CDM proposed standardized baseline form (Version 01.0)

(To be used by a designated national authority (DNA) when submitting a proposed standardized baseline in accordance with the "Procedure for submission and consideration of standardized baselines".)

SECTION 1: GENERAL INFORMATION

DNA submitting this form:	Ministério do Ambiente, Habitação e Ordenamento do Território (Ministry of Environment, Housing and Land Management), Cabo Verde
Developer of the standardized baseline: *(Parties, project participants, international industry organizations or admitted observer organizations)*	Secretariat of the Ecowas Centre for Renewable Energy and Energy Efficiency (i.e. ECREEE) under the strong assistance of UNFCCC CDM Regional Collaboration Centre in Lome, Togo in collaboration with Cape Verde Ministry of Tourism, Industry and Energy, national utility company Electra, and private renewable company Cabeolica.
Party or Parties to which the standardized baseline applies:	Republic of Cape Verde
Sector to which the proposed standardized baseline applies: *(the sector according to the definition of sector in the "Guidelines for the establishment of sector specific standardized baselines")*	Primarily the power sector and any other sector that are related to, but limited to, the power grid emission factor for the calculation of baseline or project emissions, including sectoral scope I "Energy Industries" as defined by UNFCCC.

SECTION 2: LIST OF DOCUMENTS TO BE ATTACHED TO THIS FORM *(please check)*

☐ An assessment report presenting how the data was collected, processed and compiled to establish the proposed standardized baselines;

☐ Where the proposed standardized baseline applies to a group of Parties, letters of approval of all the DNAs of the Parties to which the standardized baseline applies;

☒ Additional documentation supporting the submission (e.g. relevant data, documentation, statistics, studies, calculation tables, etc.), when applicable.

Name of authorized officer signing for the DNA:	Mr. Moisés Borges
Date and signature for the DNA:	MINISTÉRIO DO AMBIENTE, HABITAÇÃO E ORDENAMENTO DO TERRITÓRIO DIRECÇÃO GERAL DO AMBIENTE 06 November 2013, Praia, Cape Verde

Name and contact details of the focal point(s) for any follow up communication: *(all communication regarding procedural or technical issues will be sent to the focal point(s))*	For technical, procedural issues, request for information, please contact ECREEE keeping RCC Lome in copy: 1. Mr. Jansenio Delgado Renewable Energy Expert ECREEE Achada Santo Antonio, Electra Building, 2nd Floor, C.P. 288, Praia Cape Verde Email: JDelgado@ecreee.org Tel: + 238 260 4630 Fax: + 238 262 4614 2. CDM RCC Lome, at rcclome@unfccc.int, for providing assistance, support and facilitation. To keep in copy: 3. Mr. Moisés Espírito Santo Borges, Director General of Environment Ministério do Ambiente, Habitação e Ordenamento do Território (Ministry of Environment, Housing and Land Management) Achada Santo António, C.P 332-A, Praia, Cabo Verde Email: moises.borges@mahot.gov.cv; borgesmoises@hotmail.com.
SECTION BELOW TO BE COMPLETED BY THE UNFCCC SECRETARIAT	
CDM-PSB ID number:	
Date when the form was received at UNFCCC secretariat:	
Have all Parties for which the standardized baseline is applicable fewer than 10 registered CDM project activities as of 31 December 2010? (Y/N):	
CDM-PSB ID number and version: *(to be completed by UNFCCC)*	

MINISTÉRIO DO AMBIENTE, HABITAÇÃO E ORDENAMENTO DO TERRITÓRIO
DIRECÇÃO GERAL DO AMBIENTE

CLEAN DEVELOPMENT MECHANISM
PROPOSED STANDARDIZED BASELINE
(CDM-PSB)
(VERSION 01.0)

“Cape Verde

Standardized baseline for the Power Sector”

28 November 2013[1]

Version 1

Source

If the standardized baseline was developed using a methodological approach contained in an approved methodology or tool please provide the name, number (if applicable) and version of the approved methodology or tool used.

If it was developed using the “*Guidelines for the establishment of sector specific standardized baselines*” please state the version of the guidelines used.

If a table of calculation is available for the development of the standardized baseline, please state the version of the table used, and submit it with this form.

This standardize baseline was developed following the latest version “Guidelines for the establishment of sector specific standardized baselines”, version 2. Available at: https://cdm.unfccc.int/methodologies/standard_base/index.html, hereafter to be referred to as the guidelines.

Type of standardized baseline approach

The standardized baseline is developed for:

☒ Additionality demonstration;

☒ Baseline identification;

☒ Baseline emission estimation.

Please note that one, two or all three items can be checked.

[1] Initially on 06 November 2013, with initial notification email to the secretariat on 7 Nov 2013.

<u>SECTION A:</u> STANDARDIZED BASELINE DEVELOPED USING THE "GUIDELINES FOR THE ESTABLISHMENT OF SECTOR SPECIFIC STANDARDIZED BASELINES"

This section should only be completed when the standardized baseline is developed using the "Guidelines for the establishment of sector specific standardized baselines".

Applicability of the standardized baseline

Please provide the following information:

- The host country(ies) or region(s) within a host country to which the standardized baseline is applicable. In case of region(s) within a host country, please document transparently the geographical boundaries of the region (e.g. provinces, electric grids, etc).

All of the 9 inhabited islands of the Republic of Cape Verde as follows;

1. Santo Antão ;
2. São Vicente;
3. São Nicolau;
4. Sal;
5. Boavista;
6. Maio;
7. Santiago;
8. Fogo;and
9. Brava.

- The sector(s) to which the standardized baselines is applied. Note that a sector refers to a segment of a national economy that delivers defined output(s) (e.g. clinker production, domestic / household energy supply). The sector is characterized by the output(s) O_i it generates.

