



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

**CONTENTS**

- A. General description of project activity
- B. Application of a baseline and monitoring methodology
- C. Duration of the project activity / crediting period
- D. Environmental impacts
- E. Stakeholders' comments

**Annexes**

- Annex 1: Contact information on participants in the project activity
- Annex 2: Information regarding public funding
- Annex 3: Baseline information
- Annex 4: Monitoring plan

**SECTION A. General description of project activity****A.1. Title of the project activity:**

Bundled wind power project Cape Verde

Date: 03/11/2008 – Version 01.

**A.2. Description of the project activity:**

Cape Verde consists of 10 islands (9 inhabited) and 13 islets, situated in the Atlantic Ocean, approximately 455 km off the coast of *Senegal*. Cape Verde's land surface area is of 4,033 km<sup>2</sup>, however, the country has an Economic Exclusive Zone (EEZ) estimated at 700,000 km<sup>2</sup>. The current population of Cape Verde is estimated to be roughly 430,000 and the current GDP (Gross Domestic Product) is US\$ 1, 2 billion.

The recent positive economic results that Cape Verde has experienced have contributed to important advances in the socioeconomic position of Cape Verde. The foreign capital invested in tourism, international cooperation, the retention of highly skilled immigrants and the growth of the tourist industry, have positively affected the economic growth trend and the social development in the country.

As a result of this economic growth the demand for energy in Cape Verde has increased. Today, Cape Verde is highly dependent on electrical energy generation from fossil fuels due to its lack of investments and expertise to generate energy with renewable sources.

Wind energy generation is one of the most interesting and suitable renewable energy sources for Cape Verde. It is safe and will generate GHG (Greenhouse Gases) emission reductions. This type of electricity production uses local natural resources, contributes to sustainable development and reduces Cape Verde's dependence on imported fossil fuel.

The project activity is a bundling of four wind farms (28 MW), which will contribute to the reduction of fossil fuel dependence and consequently help to decrease the GHG emissions to the atmosphere by introducing an amount of electrical energy that is from a renewable source: wind power. Using the high wind potential of Cape Verde, this wind power plant installation aims to generate electrical power to supply Cape Verde and provide an alternative form of electricity generation, which fulfils the necessary requirements of the project activity.

The following four wind farms will be constructed at:

- *Santiago* with 10 MW of nominal capacity;
- *Sal* with 6 MW of nominal capacity;
- *São Vicente* with 8 MW of nominal capacity;
- *Boa Vista* with 4 MW of nominal capacity.

The bundled project activity will be developed by InfraCo Management Services Ltd. (hereafter *InfraCo*), a donor funded infrastructure development company, together with the Cape Verde



Government (hereafter GoCV) and the Water and Electricity Power Facility Company (hereafter *Electra*).

*Electra*<sup>1</sup> (*Empresa Pública de Electricidade e Água* – Electricity and Water Public Company) was created in year 1982 and is the operator of Cape Verde's electricity system and is responsible for the generation and distribution in the whole country.

Moreover, the project activities will contribute to the sustainable development of Cape Verde by introducing new practices and technologies, which will enable climate change mitigation to take place. It also contributes to an increase in the energy efficiency of the region.

**A.3. Project participants:**

| Name of the party involved(*)<br>(host) indicates a host party | Private and/or public entity(ies)<br>project participants (*)<br>(as applicable) | Kindly indicate if the Party<br>involved<br>wishes to be considered as<br>project participant<br>(Yes/No) |
|--|--|---|
| The United Kingdom   | InfraCo Management Services Ltd.   | No  |
| Cape Verde (Host country)                                      | <i>Cabeólica</i>   | No  |

**A.4. Technical description of the project activity:****A.4.1. Location of the project activity:**

The Cape Verde Wind Farms are located on the four islands: *Santiago, Sal, São Vicente* and *Boa Vista*.

**A.4.1.1. Host Party (ies):**

Cape Verde

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

The project activities are located in the *Santiago, Sal, São Vicente* and *Boa Vista* islands.

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

- The *Santiago* farm is located in the *Santiago* Island, 8 km from the city of *Praia*.
- The *Sal* farm is located in *Selada do Flamengo*, 6 km southeast of the city of *Espargos*.
- The *São Vicente* is located 6 km southwest of the city of *Mindelo*.
- The *Boa Vista* farm is located in the northwest of the island, 5 km from the city of *Sal Rei*.

<sup>1</sup> More details can be found at ELECTRA's website: <http://www.electra.cv/novo/index.htm>

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

The location of the wind farm power plants:

- *Boa Vista*

Latitude North: 16°13.2 N

Longitude West: 22°54.7 W

- *Sal*

Latitude North: 16°42.1 N

Longitude West: 22°54.1 W

- *Santiago*

Latitude North: 14°58.2 N

Longitude West: 23°30.7 W

- *São Vicente*

Latitude North: 16°50.3 N

Longitude West: 25°01.4 W



Figure 1 – Physical location of the project activity.

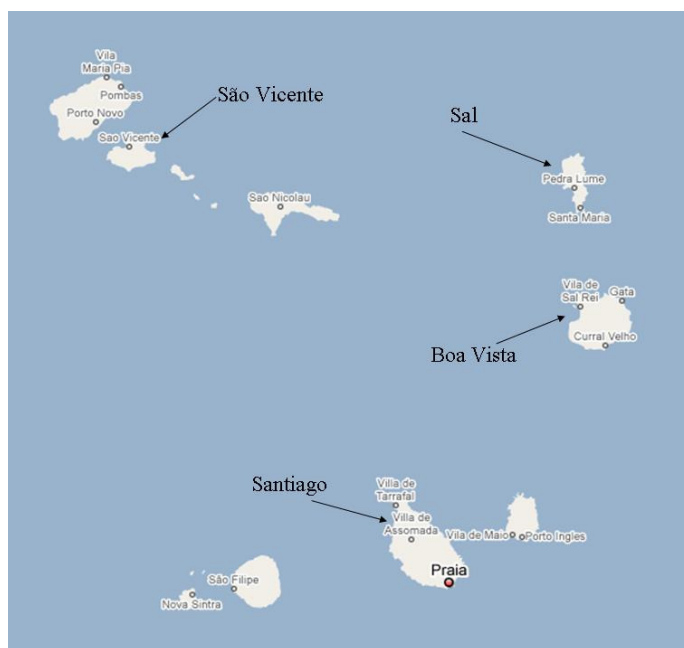


Figure 2 – Details about the location of the four wind farms of the project activity.



Figure 3 – Proposed location of wind farm in Santiago



Figure 4 – Proposed location of wind farm in Sal



Figure 5 – Proposed location of wind farm in Sao Vicente



Figure 6 – Proposed location of wind farm in Boa Vista

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

As per the sectoral scopes contemplated in the UNFCCC's approved methodologies, the bundled project activity falls under the category of "Electric energy generation from renewable sources". The methodology ACM0002, Version 07<sup>2</sup>: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applicable.

The following tools are also used in the development of this PDD: "Tool for the demonstration and assessment of additionality" – version 5.2; "Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion" – version 2; "Tool to calculate the emission factor for an electricity system" – version 1.1.

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

The proposed project activities comprise the installation and operation of four wind farms, which will compose the Cape Verde Bundled Wind Power Plant. The project will generate electricity for general consumption and satisfy Cape Verde's demand through adding renewable power to complement the existing electrical system. This will also reduce fossil fuel dependence which will result in GHG emission reductions.

The baseline scenario is fossil fuel based energy generation, mainly diesel oil (imported), characterizing a non-renewable energy matrix. Cape Verde's electricity system produced 268,518.337 MWh in year 2007, which were distributed via diesel (97.4%) and wind (2.6%) production<sup>3</sup>. The wind production is based on the three wind farms that are already in operation, Cape Verde has shown an average growth rate of 8.8% per year in wind energy production in the past five years (from 2003 to 2007). However the country is facing an energy crisis due to the lack of investments, available technology and power plants.

The project activity will be composed by four projects zones distributed in different islands (as described in section A.4), where 33 wind turbines (with 52 meter of Vestas rotor each) shall be installed, providing an overall installed capacity of 28 MW. The equipment used for these wind farms will be as follows: wind turbines with towers, transformation sites, underground cables to transport the electric power, substations and a command centre and tower access. It is estimated the wind turbines will be 80 meters in height and the turbine blades will be 28 metres in height, so the entire structure will be 108 meters in height. The technology will be brought from Denmark by the company Vestas Wind Systems.

The turbine model is Vestas V52-850 kW OptiSpeed® Wind Turbine. This type of OptiSpeed® also called Vestas Converter System (VCS), ensures a steady and stable electric power supply from the turbine, which consists of an effective asynchronous generator with wound rotor and sliprings, a power converter with Insulated Gate Bipolar Transistor (IGBT) switches, contactors and protection.

The VCS model enables variable speed operation in a range of approximately 60% of nominal RPM and, with the pitch regulation OptiTip®, ensures energy optimisation, low-noise operation and reduction of loads on the gearbox and other vital components. The VCS controls the current in the rotor circuit in the generator, what gives precise control of the reactive power and gives an accurate and precise connection between the generator and the grid.

