 2002 to Dec. 31, 2004, the most recent information available at this stage).

According to the methodology, the project is to determine the OM Emission Factor ($EF_{OM, y}$). Therefore, the following equation is to be solved:

[4] *Acompanhamento Diário da Operação do Sistema Interligado Nacional*. ONS-CNOS, Centro Nacional de Operação do Sistema. Daily reports on the whole interconnected electricity system from Jan. 1, 2002 to Dec. 31, 2004.

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y}.COEF_{i,j}}{\sum_{j} GEN_{j,y}} + \frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_{k} GEN_{k,y}} \quad (tCO_2e/GWh)$$

It is assumed here that all the low-cost/must-run plants produce zero net emissions.

$$\frac{\sum_{i,k} F_{i,k,y}.COEF_{i,k}}{\sum_{k} GEN_{k,y}} = 0 \quad (tCO_2e/GWh)$$

Where;

$F_{i,j(or\ m),y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y;*

j,m refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and excluding imports from the grid;

$COEF_{i,j(or\ m)\ y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j (or m) and the percent oxidation of the fuel in year(s) y;

$GEN_{j(or\ m),y}$ is the electricity (MWh) delivered to the grid by source *j (or m);*

$BE_{electricity,y}$ are the baseline emissions due to displacement of electricity during the year y in tons of CO_2;

EG_y is the net quantity of electricity generated due to the project activity during the year y in MWh, and;

$EF_{electricity,y}$ is the CO_2 baseline emission factor for the electricity.

The ONS data as well as the spreadsheet data with the calculation of emission factors have been provided to the validator (DOE). In the spreadsheet, the dispatch data is treated as to allow calculation of the emission factor for the most three recent years with available information: 2002, 2003 and 2004

Electricity generation for each year also needs to be taken into account. This information is provided in the table below.

Year	Electricity Load (MWh)
2002	276.731.024
2003	295.666.969
2004	301.422.617

Using appropriate information for $F_{i,j,y}$ and $COEF_{i,j}$, OM emission factors for each year can be determined, as follows:

$$EF_{OM,2002} = \frac{\sum_{i,j} F_{i,j,2002}.COEF_{i,j}}{\sum_{j} GEN_{j,2002}} \therefore EF_{OM,2002} = 0{,}9304 \text{ tCO}_2\text{/MWh}$$

$$EF_{OM,2003} = \frac{\sum_{i,j} F_{i,j,2003}.COEF_{i,j}}{\sum_{j} GEN_{j,2003}} \therefore EF_{OM,2003} = 0{,}9680 \text{ tCO}_2\text{/MWh}$$

$$EF_{OM,2004} = \frac{\sum_{i,j} F_{i,j,2004}.COEF_{i,j}}{\sum_{j} GEN_{j,2004}} \therefore EF_{OM,2004} = 0{,}9431 \text{ tCO}_2\text{/MWh}$$

Finally, to determine the baseline *ex-ante*, the mean average of the three years is calculated, determining the average of EF_{OM}.

$$EF_{OM,\,2002-2004} = 0{,}9472 \text{ tCO}_2\text{/MWh}$$

According to the methodology used, a Build Margin emission factor also needs to be determined.

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y}.COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

Electricity generation in this case means 20% of total generation in the most recent year (2004), as the 5 most recently built plants generate less than such 20%. Calculating such factor

$$EF_{BM,2004} = 0{,}1045 \text{ tCO}_2\text{/MWh}$$

Finally, the electricity baseline emission factor is calculated through a weighted-average formula, considering both the OM and the BM, being the weights 50% and 50% by default. That gives:

$$EF_{electricity,2002-2004} = \frac{EF_{OM} + EF_{BM}}{2} = \frac{0{,}9472 + 0{,}1045}{2} = 0{,}5258 \text{ tCO}_2\text{/MWh}$$

It is important to note that adequate considerations on the above weights are currently under study by the Meth Panel, and there is a possibility that the weights applied here might change.

The baseline emission would be then proportional to the electricity delivered to the grid throughout the project's lifetime. Baseline emissions due to displacement of electricity are calculated by multiplying the electricity baseline emissions factor ($EF_{electricity,2002-2004}$) by the electricity generation of the project activity.

$BE_{electricity,y} = EF_{electricity,2002-2004} \, . \, EG_y$

Where:

$BE_{electricity,y}$ are the baseline emissions due to displacement of electricity during the year y in tons of CO_2;

$EF_{electricity,y}$ is the CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y in tons CO_2/MWh;

EG_y is the net quantity of electricity generated by the wind power farm due to the project activity during the year y in MWh.