Primarily the power sector and any other sector that are related to, but limited to, the power grid emission factor for the calculation of baseline or project emissions, including sectoral scope I "Energy Industries" as defined by UNFCCC.

- The output(s) to which the standardized baseline is applied, i.e. the goods or services with comparable quality, properties, and application areas (e.g.clinker, lighting, residential cooking).

Power (electricity).

- The measure to which the standardized baseline is applicable:

☐ Fuel and feedstock switch; or

☒ Switch of technology with or without change of energy source (including energy efficiency improvement); or

☐ Methane destruction; or

☐ Methane formation avoidance.

Additionality demonstration

Please explain how the “Guidelines for the establishment of sector specific standardized baselines” were applied to demonstrate additionality and develop a positive list of project activities that are deemed additional. Follow the steps and guidance of the “Guidelines for the establishment of sector specific standardized baselines”. Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner.

Projects may already follow any of the existing tools and guidelines such as positive list, micro-scale automatic additionality tool to demonstrate additionality. For the purpose of following the standardized baseline guidelines, the below description demonstrates the additionality for all power sector projects, with a focus on wind and solar technologies as these are the dominating renewable technologies in Cape Verde and the country has little other types of renewable energy resources.

1. National circumstance and technology identification

The Cape Verde archipelago is a beautiful small island country which is located in the Atlantic Ocean, approximately 570 kilometres off the coast of West Africa. The country is a horseshoe-shaped cluster of ten (10) islands (nine inhabited) and thirteen islets that constitute an area of 4,033 km² and it has a population of about 542,000 inhabitants.

Map source (accessed as of 30 October 2013):
http://www.operationworld.org/files/ow/maps/lginset/cape-LMAP-md.png
http://www.captivatingcapeverde.com/_images/cape-verde-main-map-desktop.gif

The archipelago from the energy point of view is composed of independent systems characterized by their small sizes and distances from the supply centres: each of the nine inhabited islands has its own power generation and distribution system (mostly owned by national utility Electra) and there are no transmission lines connecting the islands. In addition, there are no transmission lines connecting the archipelago to other countries in the West Africa region.

The lack of conventional energy resources has caused a critical dependence on foreign energy - petroleum products based on which electricity and desalinated water is produced. The consumed fossil fuels are mainly diesel and fuel oil (FO180/380). Apart from these, over 85% of the rural population consume significant amount of firewood for cooking. By tradition, Cape Verde is not a charcoal producing or user country. In terms of renewable resources, Cape Verde has little hydro and biomass, but the archipelago has rich wind and solar resources.

Prior to the start (in 2009) of implementation of the registered CDM project PA9570: "Bundled wind power project Cape Verde" (a 25.5 MW bundled wind project across 4 islands, developed by the company Cabeolica), Cape Verde's power generation was dominated (nearly 100%) by diesel engine generators – only 2.4 MW very old wind generating capacity was available but those were very old equipment installed back in early 1990 and they had stopped operating before 2010. Between January 2009 and December 2013, there is another micro-scale wind project, a 2*250kW wind project being installed by Electric Wind, on Santo Anto island. Apart from these, there are two solar PV parks: a 2.5 MW on Sal, and 5 MW on San Tiago islands respectively, which were implemented in 2010, based on a preferential loan by Portuguese government.

Apart from the Cabeolica and Electric Wind projects, there is one other solar farm of 5 MW owned by the national utility company Electra, which also owns and controls all power systems on all islands except Boavista where the power system (a diesel engine power plant and a Cabeolica wind farm) is operated by a private company. The 5 MW solar farm was not developed as a CDM project as there was no CDM DNA at the time of developing the project, and the project investment was a public spending by Cape Verdean government based on a preferential loan given by Portuguese government.

There are no national or sub-national enforced regulations mandating the use of wind or solar power technology in Cape Verde as these require substantial investment. The Cape Verde government is conducting a feasibility study in order to promote high penetration of renewable energy throughout the economy, however, that is not expected to be translated into a mandatory regulation requiring to employ renewable technologies as Cape Verde is a poor country and these technologies require a much higher investment than conventional thermal power.

The spread-sheets submitted as annexes to this document lists the exact names and capacity for all of the power plants on all the islands, including the power generation data and fuel consumption during the past three calendar years: **2010, 2011 and 2012.**

Therefore, in Cape Verde, the below technologies are currently operating to generate power on nine of the isolated islands:

- Diesel engine (using diesel or fuel oil);
- Wind (a CDM bundled project, on 4 islands);
- Solar (2 micro-scale pilot projects).

The approach for the additionality demonstration outlined in the guidelines is applicable to diesel engines only. Renewable energy technologies, such as wind and solar are considered automatically additional for the purpose of this standardized baseline because of their intermittent and non-dispatchable nature and based on the following decisions of the CDM EB.

Table 1. Positive list of technologies

Technology	Basis of additionality
Solar technologies (PV or solar thermal electricity generation) up to 15 MW	EB68 Annex 27, para.2
Wind power up to 5 MW	EB73 Annex 13 para. 8(a)
Wind power up to 15 MW	EB68 Annex 27, para.1

The application of the documents presented in the table is outlined below.

Renewable energy including wind power generating technology is facing several strong barriers. Therefore, this standardized baseline proposes to follow EB68 Annex 27, paragraph 1, to prove that based on barrier analysis, any wind power project of installed capacity up to 15 MW should be considered automatic additional:

Barrier analysis

The purpose of this sub-step aims to follow EB68 Annex 27 paragraph 1 to elaborate the barriers facing renewable energy technologies and their deployment in Cape Verde.