---

<sup>2</sup> Methodology available on UNFCCC's website:

[http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF\\_AM\\_323M30IDF1IH6AG3GRCJ4PKR9CKM7P](http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_323M30IDF1IH6AG3GRCJ4PKR9CKM7P)

<sup>3</sup> Data obtained from the ELECTRA Annual Report – 2007.



| <i>Vestas V52-850 kW OptiSpeed® - Climatic Conditions</i> |         |       |
|---|---------|-------|
| Parameter   | Unit    | Value |
| Annual average wind speed ( $V_{Ave}$ )                   | m/s     | 10    |
| Weibull shape parameter C                                 | -       | 2     |
| Turbulence rate at 15 m/s                                 | %       | 18    |
| Reference wind speed for: 10 min, 50 years                | m/s     | 50    |
| Reference gust speed for: 3 sec, 50 years                 | m/s     | 70    |
| Wind gust max acceleration                                | $m/s^2$ | 10    |
| Cut-in wind speed   | m/s     | 4     |
| Cut-out wind speed  | m/s     | 25    |
| Restart wind speed (After cut-out)                        | m/s     | 20    |

The technical specifications for the turbine is determined as follows:

| <i>Rotor</i>         |                           |
|----------------------|---------------------------|
| Diameter             | 52 meters                 |
| Swept Area           | 2,124 m <sup>2</sup>      |
| Rated rotor speed    | 26 RPM                    |
| Rotor speed range    | 14 – 31.4 RPM             |
| Rotational direction | Clockwise (front view)    |
| Orientation          | Upwind                    |
| Tilt angle           | 6°                        |
| Blade coning angle   | 3°                        |
| Aerodynamic brakes   | Full feathering of blades |



| <i>Blades</i>                     |  |
|-----------------------------------|--|
| <b>Principle</b>                  | Shells bonded to supporting beam           |
| <b>Material</b>                   | Glass-fibre reinforced epoxy               |
| <b>Blade – bearing connection</b> | Steel root thread inserts + bolts          |
| <b>Length</b>                     | 25.3 meter                                 |
| <b>Weight</b>                     | About 1,900 kg each excluded blade bearing |

| <i>Generator</i>       |  |
|------------------------|--|
| <b>Type</b>            | Asynchronous with wound rotor, sliprings and VCS |
| <b>Rated power</b>     | 850 kW   |
| <b>Voltage</b>         | 690 VAC  |
| <b>Frequency</b>       | 50/60 Hz   |
| <b>Number of poles</b> | 4  |
| <b>Rated speed</b>     | 1,620 RP (50 Hz) and 1,944 RPM (60 Hz)           |
| <b>Rated current</b>   | 711 A  |



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

| Years  | Annual estimation of emission reductions (in tCO <sub>2</sub> eq) |            |                    |                  |
|--|---|------------|--------------------|------------------|
|  | <i>Santiago</i>   | <i>Sal</i> | <i>São Vicente</i> | <i>Boa Vista</i> |
| Year 1   | 33,572  | 20,179     | 26,823             | 14,414           |
| Year 2   | 33,572  | 20,179     | 26,823             | 14,414           |
| Year 3   | 33,572  | 20,179     | 26,823             | 14,414           |
| Year 4   | 33,572  | 20,179     | 26,823             | 14,414           |
| Year 5   | 33,572  | 20,179     | 26,823             | 14,414           |
| Year 6   | 33,572  | 20,179     | 26,823             | 14,414           |
| Year 7   | 33,572  | 20,179     | 26,823             | 14,414           |
| <b>Total estimated reductions (tCO<sub>2</sub>eq)</b>                                  | 235,006   | 141,256    | 187,765            | 100,901          |
| Total number of crediting years  | 7   | 7          | 7                  | 7                |
| Annual average over the crediting period of estimated reductions (tCO <sub>2</sub> eq) | 33,572  | 20,179     | 26,823             | 14,414           |
| Project's total Emission Reductions (tCO <sub>2</sub> eq)                              | 664.929   |            |                    |                  |
| Project's annual average emission reductions (tCO <sub>2</sub> eq/year)                | 94.989  |            |                    |                  |

*Table 1: Estimated emission reductions during the crediting period.***A.4.5. Public funding of the project activity:**

There will be no public funding for the project.

**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:**

The proposed project activities utilizes the consolidated baseline methodology ACM0002 – version 9 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, where the project activity is classified as sectoral scope 1.

Moreover, the more recent versions of the “Tool for the demonstration and assessment of additionality” – version 5.2, the “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” – version 2 and the “Tool to calculate the emission factor for an electricity system” – version 1.1, are considered.

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

The Cape Verde Wind Power Plant consists of four wind farms in four distinct sites - *São Vicente, Santiago, Sal* and *Boa Vista* – with a combined capacity of 28 MW. The tariff for the electricity generated is governed by a PPA (Power Purchase Agreement) with the electric utility in the country - Electra. The methodology ACM0002 – version 7 is applicable to the project activities considering that wind power plants/units are renewable energy sources and so it is in accordance to the applicability criteria: “The project activity is the installation or modification/retrofit of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit”.

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

As defined, the project boundary encompasses all anthropogenic emissions by sources of greenhouse gases (GHG) under the control of the project participants that are significant and reasonably attributable to the CDM project activity. As required by methodology ACM0002 – version 7, the project boundary for the proposed project activity comprises the facility where the wind farms shall be implemented.

The project activity is composed by 33 wind turbines (with 52 meter of Vestas rotor each) distributed in 4 islands in Cape Verde, which will provide an overall installed capacity of 28 MW. The technology will be brought from Denmark by the company Vestas Wind Systems.

The following sources of GHG emissions are included in the project boundary:

|       | Source   | Gas             | Included ? | Justification / Explanation |
|-------|--|-----------------|------------|-----------------------------|
| 2.3.1 | CO <sub>2</sub> emissions from electricity generation in fossil fuel fired | CO <sub>2</sub> | Yes        | Main emission source        |



|                  |  |                  |    |   |
|------------------|--|------------------|----|---|
| Project Activity |  | CH <sub>4</sub>  | No | Not applicable to the referred project activity |
|                  |  | N <sub>2</sub> O | No | Not applicable to the referred project activity |
|                  | For geothermal power plants, fugitive emissions of CH <sub>4</sub> and CO <sub>2</sub> from non-condensable gases contained in geothermal steam. | CO <sub>2</sub>  | No | Not applicable to the referred project activity |
|                  |  | CH <sub>4</sub>  | No | Not applicable to the referred project activity |
|                  |  | N <sub>2</sub> O | No | Not applicable to the referred project activity |
|                  | For geothermal power plants, CO <sub>2</sub> emissions from combustion of fossil fuels required to operate the geothermal power plant.           | CO <sub>2</sub>  | No | Not applicable to the referred project activity |
|                  |  | CH <sub>4</sub>  | No | Not applicable to the referred project activity |
|                  |  | N <sub>2</sub> O | No | Not applicable to the referred project activity |
|                  | For hydro power plants, emissions of CH <sub>4</sub> from the reservoir.   | CO <sub>2</sub>  | No | Not applicable to the referred project activity |
|                  |  | CH <sub>4</sub>  | No | Not applicable to the referred project activity |
|                  |  | N <sub>2</sub> O | No | Not applicable to the referred project activity |

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

The baseline scenario can be described in accordance to the methodology ACM0002 – version 07.

The project activity baseline scenario highlights that Cape Verde's electricity system is quite sensitive to variations in international prices. The current Cape Verde's islands electricity systems frequently have breaks in power distribution which causes several black outs and stops the energy supply to the subsystems which are connected to this grid. A 97.4% of Cape Verde's electricity is generated from fossil fuels and 2.6% from wind power (with a low capacity factor<sup>4</sup> of about 37%) For this reason, Cape Verde is highly dependent on the import of fossil fuel to produce electricity.

*Electra*<sup>5</sup> (*Empresa de Electricidade e Água* – Electricity and Water Utility Company) was created in 1982 and is Cape Verde's main electricity system operator. This organisation is responsible for electricity generation and distribution for most of the users in the whole country.

According to the *Electra's* Annual Report - 2007, the increased demand for energy production in the country has grown by more than 35% from 2003 to 2007 from a value of 198,653 to 268,518 MWh per year. The Company's installed capacity in 2007 was 73,890 kW, which was distributed by diesel and

<sup>4</sup> Values referred in *Electra* Annual Report - 2007, where the wind installed power is 2,100 kW and generated energy of 6,981,476.76 kWh, considering an annual generation hour of 8,760 h.

<sup>5</sup> More details can be found at ELECTRA's website: <http://www.electra.cv/novo/index.htm>



wind (as shown in the tables below). Because of the growth in energy demand without the subsequent growth in energy supply, Cape Verde is unable to meet demand and this has resulted in an energy crisis.

In order to supply the growing demand, the Cape Verde government has focused on investments in energy with a special focus on renewable sources to increase the energy supply. At December of 2007, *Electra's* facilities were composed of 19 diesel plants with different dimensions and 3 wind power farms, some of the turbines on these farms were no longer operating.

| Cape Verde's installed capacity (kW) - 2007 |               |
|---|---------------|
| Diesel Plants                               | 71,790        |
| Wind Plants                                 | 2,100         |
| <b>Total</b>                                | <b>73,890</b> |

Table 2: Installed capacity of the production power plants. Data obtained from the ELECTRA Annual Report – 2007.

| Cape Verde electricity generation (MWh) |                |                |                |                |                |
|---|----------------|----------------|----------------|----------------|----------------|
|   | 2003           | 2004           | 2005           | 2006           | 2007           |
| <b>Diesel</b>                           | 193,287        | 212,383        | 229,608        | 243,481        | 261,650        |
| <b>Wind</b>                             | 5,366          | 6,430          | 6,450          | 7,441          | 6,869          |
| <b>Total</b>                            | <b>198,653</b> | <b>218,813</b> | <b>236,058</b> | <b>250,922</b> | <b>268,519</b> |

Table 3: Evolution on electric energy generation. Data obtained from the ELECTRA Annual Report – 2007.

The implementation of this project in Cape Verde will increase the energy supply from renewable sources to the grid thereby reducing the dependence on fossil fuel for energy generation. The Government of Cape Verde is a minority partner to the project, but the project will not receive public funding. This Program is focused on improving Cape Verde's national energy generation and transmission, and growing the quantity of renewable energy supplied to the grid, which foresees an addition of 25% of energy provided by wind power plants until year 2010 – as determined in the PPP (Public-Private Partnership) between GoCV, *InfraCo* and *Electra*, signed in February 2008 and registered as Law-Decree 7/2008.

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

The project activity will reduce GHG emissions by the implementation of four wind farms, which will produce and add renewable energy to Cape Verde's islands Grid. Furthermore, the project activity will reduce GHG emissions by replacing the supply of energy produced by fossil fuel fired plants (diesel and fuel oil plants) which will, consequently, reduce the consumption of fossil fuels in order to generate energy.



The assessment and demonstration of the project's additionality is described using the approved document "Tool for the demonstration and assessment of additionality" – version 5.2.

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

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

The possible or potential alternative scenarios to the project activity are:

1. Do not implement any project activity (continuation of the current situation, where no project activity or alternatives are undertaken and there is the continuation of fuel fired plants);
2. Implementation of the project activity without CDM assistance;
3. Implementation of another type of energy generation from non-renewable sources (fossil fuel fired power plants) with the same installed capacity of the project activity.

Options 1 and 3 are common practices in the project activity region and have already well-known technologies so this type of project presents a very attractive option to investors. However they refer to non renewable energy sources that will consequently emit greenhouse gases. Option 2 is unrealistic since there would be no incentive to implement this technology without the necessary CDM revenue.