Therefore, for the first crediting period, the baseline emissions will be calculated as follows:

$$\mathbf{BE_{electricity,y} = 0{,}5258\ tCO_2/MWh\ .\ EG_y} \quad (\text{in } tCO_2e)$$

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

The total net emission reductions due to the project activity result during a given year y as:

$$\mathbf{ER = BE_{electricity,y} - (L_y + PE_y)} = 0{,}5258\ tCO_2/MWh\ .\ EG_y - 0 \rightarrow \mathbf{ER = 0{,}5258\ tCO_2/MWh\ .\ EG_y}$$

E.2 Table providing values obtained when applying formulae above:

Horizonte Power Energy Generation Project										
Grid-Connected Emission Reduction	Item	Before HWPGP 2003	2004	2005	2006	2007	2008	2009	2010	Total CERs
	Total installed capacity (MW)	0	4,8	4,8	4,8	4,8	4,8	4,8	4,8	
	Capacity factor	0	0,309	0,309	0,309	0,309	0,309	0,309	0,309	
	Estimated energy to be sold to the grid (MWh)*	0	8.583	12.603	12.603	12.603	12.603	12.603	12.603	
	Baseline emision factor (tCO2/MWh)	0,5258	0,5258	0,5258	0,5258	0,5258	0,5258	0,5258	0,5258	
	Emission Reduction (tCO_2e)	0	4.513	6.627	6.627	6.627	6.627	6.627	6.627	**44.275**
*** Electricity sold until 2004. Data for 2005 and on are estimates.**										

Total emission reductions for the first crediting period are estimated at 44.275 tCO_2e.

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The possible environmental impacts were analyzed by the Fundação do Meio Ambiente – FATMA (Environment Fundation) of the State of Santa Catarina. The HWPGP is in compliance with the Brazilian environmental legislation and it has already obtained an Operation License.

The Operation License was issued on the 1st of December 2004. It has a three year's validity. It can be renewed.

The license validity conditions are the following:

- The wind farm operates 8 600kW aero-turbines for a total installed capacity of 4,8 MW;

- The turbines are E 40/600 kw;
- The interconnection is through a 34,5 kW three phase distribution line up to a CELESC power house in Água Doce;
- Preservation and maintenance of existing hydro resources are in accordance with Law n° 4.771/65, modified by Law n° 7.803/89 article 2;
- Continuity of fauna monitoring, including birds, mammals and insects, as scheduled in the Environmental Basic Project for a 2 years' period after operation begins;
- Delivery of technical annual reports with monitoring results and other environmental programs;
- Any change to the previous specifications must be previously accepted by FATMA;
- FATMA has the right to request modifications to the control systems, and suspend or cancel the license if there is:
    - Violation of any legal requirement;
    - Omission or delivery of false information to obtain the license;
    - Occurrence of unexpected negative environmental impacts and/or threats to public health;
- The request for the Operation Licence renewal needs to be presented 120 days before its expiry date.

There will be no transboundary impacts resulting from HWPGP. All relevant impacts occur within Brazilian borders and have been mitigated to comply with national environmental requirements. Therefore the HWPGP will not affect Brazil's bordering countries.

SECTION G. Stakeholders' comments:

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

As a requirement of the Brazilian Interministerial Commission on Global Climate Change, the Brazilian DNA, CENAEEL invited several organizations and institutions to comment on the CDM project being developed. Letters[5] were sent to the following:

- *Prefeitura Municipal de Água Doce – SC /* Municipal Administration of Água Doce – SC;
- *Câmara dos Vereadores de Água Doce – SC /* Municipal Chamber of Água Doce – SC;
- *Fórum Brasileiro de ONGs /* Brazilian NGOs Forum;

[5] The copies of these invitations are available from the Project participants.

- *Ministério Público de Santa Catarina* / Public Ministry of Santa Catarina;

- *Fundação do Meio Ambiente – FATMA* / Environmental Fundation;

- *Sindicato dos Trabalhadores Rurais de Água Doce – SC* / Rural Workers Union of Água Doce – SC;

- *Câmara de Dirigentes Lojistas de Água Doce – SC* / Chamber of Shopkeepers Rulers of Água Doce – SC.

G.2. Summary of the comments received:

As of today, and before the DOE proceeds to submitting the PDD to the Global Stakeholder Conference, comments were received from the Brazilian NGOs Forum and from the Municipal Adinistration of the City of Agua Doce.

The Brazilian NGOs Forum has sent a letter to CENAEEL dated 27 September 2005. The Forum's letter expresses gratitude for the correspondence dispatched by CENAEEL and recognizes the importance of its comments. The letter mentions the importance of consulting local stakeholders for comments in order to improve sustainability and the projects' quality. The Forum affirms it is waiting for a manifestation from the Brazilian Federal Government, by means of the CIMGC, about how the comments and analysis made are considered into the final decision of this sort of projects.

The Municipality Administration has sent a letter to CENAEEL dated 24 October 2005. The letter contains positive comments and welcomes the projects and all similar initiatives. However, the Municipality would welcome more detailed information on the technical, social and environmental impacts of the HWPGP.

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

CENAEEL replied to the queries of the Municipality Administration and of the Brazilian NGOs Forum through two separate letters in which it states that the project is undergoing validation. Since the validation process might result in significant changes to the PDD, CENAEEL will submit the final approved document to the Municipality as soon as available. In the meantime, CENAEEL will remain available for any further information.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no Annex I public funding involved in CBCP project activity.