Cape Verde due to its unique geographic location has enormous potential resources for renewable energy (mainly wind and solar)[2]. Despite of the opportunities for renewable energy, the dissemination of renewable energy technologies has been very marginal because of significant barriers that still remain to their uptake and this section aims to present some of the most critical barriers that have been the main hurdles to the development of renewable energy in Cape Verde.

1. Financial and Economic Barriers

Cape Verde is a small island country where there are no large-scale centralized thermal power plants, nor is there any possibility to develop a centralized large scale wind or solar farm to supply the whole country. Small sized diesel engine power generation units have been put in place on nine of the inhabited islands as these require much less initial investment whereas renewables (wind or solar) require large upfront investment as compared to the existing small-scale conventional systems. The country has little natural resources, making it very difficult to attract foreign investment in the renewable energy sector. As a result, financial barrier has been one of the most critical factors limiting the dissemination of renewable energy technologies in Cape Verde.

Financial barriers can fall into two categories - affordability and access to finance. Affordability is a problem due to the high upfront investment cost of renewable (mainly wind/solar) technologies and inadequate financing mechanisms. Financial institutions (in the region and outside) generally perceive renewable energy technologies as unreliable and lacking long-time viability. For smaller projects (e.g. up to 15 MW) suitable to the size of Cape Verde as a country (then the small islands), it is extremely difficult to mobilise risk capital for its development such as conducting the feasibility studies, undertaking measurements on-site. For larger scale projects (above 15 MW), their return on investment are very low and this makes it extremely difficult to obtain a loan from a financial institution. Therefore, the sector has been relying mainly on external donor funding such as soft loan credit line (preferential loan) from Portugal and other countries, and grants for project development from different donors as such the Dutch government.

The Cape Verde government has only very recently introduced the Decree-Law n.1/2011, on 3rd of January 2011 on the Promotion and Incentive for the Use of Renewable Energy. Rules were introduced for the first time in Cape Verde concerning the promotion, incentives and access to licence and exploration of the independent production of electricity using renewable energy sources. This Decree Law has the objective of promoting and incentivising the use of renewable energy in Cape Verde, introduces a group of incentives for renewable energy development such as: fiscal incentives; a transparent and stable system of remuneration for the sale of energy produced during a period of 15 years with payment options that offer guarantees to sponsors, namely the creation of the Renewable Production

[2] It should be noted that when referring to renewable energy in this entire section, it should be generally understood as referring to grid connection wind and solar power generation, as these are the main renewable sources in Cape Verde. The country has very little potential for hydro and biomass for renewable energy power generation at scale, nor for anyother renewable technologies.

Credits; a special regime for micro-generation, with the right to sell the produced energy at the same price at which the electricity is purchased and a fund for the Promotion of Decentralized Rural Electrification.

This above decree-law is expected to address to a great extent financial barriers for the development of renewable energy in Cape Verde. However, it is still a very recent action and the sector has still been relying on external donor funding (e.g. soft loan credit line, grants for project development from different donors) for up-front investment costs. What has been observed is that even with the introduction of this decree law, there remains the particular difficulty of mobilising risk capital for funding the development costs of smaller scale projects (e.g. feasibility studies, measurements of resources) for a country like Cape Verde.

High capital costs/upfront investment versus limited budgets as a typical barrier for renewable power projects is particularly specific for Cape Verde, as is the same in many other countries. Renewable energy requires a greater level of financing for the same capacity and financial institutions usually require a premium in lending rates because more capital is being risked up-front when compared to financing conventional thermal power generation projects. Although the lower fuel and operating costs for renewable power projects may make renewable energy cost-competitive on a life-cycle basis, the much higher initial capital costs can mean that renewable energy provides less installed capacity per dollar invested than conventional heavy fuel oil or diesel engine generators that are dominating Cape Verde's power system at the time of submitting this standardized baseline proposal. Experience shows that many of the suitable sites for wind or solar energy development are very difficult to access and significant upfront costs are required to build access roads from the nearest port to the project sites. Further, due to the non-existence of renewable energy technology manufacturers, all equipment need to be imported hence increasing the costs of investment.

Proven experience from past efforts in developing renewable energy projects in Cape Verde, in particular wind energy projects (by Cabeolica) shows that the process of mobilising finance from different sources for bigger projects faces a series of significant difficulties and hence it takes much longer to realise. As such the private sector would need to make significant investments in the preparation of such projects and setting up the financial arrangements to realise potential investments. Given the sizes of the investment required for such projects dispersed on different islands and the associated incremental costs as compared to concentrating all generating units at one easily accessible location, the potentially small to medium scale investors (matching the size of potential small to medium projects) tend not to be able to participate in such projects.

On the other hand, the fragmented nature of power grids due to the geographical characteristics of the archipelago country tends to discourage potential large-scale investors due to the perceived limited market potential. Therefore, it is extremely difficult to attract investors to invest in small to medium (in the range typically not exceeding 15 MW) scale renewable energy projects that would both meet the country's needs and would not need huge and complex financial arrangements. Up to date, little mechanisms exist to buy down the capital costs of potential projects and assist in the development of bankable projects and loan negotiations between project developers and financial services providers.

In addition, the currently small size and dispersed nature of the Cape Verdean renewable energy market (on different islands) does not facilitate benefits compared to economies of scale.