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

The alternatives identified are all in compliance with all applicable legal and regulatory requirements.

***Step 2. Investment analysis.***

Not applicable, since the step 3 – Barrier Analysis was chosen to compose the additionality of the project activity.

***Step 3. Barrier analysis***

Herein, the project proponent is required to determine whether the proposed project activity faces barriers that:

- (a) Prevent the implementation of this type of proposed project activity; and
- (b) Do not prevent the implementation of at least one of the alternatives through the following sub-steps:

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

The following barriers have been considered by the project proponents that would hinder the implementation of the proposed project activity:

- (a) Investment barriers
- (b) Technological barriers
- (c) Prevailing practices

**(a) Investment barriers**

The initial investment required for the implementation of the four wind farms that compose the project activity is considerably higher than the initial investment required for implementing thermal power plants. In addition, given the well known technology and the lower implementation costs, thermal power plants represent a more attractive option for entrepreneurs when compared to similar alternative with approximately the same installed power (the capacity factors for wind farm is much lower than thermal power plant), running by renewable energy sources, such as wind power (see table 4).

|   | <b>Cape Verde Wind Farms<br/>(28MW) Investments (million €)</b> |
|---|---|
| Equipment, procurement and construction | 45.7  |
| Contingency                             | 2.2   |
| Land                                    | 1.0   |
| Development                             | 3.0   |
| Interest during construction and fees   | 6.7   |
| Debt service reserve accounts (DSRA)    | 3.0   |
| <b>TOTAL</b>                            | <b>61.6</b>   |

Table 4 – Investment costs for Cape Verde Wind Farms,

Another important investment barrier identified for the project activity is that *Electra* is in substantial debt, which is due to the overdue water and electricity bills by the users. *Electra* is recharging people in this condition trying to equilibrate its financial cash flow. For this reason *Electra* found some barriers to invest to the project activity, wind farms implementation, and others activities, such as water distribution and treatment. Table 5 shows the negative financial results of *Electra* for the past five years. This shows that energy generation facilities are not profitable in the project activity region, reducing the possibility of attracting investments to this area, especially deriving from the national system operator, *Electra*.

| <b><i>Electra's</i> financial report (millions of CVEs)</b> |             |             |             |             |             |
|---|-------------|-------------|-------------|-------------|-------------|
|   | <b>2003</b> | <b>2004</b> | <b>2005</b> | <b>2006</b> | <b>2007</b> |
| Operational Results   | - 348,575   | - 407,840   | - 276,174   | - 1,156,216 | - 1,298,496 |
| General Results (cash flow)                                 | - 606,961   | - 485,617   | - 539,015   | 2,057,000   | - 1,542,525 |

Table 5 – *Electra's* debt shown by financial balance from 2003 to 2007. Source: *Electra's* Annual Report – 2007

It is also important to highlight that the implementation of wind based technologies in *Cape Verde* will depend on the importation of equipment/technologies and technical expertise, once these items are not available in the host country.

**(b) Technological barriers**

For the implementation of wind based technologies in Cape Verde, it is important to consider that there is no equipment or technology suppliers in the country, so all equipment/technologies as well as technical expertise, necessary to the development of the project activity must be imported from other countries, what raising the initial investment necessary.

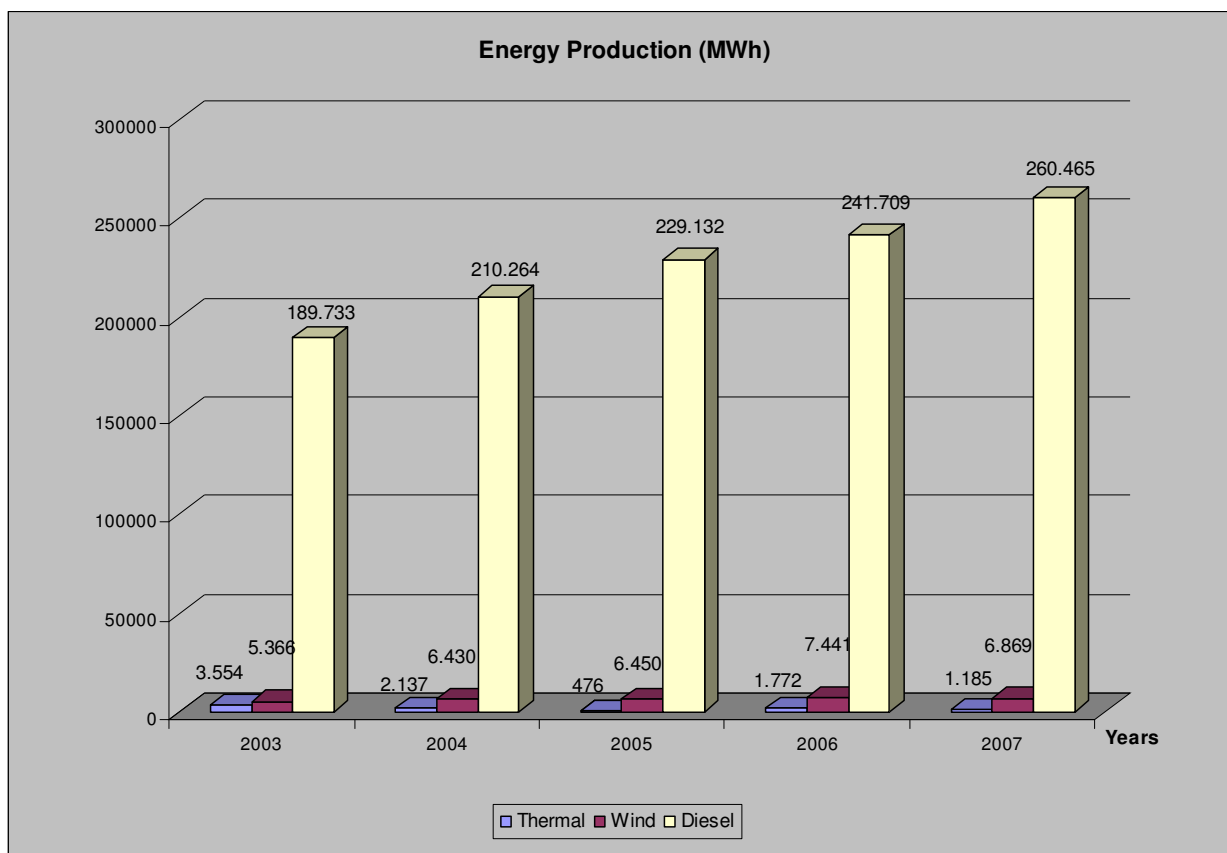
The turbines, shovels and other specific equipments needed to build the wind generators are not produced in Cape Verde. The country has no industry capable of developing such technologically advanced products, what obligates the project proponent to look for other alternatives: either to import all equipments to implement the project activities.

As well as the equipments, a specialized group of constructors will also be needed to put the equipments together and provide trainings to the local operators. As Cape Verde does not offer a trained technical team, it will be also brought from abroad to guarantee the project's best quality in building, operating and all other aspects.

**(c) Prevailing practices**

In 1994, in a project jointly funded by the Cape Verdean and the Danish governments, Wind Farms with a capacity of 2.1 MW were installed at the three major grids in *Sal*, *Mindelo* and *Praia*. In 1999, the Government of Cape Verde entered into agreements with the World Bank with respect to developments in the energy sector as well as the water and sanitation sectors. *Programa Energia, Água e Saneamento "PEAS"* (Energy, water and sewage program) was responsible for managing these actions. The World Bank agreement provided for partial funding and financing for the development of a wind energy project to be located on some of the islands in Cape Verde. Some technical and environmental work was done by the PEAS and the Government of Cape Verde.

Despite the fact that there are three wind farms operating (with some of the turbines not working) in Cape Verde, they are responsible for only 2.6% of the total energy supplied to the Country. In addition, it is relevant that in the past five years (from 2003 to 2007), wind power generation has not grown instead of fossil fuel generation. From 2006 to 2007, the wind energy generation has shown a decrease of 8%. This shows that wind energy is not the business-as-usual scenario in the project activity region, where fossil fuel power plants dominate the energy production scenario, increasing each year, as shown in the graphic below.



Graphic 1- Cape Verde's energy production (in MWh) from year 2003 to 2007 (Extracted from Electra annual reports)

The registration of the proposed project activity will have a strong impact on the development of wind power projects in Cape Verde by encouraging other project developers to implement similar projects based on the financial incentive provided by the CERs. As a further consequence, cleaner energy will be delivered to the grid and the existing power plants will no longer be consuming a large amount of fossil fuels, once they will slowly be replaced by renewable energy sources.

#### **Step 4. Common practice analysis**

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

There are no other similar activities to the proposed project activity following the same norms and regulatory, because it is the first-of-its kind in Cape Verde region. Unless there is an installed power of 2,100 kW of wind power, those projects are quite small when compared to the bundling wind power plants for the referred four islands in Cape Verde, so being not applicable in its same scale. There are also no CDM project activities in UNFCCC website asking for registration neither registered.

##### **Sub-step 4b. Discuss any similar Options that are occurring:**

Since there are no other similar activities observed, no discussion should be done.



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

The emission reductions are calculated according to the procedure set out in the selected methodology ACM0002 – version 7. The emission reductions will be calculated using the equations specified in the methodology as following:

**Project Emissions**

For most renewable energy project activities, Project Emissions ( $PE_y$ ) are zero, except for Geothermal and hydro power plants. As the project activity is the installation of Wind Power Plants,  $PE_y$ , placed in the first group described in methodology ACM0002 – version 7 and therefore, there are no project emissions.

**Baseline Emissions**

The baseline emissions consider only CO<sub>2</sub> emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity implementation, which are calculated as below:

$$BE_y = (EG_y - EG_{\text{baseline}}) * EF_{\text{grid, CM, y}} \quad \text{Equation 1}$$

Where:

- $BE_y$  = Baseline emissions in year y (tCO<sub>2</sub>/yr)
- $EG_y$  = Electricity supplied by the project activity to the grid (MWh)
- $EG_{\text{baseline}}$  = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants, this value is taken as zero.
- $EF_{\text{grid, CM, y}}$  = Combined margin CO<sub>2</sub> emission factor for grid connected energy generation in year y calculated using the version 01.1 of the “Tool to calculate the emission factor for an electricity system”

Following the methodology ACM0002 – version 7, the  $EG_{\text{baseline}}$  of the project activity emissions is zero, considering that the Bundled Wind Power Plants installed are new facilities.