Another barrier relates to the high transaction costs for renewable projects. Renewable energy projects in Cape Verde are typically much smaller than conventional energy projects (implemented elsewhere). Projects usually require additional information that is not readily available, or may require significant time and efforts for financing or permitting because of unfamiliarity with the technologies or uncertainties over performance. For these reasons, the transaction costs of Cape Verde's renewable energy projects—including resource assessment, sitting, permitting, planning, developing project proposals, assembling financing packages, and negotiating power-purchase contracts with utilities—are much larger on a per-kilowatt (kW) capacity basis than for conventional power plants. Further, the dispersed nature of the installations brings additional costs when it comes to maintenance and repairing in case of equipment failures. These higher transaction costs also add to the costs of renewable projects and they enhance investors' lack of interest in renewable energy in Cape Verde.

In addition, there is significant barrier for the financing institutions and banking sector in Cape Verde. Up to date, there has been no experience within the Cape Verdean financial institutions in lending on renewable energy projects. There is no dedicated financing for renewable energy activities within financial institutions. Furthermore, the capacity within financial institutions and power utilities to appraise renewable energy proposals is non-existing. The cost of borrowing capital in Cape Verde is expensive and the longer pay-back periods required for renewable energy projects are difficult to finance. The bank's interest rates on loans in Cape Verde are usually higher than 7.5%. Whereas foreign currency loans are available at lower costs, the revenues for renewable energy projects within the country will be in local currency only, so the financial institutions are unwilling to lend in foreign currency– due to the foreign exchange risk.

Experience from past efforts in developing renewable energy projects in Cape Verde, in particular wind energy projects shows that the process of mobilising finance from different sources for large projects normally takes extremely long to realise. As such the private sector would need to make significant investments in the preparation of such projects and setting up the financial arrangements to realise potential investments. Given the sizes of the investment required for such projects and the associated costs, potential small to medium scale investors tend not to be able to participate in such projects. On the other hand, the fragmented nature of power grids due to the geographical characteristics of the country tends to discourage potential large-scale investors due to the perceived limited market potential.

Last, but not least, renewable projects in Cape Verde face particular barrier on the emerging carbon market. The only renewable project in the country, the Cabeolica 25.5 MW project was developed under the expectation of receiving meaningful revenue from its sales of CERs as the project genuinely needs the support of CDM to pay back its loan. However, the carbon market is going through an extremely difficult time and the present sales of CERs would not even recover the transaction costs of developing the CDM aspects, as the project had gone through re-publication of PDD and several other major challenges when developing the CDM, which led to a very high transaction cost for the CDM development. Further, it has been noted that existing CER purchasing mechanisms such as the Nordic Environmental Finance Corporation (NEFCO) are still offering reasonably good prices towards CERs generated by CDM projects. However, for wind and hydro projects, they only target LDCs but Cape Verde as a small island developing state is not an LDC so its projects cannot qualify such purchasing schemes. This adds another barrier for upcoming projects to seek support from the CDM. Thus, carbon market was initially envisaged as an enabling factor towards the implementation of more renewables in Cape Verde, however, the present difficult situation has made it become a barrier and unless the situation changes, it is considered that projects will find it harder to develop the CDM, especially without the approval of a simplified standardized baseline.

2. Institutional and Regulatory Barriers

There is still insufficient support for renewable energy and there is a lack of institutional capacity to develop renewable energy projects in Cape Verde, despite of the fact that Cape Verde is considered as a renewable energy Champaign in West Africa region, only because of the successful implementation of the CDM project – Cabeolica wind project. The country government has made positive steps towards a supportive framework for renewable energy and has already implemented some of the support mechanisms recommended internationally such as allowing the private sector to operate through Independent Power Producers (IPPs) based on Power Purchase Agreement with national utility, a licensing regime, a regulatory body and clear responsibilities within the energy sector for policy, regulation and provision of energy. In addition, it has recently enacted the above-mentioned Decree-Law on the Promotion and Incentives for the Use of Renewable Energy (DLn.1/2011, of 3rd of January) that supports renewable energy development. However, this decree-law is still very recently enacted and it still needs to be put it in place and be made operational. Experience has shown that it is extremely difficult for IPPs to negotiate a PPA. Cape Verde has its National Energy Policy which is currently being reviewed and revised whereby it is expected that the country will set an ambitious goal for renewable energy penetration but up to date, there is no concrete plan made to guide the country achieve that goal. As a matter of fact, although some positive steps have been made, institutional and regulatory barrier is still one of the main barriers for the development of renewable energy in Cape Verde.

In Cape Verde, the institutional capacity and competencies within the energy sector are very limited, especially in relation to the formulation and implementation of policies as well as regulations. The recently enacted the Decree-Law on the Promotion and Incentives for the Use of Renewable Energy was developed with heavy contributions by Martifer, a private Portuguese company, with local support from Cape Verde Government. Although it may appear that there is a robust package of legislation and incentives for developing renewable energy projects in the country, no measures have been put in place to coordinate efforts to develop the renewable energy sector in conjunction with other sectors such as education, health, tourism, employment, etc. where such interventions would be appropriate and cost effective. Therefore, there is a conductive legal and regulatory framework supporting renewable energy projects in general, but a serious lack of expertise exist to implement substantive and effective policies and programmes and to promote and support renewable energy development.

Cape Verde already has had the legal framework to allow the operation of IPPs and there is experience with a few IPPs negotiating power purchase agreements (PPAs) with ELECTRA. Now with the introduction of the new decree law on the Promotion and Incentives for the Use of Renewable Energy, there is a clear mechanism for the calculation of the tariff in the PPA for renewable energy projects. However, based on experience, the process of negotiating a PPA with the national utility Electra took extremely long but there is still no standardized PPA established for renewable energy.

There is also a lack of capacity by institutions, market players and market enables that would be needed to establish and operate a market renewable energy projects. For the implementation of renewable energy projects there is a lack of institutional capacity to effectively support the development of renewable energy projects and also to enhance the capacity of the other market players, such as market enablers (policy makers) regulators, entrepreneurs, project developers and financial institutions as these players often have problems to appraise dispersed small to medium sized renewable energy projects.

3. Technical Barriers

There is insufficient technical capacity in the country to identify, develop and implement renewable energy projects. As renewable energy technologies are still quite new to the country, there is limited technical capacity to design, install, operate, manage and maintain renewable energy based modern energy services, mainly due to a lack of experience in this new field. There is very little understanding of the opportunities for renewable energy and no technical capacity to develop and implement any renewable energy project. Electra, the national utility, which can be considered as the most suitable entity to develop electricity generation projects including renewables, has been seen to have very low capacity for managing as well as meeting electricity demand even based on its conventional thermal generation, not to mention renewable energy whose output can create additional challenge. Cabeolica, the only large scale project implementer in Cape Verde, has experienced many technical challenges in integrating its wind power into the grid and it is going through a learning process to overcome the technical issues. So far, very little experience has been accumulated within the country to demonstrate the technical viability of renewable energy technologies that would be most suitable for Cape Verde needs, i.e. solar and wind.

Large scale bulk procurement of renewable energy technologies is not possible due to the very small market demand on each island for renewable energy based modern energy services. Hence the technical infrastructure to support renewable energy development does not exist so far. Local manufacturing and/or assembly of renewable energy technology components is currently lacking, along with knowledge, skills, expertise and facilities. In fact, all of the few implemented projects have had heavy involvement of experienced foreign experts. Further, there is a lack of qualified installers and contractors in Cape Verde, who are important to ensure that renewable energy systems do not fail because of unsatisfactory installation. There is no quality control, norms, standards and guidelines in terms of renewable energy performance, manufacture, installation and maintenance and thus there is a risk that poorer quality goods may be imported.

As is the case for many other countries, there is serious technical limitation of integrating renewable energy systems into the grid. Regarding grid-connected renewable energy, one of the main barriers is the technical limitation of integrating variable wind and solar resources in to the grid. Taking into consideration the variations of renewable energy (particularly wind and solar), they cannot be used as base load technology. For that, there is need for a strong investment in storage systems, and dispatching systems which can make renewable energy options extremely expensive for a country like Cape Verde. The existent grids in Cape Verde islands are quite weak, which does not ensure that produced energy is in fact delivered to the consumers due to structural problems and there are restricts on the addition of any capacity, and thus the existing systems become a strict restrict to the development of small to medium scale renewable energy projects which are most commonly envisaged throughout the archipelago. Furthermore, in the case of solar power, there is a mismatch between peak electricity demand mainly in the evenings and lower solar radiation and wind resources at the same times. All of these present particular technical barriers towards the development of renewable energy in Cape Verde.

4. Awareness Barriers and Lack of Information

Lack of data and information on renewable energy technology and opportunities is a critical barrier in Cape Verde. There is very poor awareness of renewable energy technologies and the opportunities they can offer and there is very limited knowledge of the renewable energy market potential and availability and access to existing renewable energy resource information is also extremely limited.

People are generally not aware of the commercial viability of renewable energy projects. Since energy costs are so high most enterprises now pay great attention to energy costs, however they have limited awareness and understanding of the financial and qualitative benefits that renewable energy can deliver. This is consequence of lack of information about what is technically feasible versus what is commercially available. There are no demonstration renewable energy projects and no structured renewable energy dissemination and education programmes. Knowledge on, for example, the fact that life cycle costs of renewable energy technologies can be competitive, is mostly absent. Availability of renewable energy resources is very site specific, requiring detailed analysis of the local specific conditions and therefore, for the country as a whole, there is no readily available data to assess the exact potential of specific sites.

This information is also lacking within the energy market players, some of them do not know benefits that can be yielded from renewable energy and their role.

- There is a lack of capacity among the public institutions to effectively support the development of renewable energy projects.
- Among the regulators, there is a lack of capacity to develop and implement policies and regulations that are conductive to the development of renewable energy projects.
- For the entrepreneurs, project developers, financing institutions, there is lack of capacity and experience to successfully develop and manage investments in renewable energy projects.
- To all stakeholders in the energy sector, there is a lack of awareness on the benefits of using renewable energy systems.

Before concluding, it is helpful to take a look at the below renewable energy projects that have been implemented in Cape Verde:

- Cabeolica wind projects (25.5 MW in total) are registered as CDM project in October 2013, and they haven’t completed the construction in full. The project has experienced many of the above mentioned barriers during its implementation and it had hoped that the pursuit of CDM would help overcome some of these barriers. Nowadays, due to the carbon market situation, the project is facing critical challenges in meeting its investors' expectations because of the low carbon price.

- The only existing solar farms (2.5MW in Sal, and 5 MW in Santiago) on was a project financed by the Portuguese government on a pilot basis through a preferential loan and it is implemented by Portugese company Martifer.

- The other wind project implemented by Electric Wind, is as small as 250 kW x 2 (500 kW in total), uses second hand wind turbine imported from Europe and the project was 50% financed by a grant given by the Dutch government. .

- In Cape Verde, prior to the start of the implementation of the Cabeolica wind project (CDM PA9570), there had been a few old wind turbines installed on testing basis totalling 2.4 MW. Those wind turbine generators were implemented on pilot basis and had completely stopped operating before 2010 and no cost of production data were maintained for these wind turbines.