The estimated baseline emissions per island are:

- Santiago: 33,572 tCO<sub>2</sub>
- Sal: 20,180 tCO<sub>2</sub>
- Santiago: 26,824 tCO<sub>2</sub>
- Boa Vista: 14,414 tCO<sub>2</sub>



## Grid Emission Factor

According to the “Tool to calculate the emission factor for an electricity system” – version 01.1, the following steps must be applied:

### **STEP 1. Identify the relevant electric power system.**

Each island of Cape Verde has its own electric power system, so each one has its generating and distributing system. The islands where the project activities are implemented (*Santiago, Sal, São Vicente* and *Boa Vista*) have their own electric system, what means that their generating matrix are different, therefore their emission factor should also be calculated separately.

Considering the four different islands where the bundled project activity will take place and the four different electric systems, the grid emission factor for each island was calculated following the version 01.1 of the “Tool to calculate the emission factor for an electricity system” through the simple OM method, so that the project emission reductions could be estimated separately (per island).

### **STEP 2. Select an operating margin (OM) method.**

The calculation of the operating margin emission factor ( $EF_{grid,OM,y}$ ) is based on the Simple OM method which can be only used if low-cost/must run resources constitute less than 50% of grid generation, averaged over the five most recent years, such as the graphic 01 above which represents the electric energy generation evolution of the five most recent years. This will demonstrate that the current low-cost/must run resources constitutes less than 50% of the total grid generation.

In addition, ex-ante option was chosen based on the most recent data available, without requirements to monitor and recalculate the emission factors during the crediting period.

### **STEP 3. Calculate the operating margin emission factor according to the selected method.**

For the purpose of calculating the simple OM, there are three options that can be:

- Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C).

For the current project activities the option C is the most feasible and the formulas are presented in the Section B.6.3.

### **STEP 4. Identify the cohort of power units to be included in the build margin (BM).**

The sample group of power units used to calculate the build margin consists of either:



- (a) The set of five power units that have been built most recently, or
- (b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

In Cape Verde the option b was used since there are no more than five units per island where the emission factor is calculated. The amount of produced energy in 2007 was used as a value to determine the 20% of the system generation that have been built most recently:

Santiago: 27,760 MWh;

Sal: 7,708 MWh;

Santiago: 11,706 MWh;

Boa Vista: 986 MWh;

All Islands: 48,160 MWh. **STEP 5. Calculate the build margin emission factor.**

The calculations for the build margin are presented in Section B.6.3.

#### **STEP 6. Calculate the combined margin (CM) emissions factor.**

The combined margin emissions factor is calculated as follows:

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

Where:

|                         |   |  |
|-------------------------|---|--|
| $EF_{\text{grid,BM},y}$ | = | Build margin CO <sub>2</sub> emission factor in year y (tCO <sub>2</sub> /MWh)     |
| $EF_{\text{grid,OM},y}$ | = | Operating margin CO <sub>2</sub> emission factor in year y (tCO <sub>2</sub> /MWh) |
| $w_{\text{OM}}$         | = | Weighting of operating margin emissions factor (%)                                 |
| $w_{\text{BM}}$         | = | Weighting of build margin emissions factor (%)                                     |

The following default values should be used for  $w_{\text{OM}}$  and  $w_{\text{BM}}$ :

- Wind and solar power generation project activities:  $w_{\text{OM}} = 0.75$  and  $w_{\text{BM}} = 0.25$  (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.
- All other projects:  $w_{\text{OM}} = 0.5$  and  $w_{\text{BM}} = 0.5$  for the first crediting period.



As the project activity represents bundling wind power plants, the first scope is applicable, where  $w_{OM} = 0.75$  and  $w_{BM} = 0.25$ .

### Leakage Emissions

There are no leakage emissions in the project activity, considering that the “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” – version 2 takes in account only the leakage emissions related to the combustion of fossil fuels. As the project activity does not consume fossil fuels (Wind Power Plant), the project leakage emissions are zero.

### Emission Reductions

Emission reductions are calculated as follows:

|   |                   |
|---|-------------------|
| <b><math>ER_y = BE_y - PE_y - LE_y</math></b> | <b>Equation 3</b> |
|---|-------------------|

Where:

$ER_y$  = Emission reductions in year y (t CO<sub>2</sub>e/yr)

$BE_y$  = Baseline emissions in year y (t CO<sub>2</sub>e/yr)

$PE_y$  = Project emissions in year y (t CO<sub>2</sub>/yr)

$LE_y$  = Leakage emissions in year y (t CO<sub>2</sub>/yr)

Parameters  $LE_y$  and  $PE_y$  are zero, regarding information provided above about project and leakage emissions. So, emission reductions ( $ER_y$ ) are calculated as the updated Equation 3.a below:

$$ER_y = BE_y - PE_y - LE_y = BE_y - 0 - 0$$

|                                 |                     |
|---------------------------------|---------------------|
| <b><math>ER_y = BE_y</math></b> | <b>Equation 3.a</b> |
|---------------------------------|---------------------|

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

|                      |   |             |           |  |          |     |             |           |        |        |        |        |
|----------------------|---|-------------|-----------|--|----------|-----|-------------|-----------|--------|--------|--------|--------|
| Data / Parameter:    | EFgrid,CM,y   |             |           |  |          |     |             |           |        |        |        |        |
| Data unit:           | tonCO2/ MWh   |             |           |  |          |     |             |           |        |        |        |        |
| Description:         | Combined margin CO <sub>2</sub> 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 used: | Calculated as per Simple OM method from the “Tool to calculate the emission factor for an electricity system” – version 01.1  |             |           |  |          |     |             |           |        |        |        |        |
| Value applied:       | <table><tr><td>Santiago</td><td>Sal</td><td>São Vicente</td><td>Boa Vista</td></tr><tr><td>0.7711</td><td>0.7203</td><td>0.7181</td><td>0.7896</td></tr></table>  |             |           |  | Santiago | Sal | São Vicente | Boa Vista | 0.7711 | 0.7203 | 0.7181 | 0.7896 |
| Santiago             | Sal   | São Vicente | Boa Vista |  |          |     |             |           |        |        |        |        |
| 0.7711               | 0.7203  | 0.7181      | 0.7896    |  |          |     |             |           |        |        |        |        |



|   |  |
|---|--|
| Justification of the choice of data or description of measurement methods and procedures actually applied : |  |
| Any comment:  |  |

| Data / Parameter:  | NCV <sub>i, y</sub>   |  |             |                                      |  |  |   |   |  |  |
|--|---|--|-------------|--------------------------------------|--|--|---|---|--|--|
| Data unit:   | GJ / L  |  |             |                                      |  |  |   |   |  |  |
| Description:   | Net calorific value (energy content) of fossil fuel type i in year y  |  |             |                                      |  |  |   |   |  |  |
| Source of data used:   | <div>The following data sources may be used if the relevant conditions apply:</div> <table><thead><tr><th>Data source</th><th>Conditions for using the data source</th></tr></thead><tbody><tr><td>Values provided by the fuel supplier of the power plants in invoices</td><td>If data is collected from power plant operators (e.g. utilities)</td></tr><tr><td>Regional or national average default values</td><td>If values are reliable and documented in regional or national energy statistics / energy balances</td></tr><tr><td colspan="2">IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.</td></tr></tbody></table> |  | Data source | Conditions for using the data source | Values provided by the fuel supplier of the power plants in invoices | If data is collected from power plant operators (e.g. utilities) | Regional or national average default values | If values are reliable and documented in regional or national energy statistics / energy balances | IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. |  |
| Data source  | Conditions for using the data source  |  |             |                                      |  |  |   |   |  |  |
| Values provided by the fuel supplier of the power plants in invoices   | If data is collected from power plant operators (e.g. utilities)  |  |             |                                      |  |  |   |   |  |  |
| Regional or national average default values  | If values are reliable and documented in regional or national energy statistics / energy balances   |  |             |                                      |  |  |   |   |  |  |
| IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. |   |  |             |                                      |  |  |   |   |  |  |
| Value applied:   | <table><thead><tr><th>Diesel</th><th>Fuel Oil</th></tr></thead><tbody><tr><td>0,036917</td><td>0,040117</td></tr></tbody></table>   |  | Diesel      | Fuel Oil                             | 0,036917   | 0,040117   |   |   |  |  |
| Diesel   | Fuel Oil  |  |             |                                      |  |  |   |   |  |  |
| 0,036917   | 0,040117  |  |             |                                      |  |  |   |   |  |  |
| Justification of the choice of data or description of measurement methods and procedures actually applied :  | <div>Simple OM: Either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or annually during the crediting period for the relevant year.</div> <div>BM: For the first crediting period, either once ex-ante or annually ex-post, following the guidance included in step 4. For the second and third crediting period, only once ex-ante at the start of the second crediting period.</div>  |  |             |                                      |  |  |   |   |  |  |
| Any comment:   | <div>Applicable in the following cases:</div> <div>Calculation of the simple OM in cases where fuel consumption data is available for all power plants / units.</div> <div>The gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used. Make sure that in such cases also a gross calorific value basis is used for CO2 emission factor.</div>   |  |             |                                      |  |  |   |   |  |  |

| <b>Data / Parameter:</b> | $EF_{CO_2,i,y}$  |             |                                      |
|--------------------------|--|-------------|--------------------------------------|
| Data unit:               | tCO <sub>2</sub> /GJ   |             |                                      |
| Description:             | CO <sub>2</sub> emission factor of fossil fuel type i in year y  |             |                                      |
| Source of data used:     | <p>The following data sources may be used if the relevant conditions apply:</p> <table> <tr> <th>Data source</th><th>Conditions for using the data source</th></tr> </table> | Data source | Conditions for using the data source |
| Data source              | Conditions for using the data source   |             |                                      |



|   |  |  |
|---|--|--|
|   | <p>Values provided by the fuel supplier of the power plants in invoices</p> <p>Regional or national average default values</p> <p>IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.</p>  | <p>If data is collected from power plant operators (e.g. utilities)</p> <p>If values are reliable and documented in regional or national energy statistics / energy balances</p> |
| Value applied:  | <input type="text"/>   |  |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | <p>Simple OM: Either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or annually during the crediting period for the relevant year.</p> <p>BM: For the first crediting period, either once ex-ante or annually ex-post, following the guidance included in step 4. For the second and third crediting period, only once ex-ante at the start of the second crediting period.</p> |  |
| Any comment:  | --   |  |