To conclude, the development of renewable energy faces significant barriers in Cape Verde. The only solar project was developed by based on a preferential loan given by the Portuguese government. The only one micro-scale wind project (250kW*2 = 500 kW) by small IPP Electric Wind was developed based on second-hand equipment and a Dutch government grant to cover 50% of the project investment, while the only other large scale project, the Cabeolica 25.5 MW wind project, registered in October 2013, was registered as a CDM project. Even though the renewable energy Decree-Law has been in place since almost 3 years, Cape Verde has not observed any major projects at scale that are implemented without pursuing CDM or donor country preferential loan or grant. Due to the intermittent and non-dispatchable nature, and based on this analysis following EB68 Annex 27, paragraph 1, it can be concluded that wind power generation of up to 15 MW in Cape Verde shall be considered as automatically additional.

For **wind power of installed capacity up to 5 MW**, it is already considered automatically additional by "Guidelines – Demonstrating additionality of microscale project activities" (EB73 Annex 13) which states (para. 8a) that "Project activities up to five megawatts that employ renewable energy technology2 are additional if any one of the conditions below is satisfied: (a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country". Since Cape Verde is a SIDS, **any wind power project in Cape Verde of installed capacity up to 5 MW is considered additional by the EB.**

For **solar technologies (PV or solar thermal electricity generation) of installed capacity up to 15MW**, it is already considered automatically additional by "Guidelines on the demonstration of additionality of small-scale project activities" (EB68 Annex 27), where it is stated:

"1. Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:
(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

2. Documentation of barriers, as per paragraph 1 above, is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:
(a) The following grid-connected and off-grid renewable electricity generation technologies:
(i) Solar technologies (photovoltaic and solar thermal electricity generation);
(ii) Off-shore wind technologies;
(iii) Marine technologies (wave, tidal);
(iv) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW;
(b) The following off-grid electricity"

Therefore, any project in Cape Verde based on solar technologies (PV or solar thermal electricity generation) of installed capacity up to 15MW is considered additional by the EB.

The proposed CDM project activities applying technologies that are not deemed automatically additional may demonstrate additionality by passing benchmarks. Benchmarks are elaborated by applying the guidelines step 2 "Establish additionality criteria for the identified measures" that requires that "the cumulative percent of output Oi, produced based on technologies is arranged in descending order of carbon intensity of the technologies", and "technologies that have lower greenhouse gas intensity than any of the technologies used to produce aggregately more than the value of the threshold (Ya) of the output(s) Oi of the sector and are less commercially attractive than any of these technologies, are deemed additional".

Since each of nine inhabited islands has its own isolated power system, the threshold of 80% is chosen from the Appendix 1 to the guidelines. Although it is not explicitly mentioned in the guidelines, for the sake of achieving extreme conservativeness, all plants including Cabeolica's CDM plants have been included into consideration in the below discussions. Should the EB decide in the future, that CDM projects do not necessarily need to be considered in this step, which we believe is a reasonable approach, then we shall follow the new rule to update and maintain of the standardized baseline in the subsequent years.

The following steps were applied to determine the additionality benchmark following the guidelines:

Step 1. The cost of electricity generation[3] is collected for each power plant by Agency of Economic Regulation and for each reported year (i.e. 2010, 2011, 2012).

Step 2. The weighted average cost of generation is calculated based on the three years data as follows:

$$Cost_n = \frac{\sum_y Cost_{n,y} \times EG_{n,y}}{\sum_y EG_{n,y}} \qquad \text{Equation (1)}$$

Where:

$Cost_n$	=	Cost of generation of the power unit *n* (CVE/kWh)
$Cost_{n,y}$	=	Cost of generation of the power unit *n* in year y (CVE/kWh)
$EG_{n,y,}$	=	Net quantity of electricity generated and delivered to the grid by power unit *n* in year *y* (MWh)
y	=	The reported year as per the data vintage (2010, 2011, 2012)

[3] Classified confidential data provided by Cape Verde's economic regulator – Agency of Economic Regulation.

Step 3. The power units are ranked in the ascending order based on the cost of generation.

Step 4. The wind and solar power plants are excluded[4] from the list based on the above application of the different EB documents.

Step 5. The aggregated electricity production is calculated for power plants ranked in the ascending order.

Step 6. The cost of production of the technology that is used to produce aggregately 80% of electricity is determined and used as the additionality benchmark.

The spread-sheets present detailed step-wise calculation how the guidelines step 2, 3, 4 have been followed, where the comparison of carbon intensity of technologies, and the cost comparison are presented.

Since the islands are not interconnected, each island is presented individually and separately. This also follows the logic, for example, that any potential CDM project on Boavista Island cannot replace the grid electricity on Santiago Island. For the four islands where there is only one diesel engine power plant supplying the entire island the additionality demonstration is based on the carbon intensity and the cost of the existing diesel engine power. In other words any proposed project activity that has the emission factor less than baseline emission factor of the existing diesel engine (please refer to the below section regarding baseline emission factor) and requires larger investment is deemed additional.

The summary of additionality criteria for the nine islands is presented in the following table:

Table 2. Additionality benchmarks

##	Island	Benchmark [CVE/kWh][5]	Baseline emission factor[6] [tCO2e/MWh]
1.	Santo Antão	25.15	0.70657
2.	São Vicente	14.08	0.61195
3.	São Nicolau	25.75	0.72087
4.	Sal	25.12	0.5808
5.	Boavista	28.22[7]	0.61509
6.	Maio	25.31	0.70143
7.	Santiago	18.52	0.5808
8.	Fogo	25.33	0.72731

[4] In addition, at the time of submitting this standardized baseline proposal, there haven't been any available data from these renewable energy technologies due to uncompleted construction and other reasons.
[5] Please note that in the spreadsheet, where CVE and/or $ sign is referred to, it all means local Cape Verdean currency escudo (CVE). $ sign should not be understood as US dollars throughout this submission.
[6] Obtained from the below setion.
[7] Boavista cost of production was not available. Therefore, to be conservative, we choose the highest cost of production among all other islands and apply it to Boavista in this case.