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

#### Grid Emission Factor

#### Calculate the operating margin emission factor according to the selected method

The grid emission factor is calculated based on the “Tool to calculate the emission factor for an electricity system” – version 1.1. The choice for the option to calculate the OM by the simple analysis and the option C were cited above in the Section B.4. The formulas below results from these choices:

|  |                   |
|--|-------------------|
| $EF_{\text{grid, OMsimple, } y} = (\sum FC_{i, y} * NCV_{i, y} * EF_{\text{CO}_2, i, y}) / (EG_y)$ | <b>Equation 5</b> |
|--|-------------------|

Where:

$EF_{\text{grid, OMsimple, } y}$  is the simple operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh);

$FC_{i, y}$  is the amount of fossil fuel type y consumed in the project electricity system in year y (mass or volume unit);

$NCV_{i, y}$  is the net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit);

$EF_{\text{CO}_2, i, y}$  is the CO<sub>2</sub> emission factor of fossil fuel type i in year y (tCO<sub>2</sub>/GJ);

$EG_y$  is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must run power plants/ units, in year y (MWh);



$i$  are the all fossil fuel types combusted in power sources in the project electricity system in year  $y$ ;

$y$  is the either the three most recent years for which data is available at the time of the of submission of the CDM-PDD to the DOE for validation (ex ante option).

The data for 2005, 2006 and 2007 were used to the calculation, such as diesel and fuel oil consumption related to its installed potential.

For diesel consideration, the tables below show the amount of fuel consumption in the four islands and its contribution to their operation margin:

| Santiago   |            |            |            |
|--|------------|------------|------------|
| Factor   | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, $y$ (tCO <sub>2</sub> /MWh)        | 29,246     | 37,494     | 57,570     |
| FCi, $y$ (L)   | 10,691,116 | 13,706,338 | 21,045,125 |
| NCVi, $y$ (GJ/L)                                     | 0.036917   | 0.036917   | 0.036917   |
| EFCO <sub>2</sub> , $i$ , $y$ (tCO <sub>2</sub> /GJ) | 0.0741     | 0.0741     | 0.0741     |

| Sal  |            |            |            |
|--|------------|------------|------------|
| Factor   | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, $y$ (tCO <sub>2</sub> /MWh)        | 3,509      | 2,214      | 1,902      |
| FCi, $y$ (L)   | 1,282,684  | 809,242    | 695,137    |
| NCVi, $y$ (GJ/L)                                     | 0.036917   | 0.036917   | 0.036917   |
| EFCO <sub>2</sub> , $i$ , $y$ (tCO <sub>2</sub> /GJ) | 0.0741     | 0.0741     | 0.0741     |

| São Vicente  |            |            |            |
|--|------------|------------|------------|
| Factor   | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, $y$ (tCO <sub>2</sub> /MWh)        | 3,033      | 3,241      | 2,449      |
| FCi, $y$ (L)   | 1,108,880  | 1,184,629  | 895,101    |
| NCVi, $y$ (GJ/L)                                     | 0.036917   | 0.036917   | 0.036917   |
| EFCO <sub>2</sub> , $i$ , $y$ (tCO <sub>2</sub> /GJ) | 0.0741     | 0.0741     | 0.0741     |

| Boa Vista  |            |            |            |
|--|------------|------------|------------|
| Factor   | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, $y$ (tCO <sub>2</sub> /MWh)        | 3,129      | 3,156      | 3,761      |
| FCi, $y$ (L)   | 1,143,894  | 1,153,701  | 1,374,808  |
| NCVi, $y$ (GJ/L)                                     | 0.036917   | 0.036917   | 0.036917   |
| EFCO <sub>2</sub> , $i$ , $y$ (tCO <sub>2</sub> /GJ) | 0.0741     | 0.0741     | 0.0741     |



For fuel oil consideration, the tables below show the amount of fuel consumption in the four islands and its contribution to their operation margin:

| Santiago  |            |            |            |
|---|------------|------------|------------|
| Factor  | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, y (tCO <sub>2</sub> /MWh)     | 54,566     | 50,932     | 41,271     |
| FCi, y (L)                                      | 17,573,421 | 16,403,023 | 13,291,684 |
| NCVi, y (GJ/L)                                  | 0.040117   | 0.040117   | 0.040117   |
| EFCO <sub>2</sub> , i, y (tCO <sub>2</sub> /GJ) | 0.0774     | 0.0774     | 0.0774     |

| Sal   |            |            |            |
|---|------------|------------|------------|
| Factor  | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, y (tCO <sub>2</sub> /MWh)     | 20,213     | 24,958     | 25,280     |
| FCi, y (L)                                      | 6,509,694  | 8,037,979  | 8,141,600  |
| NCVi, y (GJ/L)                                  | 0.040117   | 0.040117   | 0.040117   |
| EFCO <sub>2</sub> , i, y (tCO <sub>2</sub> /GJ) | 0.0774     | 0.0774     | 0.0774     |

| São Vicente                                     |            |            |            |
|---|------------|------------|------------|
| Factor  | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, y (tCO <sub>2</sub> /MWh)     | 36,206     | 35,186     | 36,022     |
| FCi, y (L)                                      | 11,660,477 | 11,331,848 | 11,600,987 |
| NCVi, y (GJ/L)                                  | 0.040117   | 0.040117   | 0.040117   |
| EFCO <sub>2</sub> , i, y (tCO <sub>2</sub> /GJ) | 0.0774     | 0.0774     | 0.0774     |

| Boa Vista                                       |            |            |            |
|---|------------|------------|------------|
| Factor  | Value 2005 | Value 2006 | Value 2007 |
| EFgrid, OMsimple, y (tCO <sub>2</sub> /MWh)     | 0          | 0          | 0          |
| FCi, y (L)                                      | 0          | 0          | 0          |
| NCVi, y (GJ/L)                                  | 0.040117   | 0.040117   | 0.040117   |
| EFCO <sub>2</sub> , i, y (tCO <sub>2</sub> /GJ) | 0.0774     | 0.0774     | 0.0774     |

The operating margins calculated are the follows to the islands:

- Santiago: 0.7265 tCO<sub>2</sub>/MWh
- Sal: 0.7296 tCO<sub>2</sub>/MWh
- Santiago: 0.7169 tCO<sub>2</sub>/MWh
- Boa Vista: 0.7777 tCO<sub>2</sub>/MWh



**Calculate the build margin emission factor**

The build margin factor is calculated as follows:

|  |                   |
|--|-------------------|
| $EF_{grid, BM, y} = (\sum EG_{m, y} * EF_{EL, m, y}) / (\sum EG_{m, y})$ | <b>Equation 6</b> |
|--|-------------------|

Where:

$EF_{grid, BM, y}$  is the build margin CO<sub>2</sub> emission factor in year  $y$  (tCO<sub>2</sub>/MWh);

$EG_{m, y}$  is the net quantity of electricity generated and delivered to the grid by unit  $m$  in year  $y$  (MWh);

$EF_{EL, m, y}$  is the CO<sub>2</sub> emission factor of power unit  $m$  in year  $y$  (tCO<sub>2</sub>/MWh);

$m$  is the power units included in the build margin;

$y$  is the most recent historical year for which energy generation data is available.

The  $EF_{EL, m, y}$  is calculated according to the option B1, for a power unit  $m$  that presents available data for fuel consumption and electricity generation (2007):

|  |                   |
|--|-------------------|
| $EF_{EL, m, y} = (\sum FC_{i, m, y} * NCV_{i, y} * EF_{CO2, i, y}) / (\sum EG_{m, y})$ | <b>Equation 7</b> |
|--|-------------------|

Where:

$EF_{EL, m, y}$  is the CO<sub>2</sub> emission factor of power unit  $m$  in year  $y$  (tCO<sub>2</sub>/MWh);

$FC_{i, m, y}$  is the amount of fossil fuel type  $i$  consumed by power unit  $m$  in year  $y$  (L);

$NCV_{i, y}$  is the net calorific value (energy content) of fossil fuel type  $i$  in year  $y$  (GJ/mass or volume unit);

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

$m$  are all the power units serving the grid in year  $y$  except low cost/must run power units;

$i$  are all fossil fuel types combusted in power unit  $m$  in year  $y$ ;

$y$  either the recent year for which data is available.

The calculation is conducted differencing per type of fuel and for each island, which are explained in the tables below.

The following tables present the  $EF_{EL, m, y}$  calculation for diesel consumption for the 4 islands.



| Factor  | Value 2007    |
|---|---------------|
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | <b>0.9089</b> |
| FCi,m,y (L)                                   | 4,209,025     |
| NCVi,y (GJ /L)                                | 0.036917      |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0741        |
| EGm,y (MWh)                                   | 12667.81071   |

| Sal   |               |
|---|---------------|
| Factor  | Value 2007    |
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | <b>0.6993</b> |
| FCi,m,y (L)                                   | 139,027       |
| NCVi,y (GJ /L)                                | 0.036917      |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0741        |
| EGm,y (MWh)                                   | 543.8255407   |

| São Vicente                                   |               |
|---|---------------|
| Factor  | Value 2007    |
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | <b>0.7289</b> |
| FCi,m,y (L)                                   | 179,020       |
| NCVi,y (GJ /L)                                | 0.036917      |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0741        |
| EGm,y (MWh)                                   | 671.8197351   |

| Boa Vista                                     |               |
|---|---------------|
| Factor  | Value 2007    |
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | <b>0.8253</b> |
| FCi,m,y (L)                                   | 274,962       |
| NCVi,y (GJ /L)                                | 0.036917      |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0741        |
| EGm,y (MWh)                                   | 911.3564438   |

The following tables present the EF<sub>EL, m, y</sub> calculation for fuel oil consumption for the 4 islands.