9.	Brava	23.44	0.64365

Outcome

The proposed CDM project activity is deemed additional if either:

1. The capacity and technology of the project activity fall into the positive list presented in the Table 1; or

2. the project emission factor of the project activity is lower than the respective baseline emission factor and if levelized cost of project technology is higher than the respective benchmark, taken from the Table 2; or

3. The project activity is to employ any renewable energy technology up to 5 MW of installed capacity as per the microscale additionality guideline, for a Small Island Developing State.

Baseline identification

Please explain how the "*Guidelines for the establishment of sector specific standardized baselines*" were applied to identify the baseline for the measures. Follow the steps and guidance of the "*Guidelines for the establishment of sector specific standardized baselines*". Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner.

Please refer to attachment annexes for each island. As demonstrated, for all of the inhabited islands, the **diesel engine technology** has been identified as the baseline technology.

Baseline emission factor estimation (if applicable)

Please explain how the "*Guidelines for the establishment of sector specific standardized baselines*" were applied to determine a baseline emission factor. Follow the steps and guidance of the "*Guidelines for the establishment of sector specific standardized baselines*". Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner.

The data of power generation and fuel consumption are obtained from the following sources in a transparent manner:

- National utility, annual reports, publicly available [for all power generation and fuel consumption data except Boavista island where the plant is operated by a different private company, which submits data to Agency of Economic Regulation];
- Cabeolica, annual reports, upon request by DNA [for Cabeolica's wind projects generation data];
- Agency of Economic Regulation of Cape Verde, an independent regulatory body of Cape Verde (for cost of production data, and the data from Boavista Island).

The following approach is taken to determine the baseline emission factors for each inhabited island.

Step 1. Determination of the plant emission factor.

The emission factor for each power plant is determined based on:

1. Electricity supplied to the grid over the three reported years;

2. Total fuel consumption;

3. The type of service provided by the power plant, i.e. (i) power production and supply to the grid, (ii) power production and supply to the grid and to the desalination plants;

4. Default efficiency.

For power plants that are used to supply electricity to the grid only the emission factor is determined using the following equation:

$$EF_n = \sum_y \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad \text{Equation (2)}$$

Where:

EF_n	=	CO_2 emission factor of power unit *n* in year *y* (t CO_2/MWh)
$FC_{i,y}$	=	Amount of fuel type *i* consumed by power unit *n* in year *y* (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fuel type *i* in year *y* (t CO_2/GJ)
EG_y	=	Net quantity of electricity generated and delivered to the grid by power unit *n* in year *y* (MWh)
i	=	All fuel types combusted in power unit *n* in year *y*
y	=	The reported year as per the data vintage (2010, 2011, 2012)

For power plants that are used to supply electricity to the grid and to the desalination plants the emission factor is determined using the following equation:

$$EF_n = \frac{EF_{CO2,i,y} \times 3.6}{\eta_n} \quad \text{Equation (3)}$$

Where:

EF_n	=	CO_2 emission factor of power unit *n* in year *y* (t CO_2/MWh)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fuel type *i* in year *y* (t CO_2/GJ)
η_n	=	Average net energy conversion efficiency of power unit *m* in year *y* (ratio)
y	=	The reported year as per the data vintage (2010, 2011, 2012)

The efficiency is derived from the Appendix 1 of the latest approved version of the "tool to calculate the emission factor for an electricity system.

The NCV is derived from the IPCC table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. Value is taken at the lower limit of the uncertainty at a 95 per cent confidence interval. There are three types of fuels used in the country: diesel, fuel oil 180 and fuel oil 380. Since fuel oil 180 and 380 have slightly higher NCVs, it is conservatively assumed that all fuel used is diesel with NCV 41TJ/Gg and emission factor of 72600 kg/TJ. Raw data on fuel consumption is reported in litres. For the purpose of calculations, the fuel consumption is converted into tons using the default IPCC value for diesel density 0.832 kg/l.

Step 2. Determination of the baseline emission factor.

With the known emission factors for each power plant the baseline emission factor is determined using the following step-wise approach:

1. All power plants are ranked based on their carbon intensity, i.e. emission factor in descending order;

2. Cumulative electricity production is calculated starting from most carbon intensive power plant;

The threshold of 80% is applied to cumulative production to identify the baseline technology and the baseline emission factor. Please refer to attachment annexes. Each spread sheet presents the calculation in a clear and transparent manner for each island. A summary is presented in table 3 below.

Table 3. Baseline emission factors corresponding to each island

##	Island	Baseline emission factor [tCO2e/MWh]
1.	Santo Antão	0.70657
2.	São Vicente	0.61195
3.	São Nicolau	0.72087
4.	Sal	0.5808
5.	Boavista	0.61509
6.	Maio	0.70143
7.	Santiago	0.5808
8.	Fogo	0.72731
9.	Brava	0.64365

Use of the standardized baseline with an approved methodology

Please explain how the standardized baseline will be used with the relevant approved methodology(ies) or an approved tool, i.e. which (parts of) the approved methodology(ies) or the approved tool are replaced by the standardized baseline. Note that a standardized baseline derived from the *"Guidelines for the establishment of sector specific standardized baselines"* will usually replace the sections on demonstration of additionality, identification of the baseline scenario and the determination of baseline emissions, while the methodology sections on applicability, project boundary, project emissions, leakage emissions and provision to monitor project and leakage emissions may not be affected by the use of the standardized baseline. If an approved methodology is not available, a new methodology should be submitted to be used with the standardized baseline, following the relevant procedures ("*Procedure for the submission and consideration of a proposed new baseline and monitoring methodology for large scale CDM project activities*" or "*Procedures for the submission and consideration of a proposed new small scale methodology*").

This proposed standardized baseline is to be used in conjunction with the following approved methodologies:

AMS-I.D "Grid connected renewable electricity generation". The proposed value of the baseline emission factor should be applied to the 'CO_2 emission factor of the grid in year y' ($EF_{CO2, grid,y}$);

AMS –I.F "Renewable electricity generation for captive use and mini-grid". The proposed value of the baseline emission factor should be applied to the 'emission factor' (EF_{CO2});

ACM0002 "Grid-connected electricity generation from renewable sources". The proposed standardized baseline replaces the baseline emission factor should be applied to the 'combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" '($EF_{grid, CM,y}$)

AM0103 "Renewable energy power generation in isolated grids". The proposed standardized baseline replaces the section on the baseline emission factor that should be applied to the 'Emission factor of the isolated grid' $EF_{isolated\_grid}$.

In summary, table 4 presents the summary of application of this standardized baseline:

Table 4. Summary of application of this standardized baseline

Methodology\Application of this standardized baseline	Replacement of additionality demonstration	Replacement of grid emission factor
AMS.I.D.	Yes	Yes
AMS.I.F.	Yes	Yes
ACM0002	No	Yes
AM0103	No	Yes

Validity of the standardized baseline

Please state the period of time for which the standardized baseline is valid. Please note that Appendix I of the "Guidelines for the establishment of sector specific standardized baselines" provide interim values for data vintage and the frequency of update.

Effective immediately from the adoption by the CDM EB, updated once every 3 years or more frequently should data become available.

SECTION B: STANDARDIZED BASELINE DEVELOPED USING A METHODOLOGICAL APPROACH CONTAINED IN AN APPROVED METHODOLOGY OR TOOL

This section should only be completed when the standardized baseline is developed using a methodological approach to estimate baseline emissions contained in an approved methodology or tool. An example for this is the application of the "Tool to calculate the emission factor for an electricity system" to estimate the emission factor for a electric grid.

Applicability of the standardized baseline

Please state the host country(ies) or region(s) within a host country to which the standardized baseline is applicable. In case of region(s) within a host country, please document transparently the geographical boundaries of the region (e.g. provinces, electric grids, etc).

This is not applicable.

Baseline emission estimation

Please explain how the methodological approach contained in the approved methodology or tool was applied to estimate the baseline emissions of a project activity in (a) country(ies) or region. Follow the steps and guidance of the approved methodologies or tools. Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner. Note that the underlying methodology or tool has to provide a methodological approach to derive the baseline emissions for a country or region in order to apply this step. This applies, for example, to the methodological tool "Tool to determine the emission factor of an electricity system".

This is not applicable.

Use of the standardized baseline with an approved methodology

Please explain how the standardized baseline will be used with the relevant approved methodology(ies) or approved tool, i.e. which (parts of) the approved methodology(ies) or the approved tool are replaced by the standardized baseline.

This is not applicable.

Validity of the standardized baseline

Please state the vintage of the parameters used to derive the standardized baseline, in accordance with the requirements contained in the approved methodology or tool.

This is not applicable.

REFERENCES AND ANY OTHER INFORMATION

The development of this standardized baseline has faced significant challenges with regard to access to relevant stakeholders, bringing them to understand the importance of this initiative and the potential benefits to the Cape Verde as a whole. In addition, the availability of data and stakeholder willingness to provide data and information had been a critical challenge along this process, apart from many other difficulties. The DNA of Cape Verde expresses its gratitude to the following individuals and organizations/offices for their significant contribution towards the completion of this initiative: the CDM RCC Lome (**Mr. Chunyu Liang,** Technical Expert from RCC Lome), for assisting the country in identifying and initiating the process with all relevant stakeholders including the DNA office, and persistently supporting these stakeholders to solve the identified issues and pursue the completion of this study on a zero cost basis and within an extremely short time frame; **Mr. Jansenio Delgado**, senior Renewable Energy Expert from Ecowas Centre for Renewable Energy and Energy Efficiency (ECREEE) for agreeing to accept the designation to act on DNA's behalf for providing the most critical local support in engaging local stakeholders in Cape Verde to participate in this initiative, solve the many identified issues, and in enabling access to data and information; **Mr. Rito Evora**, Administrator, Agency of Economic Regulation (ARE), for his understanding and support to this initiative and for ARE contribution in granting important data and information; **Mr. Antão Fortes**, CEO, and **Ms. Ana Monteiro** Head of Health Environment and Administration at Cabeolica, for their kind collaboration in providing important data and information; **Prof. Antunio Barbosa**, Professor at University of Cape Verde, for making important information available to smooth the study of this standardized baseline. We thank **Mr. Joao Manuel Dias da Fonseca**, Executive Director of Electra for the support of Electra, Mr. **Daniel Graca**, CEO of Electric Wind (IPP in Cape Verde) for providing much needed information and assistance, and the D.G. of Energy and the national utility Electra **(Mr. Antonio Baptista**) for offering their support to this initiative. Last, but not least, we must mention that the successful delivery of the final outcome would not have been smooth without the contribution of an international expert who wishes to be anonymous from this report. Cape Verde is committed towards fighting against climate change together with the international community and the CDM EB is commended for its good work in guiding us with its procedures and guidelines, and we look forward to the smooth approval of this standardized baseline by the CDM EB.

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History of the document

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Decision Class: Regulatory **Document Type**: Form **Business Function**: Methodology		