| Santiago                                      |               |
|---|---------------|
| Factor  | Value 2007    |
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | <b>0.8994</b> |
| FCi,m,y (L)                                   | 2,658,337     |
| NCVi,y (GJ /L)                                | 0.040117      |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0774        |
| EGm,y (MWh)                                   | 9177.317421   |



| Sal   |               |
|---|---------------|
| Factor  | Value 2007    |
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | <b>0.6920</b> |
| FCi,m,y (L)                                   | 1,628,320     |
| NCVi,y (GJ /L)                                | 0.040117      |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0774        |
| EGm,y (MWh)                                   | 7306.083755   |

| São Vicente                                   |               |
|---|---------------|
| Factor  | Value 2007    |
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | <b>0.7213</b> |
| FCi,m,y (L)                                   | 2,320,197     |
| NCVi,y (GJ /L)                                | 0.040117      |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0774        |
| EGm,y (MWh)                                   | 9987.604702   |

| Boa Vista                                     |            |
|---|------------|
| Factor  | Value 2007 |
| EFEL,m,y (tCO <sub>2</sub> /MWh)              | -          |
| FCi,m,y (L)                                   | 0          |
| NCVi,y (GJ /L)                                | 0.040117   |
| EFCO <sub>2</sub> ,l,y (tCO <sub>2</sub> /GJ) | 0.0774     |
| EGm,y (MWh)                                   | 0          |

The build margins for each island are presented bellow:

- Santiago: 0.9049 tCO<sub>2</sub>/MWh
- Sal: 0.6925 tCO<sub>2</sub>/MWh
- Santiago: 0.7218 tCO<sub>2</sub>/MWh
- Boa Vista: 0.8253 tCO<sub>2</sub>/MWh

### Calculate the combined margin emission factor

The combined margin emission factor is calculated as follows:

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

**Equation 7**

Where:



$EF_{grid, BM, y}$  is the build margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh);

$EF_{grid, OM, y}$  is the operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh);

$w_{OM}$  is the weighting of operating margin emissions factor (%);

$w_{BM}$  is the weighting of building margin emissions factor (%).

Wind energy generation project activities uses  $w_{OM} = 0.75$  and  $w_{BM} = 0.25$  for the first crediting period and for subsequent crediting periods.

The emission factors for each island are presented below:

- Santiago: 0.7711 tCO<sub>2</sub>/MWh
- Sal: 0.7203 tCO<sub>2</sub>/MWh
- Santiago: 0.7181 tCO<sub>2</sub>/MWh
- Boa Vista: 0.7896 tCO<sub>2</sub>/MWh

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

| Year                                    | Estimation of project activity emissions (tonnes of CO <sub>2</sub> e) | Estimation of baseline emissions (tonnes of CO <sub>2</sub> e) |         |             |           | Estimation of leakage (tonnes of CO <sub>2</sub> e) | Estimation of overall emission reductions (tonnes of CO <sub>2</sub> e) |
|---|--|--|---------|-------------|-----------|---|---|
|   |  | Santiago   | Sal     | São Vicente | Boa Vista |   |   |
| Year 1                                  | 0  | 33,572   | 20,180  | 26,824      | 14,414    | 0   | 94,990  |
| Year 2                                  | 0  | 33,572   | 20,180  | 26,824      | 14,414    | 0   | 94,990  |
| Year 3                                  | 0  | 33,572   | 20,180  | 26,824      | 14,414    | 0   | 94,990  |
| Year 4                                  | 0  | 33,572   | 20,180  | 26,824      | 14,414    | 0   | 94,990  |
| Year 5                                  | 0  | 33,572   | 20,180  | 26,824      | 14,414    | 0   | 94,990  |
| Year 6                                  | 0  | 33,572   | 20,180  | 26,824      | 14,414    | 0   | 94,990  |
| Year 7                                  | 0  | 33,572   | 20,180  | 26,824      | 14,414    | 0   | 94,990  |
| <b>Total (tonnes of CO<sub>2</sub>)</b> | <b>0</b>   | 235,004  | 141,260 | 187,768     | 100,898   | <b>0</b>  | <b>664,930</b>  |

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

##### B.7.1 Data and parameters monitored:



|                                  |   |
|----------------------------------|---|
| <b>Data / Parameter:</b>         | $EG_y$  |
| Data unit:                       | MWh   |
| Description:                     | Electricity supplied by the project activity to the grid.                                   |
| Source of data:                  | Project proponent.  |
| Measurement procedures (if any): | Measured by energy meters.  |
| Monitoring frequency:            | Hourly measurement and monthly recording.   |
| QA/QC procedures:                | Electricity supplied by the project activity to the grid. Double check by receipt of sales. |
| Any comment:                     | --  |

|                                  |  |
|----------------------------------|--|
| <b>Data / Parameter:</b>         | $EF_{grid,CM,y}$   |
| Data unit:                       | tCO <sub>2</sub> /MWh  |
| Description:                     | Combined margin CO <sub>2</sub> emission factor for grid connected energy generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”. |
| Source of data:                  | As per the “Tool to calculate the emission factor for an electricity system”.  |
| Measurement procedures (if any): | As per the “Tool to calculate the emission factor for an electricity system”.  |
| Monitoring frequency:            | As per the “Tool to calculate the emission factor for an electricity system”.  |
| QA/QC procedures:                | As per the “Tool to calculate the emission factor for an electricity system”.  |
| Any comment:                     | As per the “Tool to calculate the emission factor for an electricity system”.  |

|                                  |  |
|----------------------------------|--|
| <b>Data / Parameter:</b>         | $PE_{FC,j,y}$  |
| Data unit:                       | tCO <sub>2</sub> /yr   |
| Description:                     | CO <sub>2</sub> emissions from fossil fuel combustion in process j during the year y (tCO <sub>2</sub> /year). This parameter shall be calculated as per the latest version of the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion” where j stands for the processes required for the operation of the geothermal power plant. |
| Source of data:                  | As per the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion”.   |
| Measurement procedures (if any): | As per the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion”.   |
| Monitoring frequency:            | As per the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion”.   |
| QA/QC procedures:                | As per the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion”.   |
| Any comment:                     | As per the “Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion”.   |

|                          |   |
|--------------------------|---|
| <b>Data / Parameter:</b> | $FC_{i,j,k,n}$  |
| Data unit:               | Mass or volume unit   |
| Description:             | Amount of fossil fuel type i consumed by power plant / unit m, j, k or n (or in the |



|                                  |  |
|----------------------------------|--|
|                                  | project electricity system in case of $FC_{i,y}$ ) in year $y$ or hour $h$ .   |
| Source of data:                  | Utility or government records or official publications.  |
| Measurement procedures (if any): | --   |
| Monitoring frequency:            | Either once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or annually during the crediting period for the relevant year.<br>BM: For the first crediting period, either once ex-ante or annually ex-post, following the guidance included in step 4. For the second and third crediting period, only once ex-ante at the start of the second crediting period. |
| QA/QC procedures:                | --   |
| Any comment:                     | Calculation of the simple OM in cases where fuel consumption data is available for all power plants / units.   |

|                                  |   |
|----------------------------------|---|
| <b>Data / Parameter:</b>         | $FC_{i,y}$  |
| Data unit:                       | Mass or volume unit per year (e.g. ton/yr or m <sup>3</sup> /yr)  |
| Description:                     | Quantity of fuel type $i$ combusted in process $j$ during the year $y$ .  |
| Source of data:                  | Onsite measurements.  |
| Measurement procedures (if any): | <ul style="list-style-type: none"> <li>• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift);</li> <li>• Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance;</li> <li>• In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.</li> </ul> |
| Monitoring frequency:            | Continuously.   |
| QA/QC procedures:                | <p>The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes.</p> <p>Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.</p>   |
| Any comment:                     | --  |

#### B.7.2. Description of the monitoring plan:

The monitoring plan is set up according to the methodology ACM0002 – version 7. The operator, through its technical team (which is also responsible for day-to-day operation of the electric power production by the wind farm) will be the party responsible for the gathering of data and for filling in registration forms for data storage. The project proponent will be the only responsible for the monitoring plan.



The wind power plant operator, with help from the equipment manufactures, will be responsible for training of his monitoring and operation staff. After training activities, the technical team will manage monitoring activities, quality control and the quality assessment procedures. Further detailed procedures for monitoring shall be developed during the final design of the facilities.

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

The calculation of the operating margin and build margin emission factors should include all data used to calculate the emission factors, including:

- For each grid-connected power plant / unit the following information:
  - The date of commissioning,
  - The capacity (MW);
  - The fuel type(s) used;
  - The quantity of net electricity generation in the relevant year(s);
  - If applicable: the fuel consumption of each fuel type in the relevant year(s);
  - In case where the simple OM or the simple adjusted operating margin is used: information whether the plant / unit is a low-cost / must-run plant / unit;
- Net calorific values used;
- CO<sub>2</sub> emission factors used;
- Plant efficiencies used;
- Identification of the plants included in the build margin and the operating margin during the relevant time year(s);

|   |
|---|
| <b>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):</b> |
|---|

The baseline study for the project activity and monitoring methodology, according to the methodology ACM0002 – version 7, were completed on 27/10/2008 by *CantorCO2e Brasil*, which is not a project participant. Below, the name of the person and entity responsible for determining the baseline:

| Name of person/Organization  | Project Participant |
|--|---------------------|
| Adriana Berti<br><i>CantorCO2e Brasil</i> .<br>São Paulo, Brazil.<br>Tel: +55 11 5083 3252 | NO                  |



|  |  |
|--|--|
| Fax: +55 11 5083 8442<br>e-mail: aberti@cantorco2e.com.br<br>Website: www.cantorco2e.com |  |
|--|--|





**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:**

14/02/2008 (The beginning of the environmental studies for the project.)

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

20 years and 0 months.

**C.2. Choice of the crediting period and related information:****C.2.1. Renewable crediting period:****C.2.1.1. Starting date of the first crediting period:**

01/06/2009, but not earlier than registration.

**C.2.1.2. Length of the first crediting period:**

7 years and 0 months

**C.2.2. Fixed crediting period:****C.2.2.1. Starting date:**

Not applicable.

**C.2.2.2. Length:**

Not applicable.



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

The project is licensed by the General Directorate of Industry and Energy of the Ministry of Economy, Growth and Competiveness upon presenting the *Estudo de Impacto Ambiental – EIA* (Environmental Impact Study) which must be approved by the Ministry of Environment, Rural Development and Marine Resources. The *EIA*'s licensing entity, subject to an assessment procedure, is the General Directorate of the Environment, according to number 1 of article 2 of Decree-Law number 29/2006 of March 6, the government department responsible for the area of the environment, through discussions held with the municipalities within whose territorial limits the activities will be developed.

*InfraCo* is the party responsible for the development of the project activities in the four wind farms located in the *Santiago, São Vicente, Sal* and *Boa Vista* islands.

| Environmental and ordering Components | Undertaking Actions Consequences              | Impacts                               | Mitigation Actions (All described in section D.2) |
|---------------------------------------|---|---------------------------------------|---|
| Geology and geomorphology             | N/A   | N/A                                   |   |
| Tectonic and seismic                  | N/A   | N/A                                   |   |
| Vegetation and flora                  | Burning risk                                  | Vegetation cover destruction          | C3, C4, C5, C8                                    |
| Habitats and fauna                    | Habitat destruction<br>Vegetation destruction | Fragment and losses of the vegetation | C1, C2, C3, C4, C5, C6, C7, C8                    |
|                                       | Burning risk                                  | Fragment and losses of the vegetation | C3, C4, C5, C8                                    |

Table 6: Environmental Impacts of the Cape Verde project in the construction phase.

| Environmental and ordering Components | Undertaking Actions Consequences           | Impacts  | Mitigation Actions |
|---------------------------------------|--|--|--------------------|
| Geology and geomorphology             | N/A  | N/A  |                    |
| Tectonic and seismic                  | N/A  | N/A  |                    |
| Climate                               | Environmental pollution emission reduction | Contribution to the CO <sub>2</sub> emission reduction (greenhouse gas emission reduction) |                    |
| Air quality                           | Environmental pollution                    | CO <sub>2</sub> , SO <sub>2</sub> , NO <sub>x</sub> and particles                          |                    |



|                                 |  |  |    |
|---------------------------------|--|--|----|
|                                 | emission reduction                       | reduction (due to the fossil fuel use alternative).                |    |
| <b>Economic activity</b>        | Savings on non renewable resources saves | Fossil fuel alternative use usually imported from other countries. |    |
| <b>Territory ordering plans</b> | Occupation of classified areas           | Occupation of classified areas                                     | E1 |

Table 7: Environmental Impacts of the Cape Verde project in the Operation phase.

| Environmental and ordering Components | Undertaking Actions Consequences   | Impacts   | Mitigation Actions |
|---------------------------------------|--|---|--------------------|
| <b>Geology and geomorphology</b>      | N/A  | N/A   |                    |
| <b>Tectonic and seismic</b>           | N/A  | N/A   |                    |
| <b>Climate</b>                        | Increase of environmental pollution emission   | Increase of CO <sub>2</sub> emissions due the electric power generation by fossil fuel.                               |                    |
| <b>Air quality</b>                    | Increase of environmental pollution emission   | CO <sub>2</sub> , SO <sub>2</sub> , NO <sub>x</sub> and particles increase (due to fossil fuel use alternative).      |                    |
| <b>Vegetation and flora</b>           | Burning risk   | Vegetation cover destruction  |                    |
| <b>Landscape</b>                      | Undertaking removal  | Visual disturbance elimination.<br>Original landscape recovery.   | D1, D2, D3         |
| <b>Economic activity</b>              | Undertaking removal  | Infrastructure investment loss  |                    |
|                                       | Non renewable resources consumption  | Fossil fuel alternative use usually imported from other countries.  |                    |
|                                       | Discourage of new technological development and the creation of new national industrial activities | Job decrease related with the building, operation and maintenance of the equipments used on the wind farm power plant |                    |

Table 8 : Environmental Impacts of the Cape Verde project in the Deactivation phase.

**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 mitigation actions for the environmental impacts identified in the project activity's construction, operation and deactivation phases (as described in section D.1) will be carried out following the actions listed below:

| Type | Mitigation Action   |
|------|---|
| C1   | Circulation restriction of personnel, vehicles and equipments to only absolutely necessary areas with the objective of avoiding compaction, creation of tracks and/or destruction of important habitat areas throughout the surroundings.   |
| C2   | Preservation of the vegetation cover, reducing the areas of intervention to the minimal, delimiting areas of vegetation covers containing classified natural habitats.  |
| C3   | Reuse or removal of vegetation waste materials, avoiding that these are buried or deposited in areas where their natural decomposition is susceptible to provoke water quality degradation. Temporary storage of these waste materials in the yard areas to be deposited later in an adequate location. Avoiding the burning of waste products in order to prevent fire risks given the elevated susceptibility and fragility of these areas to such risks. |
| C4   | During the construction phase, the developer should provide training of the personnel in order to bring awareness of issues pertaining to potential effects of their activities and the environment to avoid unnecessary disturbances susceptible to produce negative impacts.  |
| C5   | The proponent of the building construction must establish and maintain procedures to identify potential accidents and emergency situations on the environment and be able to react preventing the environmental impacts.  |
| C6   | Recuperation of all areas of intervention, particularly through removal of waste, possible reestablishment of original forms of morphology and recuperation of affected vegetation cover, avoiding the introduction of alien species. Particular attention should be given to the recuperation of areas containing water courses susceptible to suffer alterations during construction phase.   |
| C7   | Conduction of an access and soil occupation plan, covering all the areas where interventions will occur during the construction phase, with the objective of limiting and signalling the areas subject to impact generating impacts which will occur during this phase.   |
| C8   | There should be plans for the accommodations of tanks for retention of accidental oil spills.   |

Table 9: Mitigation actions for the construction phase impacts.

| Type | Mitigation Action  |
|------|--|
| E1   | Handling of oil and maintenance operations on the necessary actions of periodic lubrication of the equipments should be collected and stored in adequate containers for posterior transportation to final destinations where adequate hazardous waste treatments are |



|  |            |
|--|------------|
|  | conducted. |
|--|------------|

*Table 10: Mitigation actions for the exploration phase impacts.*

| Type | Mitigation Action   |
|------|---|
| D1   | Following the conclusion of the Project operation period, soil should be placed on the areas where the turbines foundations and other relevant infrastructures were demolished and removed.   |
| D2   | In order to guarantee conditions for rapid vegetation regeneration and protection against erosion in the areas of intervention, the possibility of creating phytosociologically adequate plantation and/or seed beds should be considered.  |
| D3   | The removed materials, including the cement foundations, may be crushed and reused in such sectors as the civil construction industry for filling materials used in street paving. Metallic materials removed from the equipments, such as steel from the turbine tower stems or copper from transmission cables, may be refurbished and reused in new foundry pieces. Blade materials, following their fragmentation, should be transported to final destinations where their adequate recycling will take place. All hazardous oil products should be collected, transported and taken to final destination where they will also receive adequate treatments. |

*Table 11: Mitigation actions for the deactivation phase impacts*

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

In analyzing the affect of the Cape Verde Wind Farm Extension Project on stakeholders, four meetings were arranged on the four islands (*Santiago, São Vicente, Sal* and *Boa Vista*) at which the Cape Verde Wind Farm Extension Project is seeking to implement the 4 wind farms.

Comments by local stakeholders were invited by utilizing the following tools:

1. Advertising for public meetings

Newspaper advertising – Advertisements were published in 2 different national newspapers. The newspapers were chosen due to the high circulation levels in order to reach as many stakeholders as possible. These advertisements described the meetings (pertaining to the EIA) as well as stating times and locations of the meetings in each island so as to encourage public participation.

2. Invitations

In addition, the consultants put together invitations which were approved and signed by the Cape Verdean Director General of Industry and Energy. These invitations were individually sent to key stakeholders and interested parties (pertaining to the EIA).

Comments by local stakeholders were compiled by using the following tools:

1. EIA Stakeholders presentation and meeting (approximate duration: 1hr 30 minutes per meeting)

The presentations began with an introduction to the Project as a whole, followed by an account of the environmental and socio-economic description of the island at which it is being implemented in. Following this, a detailed account of the nature of the construction and equipment to be used for the purpose of the island's particular project and the environmental and socio-economic implications of the construction of such a project were presented. The presentations ended with a summary of the negative and positive environmental and socio-economic implication of the project as a whole in all of the 4 islands and in Cape Verde in general.

Upon completion of the presentation, a meeting was conducted in which the participants posed their questions, suggestions and concerns.

2. CDM stakeholder presentations and meetings (durations approximately 40 minutes per meeting)

Upon completion of the EIA stakeholder presentation and meeting in each island, the EIA consultants presented the topic of CDM as arranged by CantorCO2e. This presentation briefly introduced the topic of CDM in terms of the history of the mechanism, the background of carbon credits, implications of the commercialization of carbon credits, the CDM situation of *Cape Verde* and finally implications of its implementation in *Cape Verde*.

Timeline



The 4 stakeholders meetings were completed by October 16<sup>th</sup> 2008. The specific dates of the meetings were as follows:

- São Vicente: 3<sup>rd</sup> of October
- Sal: 10<sup>th</sup> of October
- Boa Vista: 13<sup>th</sup> of October
- Santiago: 16<sup>th</sup> October

Submission of Report of Meetings – October 20<sup>th</sup>, 2008

|   |
|---|
| <b>E.2. Summary of the comments received:</b> |
|---|

The summary of the comments received can be found in Annex 5 of this report.

|   |
|---|
| <b>E.3. Report on how due account was taken of any comments received:</b> |
|---|

Each presentation had an attendance form that was required to be filled out to record the attendance of the participants. Each presentation was recorded. All questions, suggestions and concerns were written down and presented in a report to *InfraCo*.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

|                  |  |
|------------------|--|
| Organization:    | InfraCo Management Services Ltd.                                     |
| Street/P.O.Box:  | 16/19 Eastcastle Street, 5 <sup>th</sup> Floor                       |
| City:            | London   |
| Postcode/ZIP:    | W1W 8DA  |
| Country:         | The United Kingdom   |
| Telephone:       | + 44 207 079 3070  |
| FAX:             | +44 207 323 6570   |
| E-Mail:          | <a href="mailto:fabio.borba@infraco.com">fabio.borba@infraco.com</a> |
| URL:             | <a href="http://www.infraco.com">www.infraco.com</a>                 |
| Represented by:  | Fabio Borba  |
| Title:           | Vice President   |
| Salutation:      | Mr.  |
| Last name:       | Borba  |
| First name:      | Fabio  |
| Department:      | Project Development  |
| Direct FAX:      |  |
| Direct tel:      |  |
| Personal e-mail: |  |

|                  |  |
|------------------|--|
| Organization:    | Cabeólica  |
| Street/P.O.Box:  | C.P. 128/C   |
| Building:        | Conjunto Imobiliário “As Américas”, Largo Europa, Bloco C 1ºD  |
| City:            | Praia  |
| State/Region:    | Santiago   |
| Postcode/ZIP:    | -  |
| Country:         | Cape Verde   |
| Telephone:       | (+238) 261 3290  |
| FAX:             | (+238) 261 31 51   |
| E-Mail:          | <a href="mailto:ilidiocruz@gmail.com">ilidiocruz@gmail.com</a> / <a href="mailto:lidiasancha@gmail.com">lidiasancha@gmail.com</a> / <a href="mailto:gacpj@cvtelecom.cv">gacpj@cvtelecom.cv</a> |
| URL:             | -  |
| Represented by:  | Ilidio Cruz  |
| Title:           | Lawyer   |
| Salutation:      | Mr.  |
| Last name:       | Cruz   |
| Middle name:     | Alexandre  |
| First name:      | Ilidio   |
| Department:      | Gabinete de Advocacia Consultoria e Procuradoria Jurídica  |
| Mobile:          | (+238) 991 5075  |
| Direct FAX:      | (+238) 261 31 51   |
| Direct tel:      | (+238) 261 3290  |
| Personal e-mail: | <a href="mailto:ilidiocruz@gmail.com">ilidiocruz@gmail.com</a>   |





**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

There will be no public funding on the project.



### Annex 3

#### **BASELINE INFORMATION**

*Cape Verde* is quite dependent on the import of fossil fuel to the generation of electric power. The grid is mainly composed of energy generation through fuel fired consumption, 97.4% from fossil fuel and 2.6% wind power.

According to the *Electra's* Annual Report - 2007, the energy production in the Country has grown more than 35% from 2003 to 2007, growing from 198,653 to 268,518 MWh per year, following the internal demand. The Company's installed capacity in 2007 was 73,89kW, which were distributed in diesel, wind and thermal centrals. Besides the generation growth, *Cape Verde* has a lack of electricity offer, which resulted in an energy crisis and frequently black-outs.

The implantation of the four wind farms of the project activity in *Cape Verde* will help to increase the energy supply to the grid, avoiding the energy generation by fossil fuel plants. The 28MW of installed power that will be provided by the project activities are part of a *Cape Verde's* Government Program that foresees an addition of 25% energy provided by wind power plants until year 2010, growing the share of renewable energy in the national grid – as determined in the PPP (Public-Private Partnership) between CV Gov, *InfraCo* and *Electra*, signed in February 2008 and registered as Law-Decree 7/2008.



#### Annex 4

### MONITORING INFORMATION

The monitoring plan is referred according to the methodology ACM0002 – version 7. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

The Vestas V52-850 kW turbines present safety systems that are equipped with both mechanical and aerodynamic brakes which will be activated in case of an emergency situation. The turbine furthermore has an independent electrical emergency circuit which will be activated by an over-speed situation.

Some parameters must be considered according to the Section B.7.2 and attached to the PDD-CDM.

Annex 5

## SUMMARY OF STAKEHOLDER COMMENTS

*Sal*10<sup>th</sup> October 2008*Photo 1 – Meeting in Sal.*

| Attendees                      | Company Details          | Contact   |
|--------------------------------|--------------------------|---|
| <i>Adalzira M Fernandes</i>    | <i>DGA</i>               | <a href="mailto:adalzirafernandes@hotmail.com">adalzirafernandes@hotmail.com</a><br>(9835573) |
| <i>Neusa Brito</i>             | <i>Ambiente</i>          | <a href="mailto:muisufonfer@hotmail.com">muisufonfer@hotmail.com</a><br>(4961850)             |
| <i>Janina Cabral</i>           | <i>Aguas Ponta Preta</i> | <a href="mailto:jcabral@aguaspp.com">jcabral@aguaspp.com</a> (2421712)                        |
| <i>Euclides Gonçalves</i>      | <i>ETMA (CMS)</i>        | <a href="mailto:bialjo@hotmail.com">bialjo@hotmail.com</a> (9920817)                          |
| <i>Carlos Soares</i>           | <i>Enapor S.A.</i>       | <a href="mailto:melquiodessoares@enapor.cv">melquiodessoares@enapor.cv</a><br>(9927718)       |
| <i>Rodrigo Tomar Vera Cruz</i> | <i>TACV</i>              | <a href="mailto:rveracruz@tacv.aero">rveracruz@tacv.aero</a> (9923871)                        |
| <i>Antero Melo Alfama</i>      | <i>Câmara Municipal</i>  | <a href="mailto:auievoa@cmsal.gov.cv">auievoa@cmsal.gov.cv</a> (9931427)                      |
| <i>Cesar Almeida</i>           | <i>Electra</i>           | 9912220   |
| <i>Alfredo Delgado</i>         | <i>Planificacions</i>    | 9937508   |

Reaction to CDM Presentation:

No questions / comments were received



Reaction to the EIA presentation:

No comments.

***Boa Vista***

13<sup>th</sup> October 2008



*Photo 2 – Meeting in Boa Vista.*

| Attendees                    | Company Details           | Contact |
|------------------------------|---------------------------|---------|
| <i>Marlene Pinto</i>         | <i>Bucan</i>              | 2511915 |
| <i>Alexandro Monteiro</i>    | <i>Clube Ambiental BV</i> | 9822231 |
| <i>Dorys Rendall Delgado</i> | <i>ETMA Boavista</i>      | 9964307 |
| <i>Ivone M. Delgado</i>      | <i>MADRRM – Boavista</i>  | 9815168 |
| <i>Geraldo Pina</i>          | <i>CMBV</i>               | 9944912 |
| <i>Antonieta Almeida</i>     | <i>CMBV – ETMA</i>        | 9843553 |

Reaction to CDM Presentation:

No questions / comments were received.

***Santiago (Praia)***

16<sup>th</sup> October 2008

*Photo 1 – Meeting in Santiago.*

| <b>Attendees</b>      | <b>Company Details</b>                               | <b>Contact</b>  |
|-----------------------|--|---|
| <i>Antonio Pina</i>   | <i>Electra</i>                                       | <a href="mailto:a.pina@electra.cv">a.pina@electra.cv</a> (9912944)                    |
| <i>Carlos Graça</i>   | <i>Efectivo, SA</i>                                  | <a href="mailto:Carlos.graca@efectivo.pt">Carlos.graca@efectivo.pt</a><br>(9828043)   |
| <i>Rui Levy</i>       | <i>Efectivo SA</i>                                   | <a href="mailto:Rui.levi@efectivo.pt">Rui.levi@efectivo.pt</a> (9828043)              |
| <i>Ramiro Lopes</i>   | <i>Polinertes, LDA</i>                               | <a href="mailto:Petregal.cv@cvtelecom.cv">Petregal.cv@cvtelecom.cv</a><br>(9966987)   |
| <i>Emitério Ramos</i> | <i>Directorate General of<br/>Agriculture-MADRRM</i> | <a href="mailto:dgaspcv@yahoo.com">dgaspcv@yahoo.com</a><br>(2647544)                 |
| <i>Cesaria Gomes</i>  | <i>DGA-MADRRM</i>                                    | <a href="mailto:Cesaria.gomes@hotmail.com">Cesaria.gomes@hotmail.com</a><br>(2618984) |
| <i>Rui Spencer</i>    | <i>CV Telecom</i>                                    | <a href="mailto:Rui.spencer@cvt.cv">Rui.spencer@cvt.cv</a> (9915107)                  |
| <i>João C. Lima</i>   | <i>DGIE/CEP</i>                                      | <a href="mailto:Joao.lima@gorcv.gov.cv">Joao.lima@gorcv.gov.cv</a><br>(9929962)       |

## Reaction to CDM Presentation:

## 1. (DGASP)

## Question:

‘Will the construction period (initiation of electrical production of the project) coincide within the first phase of the Kyoto Market?’

## Answer:

‘Yes, the intention is to begin production before the end of the first phase. In any case there is confidence that there will be further phases in the Kyoto Market.’

*São Vicente*3<sup>rd</sup> October 2008



*Photo 1 – Meeting in São Vicente.*

| <b>Attendees</b>                 | <b>Company Details</b>                 | <b>Contact</b>   |
|----------------------------------|--|--|
| <i>Antonio P Silva</i>           | <i>Adeco</i>                           | <a href="mailto:tonecasilva@gmail.com">tonecasilva@gmail.com</a> (2327033 / 9883386) |
| <i>Margarete Fernandes</i>       | <i>Ass. Municipal S.V.</i>             | <a href="mailto:margamonte@hotmail.com">margamonte@hotmail.com</a> (9914466)         |
| <i>Jose Carlos Vitoria Soulé</i> | <i>Shell Cape Verde</i>                | <a href="mailto:jose.j.soule@scv.simis.com">jose.j.soule@scv.simis.com</a>           |
| <i>Guilherme Mascarenhas</i>     | <i>ISECMAR Wind Project</i>            | <a href="mailto:guilherme.mascarenhas@yahoo.com">guilherme.mascarenhas@yahoo.com</a> |
| <i>Rafael Torres</i>             | <i>AAN</i>                             | 9922696  |
| <i>Maria de Lourdes Fonseca</i>  | <i>Delegações MADRRM</i>               | 2324054 / 9941382  |
| <i>Fatima Alves</i>              | <i>Morabi</i>                          | <a href="mailto:morabi@cvtelecom.cv">morabi@cvtelecom.cv</a> (2326499 / 9949624)     |
| <i>Rui Paisana</i>               | <i>ISECMAR</i>                         | <a href="mailto:rui.paisana@cvtelecom.cv">rui.paisana@cvtelecom.cv</a> (9932562)     |
| <i>Edmar Coronel</i>             | <i>Eng Eléctrica &amp; Electrónica</i> | 9830191  |
| <i>Thedson Leite</i>             | <i>Tecnicil S.A.</i>                   | 9886216  |

#### Reactions to CDM Presentation:

##### São Vicente

1. Guilherme Mascarenhas (ISECMAR) – ‘A great self sustainable method for encouragement of renewable. Important to introduce the economic advantage of clean energy.’
2. Rui Paisana (ISECMAR) – ‘Extremely important for a commercial balance.’
3. Shell?

##### Question:

‘Who will keep the credits?’

##### Answer:

‘The project company (Cabéolica).’