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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: 60 MW Kinangop Wind Park Project

Version: 04
Date: 11/01/2012

A.2. Description of the project activity:

The objective of the 60 MW[1] Kinangop Wind Park Project, which has been proposed by Aeolus Kenya Limited, is to add about 178,520 MWh per year of wind-generated electricity to the Kenya national grid system. Although the country has a wind potential of several hundreds of megawatts, less than 6 MW of generation capacity from wind has been installed in the country (For more information please see section B.5).

The Kenyan national grid system, with a generating capacity of about 1,455 MW by end 2010, comprises both renewable and thermal generation sources. In 2009/2010, the electricity supply in Kenya was made of 20.12% from geothermal, 32.62% from hydro, 44.95% from thermal, 0.24% from wind, 1.49% from biomass and 0.57% from imports.

The renewable energy generated by the project will be sold under a Power Purchase Agreement to the Kenya Power and Lighting Company (KPLC). The project activity will reduce CO_2 emission through the replacement of electricity generated by fossil fuel fired power plants connected to the national grid. The baseline scenario for the project is as follows (See section B.4 for details):

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

The existing scenario is the same as the baseline scenario. In the project scenario, the wind-generated renewable electricity will displace an equivalent amount of energy currently generated by the grid-connected power plants.

The project will contribute to the sustainable development of Kenya in the following ways:

- Renewable electricity – The proposed project will provide renewable and clean electricity to the national grid while also diversifying the electricity sources for the country and reducing fossil fuel imports[2].
- Employment - The proposed project activity will provide about 1,000 temporary jobs during construction and not less than 16 permanent jobs during operation.
- Local development - The project will stimulate market activity near the site, requiring support from several local businesses in the purchasing of consumables, operation and maintenance of equipment and subcontracting services[3].
- Technology transfer - The project will enhance the transfer of windmill technology to the country and the neighbouring countries through the application and promotion of wind turbines, accelerating the accumulation of experiences and absorption of this kind of technology and advancement of domestic wind power technology.

[1] The actual installed capacity of the project is expected to be 60.8MW
[2] Hydro-electricity is prone to weather fluctuations while fossil fuel-based electricity is prone to price fluctuations
[3] A great percentage of goods for the project will be purchased locally. In addition, local banking and communication systems, local accounting, legal and other professional services will be used.

A.3. Project participants:

Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.		
Name of Party involved (*) (host) indicates a Host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Kenya (Host)	Aeolus Kenya Limited	No
United Kingdom of Great Britain and Northern Ireland	J.P. Morgan Ventures Energy Corporation	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities International Limited	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Kenya

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

Nyandarua County

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

Karati, Magumu and Heni Sub-locations

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

Kinangop (the project site) is located in the Kenyan Highlands situated on the Kinangop Plateau at an elevation level of approximately 2,600 m above sea level. The coordinates of the area which describe the Kinangop Wind Park site are given as 0^0 49' 41.22" S and 36^0 33' 19.27" E.

The project location in the Kenya map is shown below:

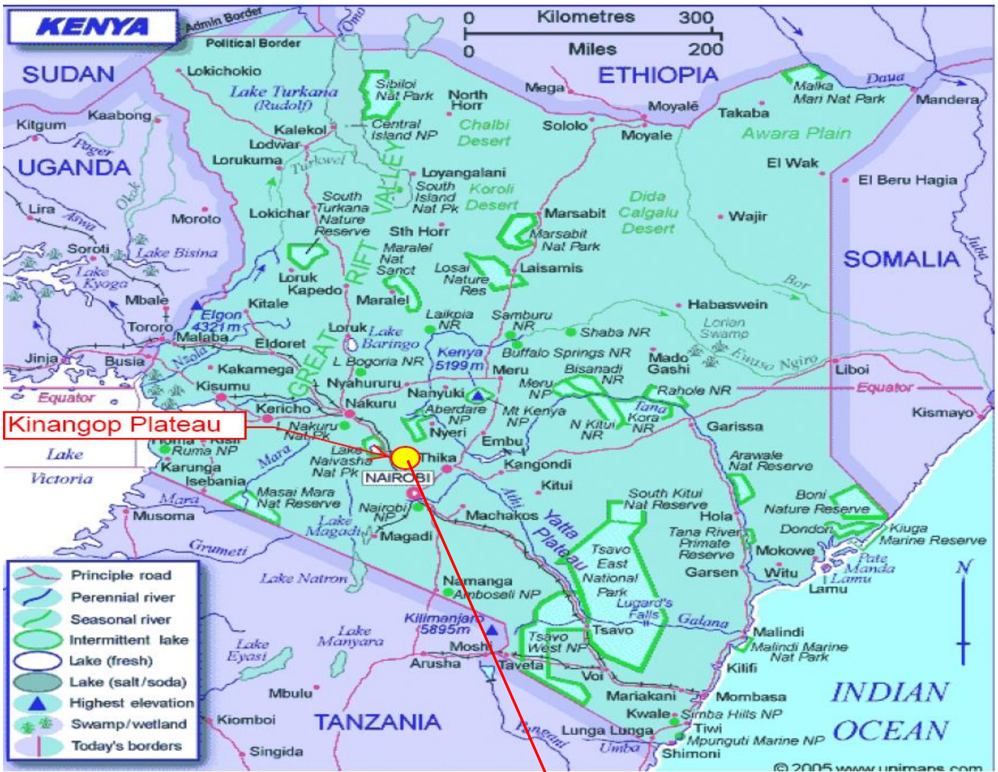


Plate 1: A Map of Kenya Showing the Project Site

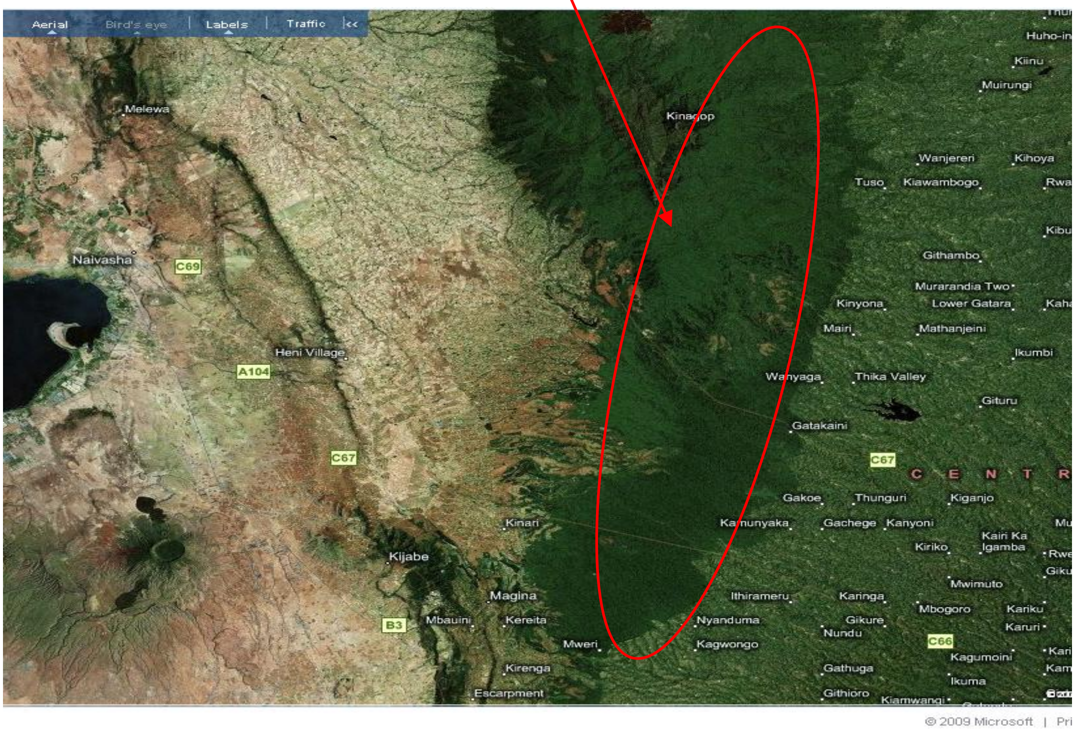


Plate 2: Kinangop Project Site

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

Sectoral Scope: 01 Energy industries (renewable / non-renewable sources),
Category: Grid-connected Electricity Generation from Renewable Sources

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

The purpose of the proposed project activity is to build and operate a 60.8 MW greenfield[4] wind farm capable of exporting 178,520 MWh of clean electricity to the Kenya national grid. The electricity exported to the grid will displace the fossil fuel intensive electricity from the Kenya national grid.

The Kinangop project will involve the installation and operation of 38 wind turbines, each of which has a rated output of 1.6 MW providing a total capacity of 60.8 MW. The turbines are designed to have a lifetime of 20 years.

The baseline scenario is that the electricity generated by the project would have been provided by the additional provision of comparable capacity or electricity generation by the Kenya Power and Light Company, the national grid operator, which is the same as the situation existing before the project activity. The project scenario is the installation and operation of the 38 wind turbines with a total installed capacity of 60.8 MW at the project site where presently there is no power generation at all. The turbine manufacturer will be responsible for the construction and commissioning of the project, training of both operation and maintenance staff and initial servicing and maintenance of the turbines.

Since the whole of Kenya has less than 6 MW of installed wind capacity (for more information please see section B.5), and although a number of wind power installations have been proposed and planned as CDM projects, this project offers significant wind technology transfer from Annex I party to Kenya. Local installation, operation and maintenance staff will be trained by the turbine manufacturer. The wind turbine technology[5] will be used in Kenya for a wind farm for the first time, the existing wind project by KenGen having been supplied by Windmaster (Netherlands) and Vestas (Denmark). The expected technical lifetime of the selected wind turbine is 20 years[6]. The main parameters of the wind turbine are shown in Table 1.

Table 1: Key Technical Features of the Turbine

Manufacturer	GE Energy
Rotor diameter (m)	82.5
Cut in wind speed (m/s)	3.5
Cut out wind speed (m/s)	25
Average wind speed (m/s)	8.5
Reference wind speed (m/s)	40
Ve50 (m/s)	56.0
Frequency (Hz)	50/60
Hub height of the wind turbine (m)	80/100
Capacity (kW)	About 1,600
Technical lifetime (years)	20
Rated voltage (v)	575
Total capacity (MW)	60.8
Number of turbines	38
IEC Wind Class	IEC TC IIB

Source: http://www.gepower.com/prod_serv/products/wind_turbines/en/15mw/specs.htm (Last accessed on 9th May 2011)

[4] There is no existing power generation activity at the project site.
[5] GE is one of the world's leading wind turbine suppliers. With over 13,500 wind turbine installations worldwide comprising more than 218 million operating hours and 127,000 GWh of energy produced, our knowledge and expertise spans more than two decades. With wind manufacturing and assembly facilities in Germany, Norway, China, Canada and the United States, our current product portfolio includes wind turbines with rated capacities ranging from 1.5 to 4.0 megawatts and support services ranging from development assistance to operation and maintenance (See http://www.ge-energy.com/businesses/ge_wind_energy/en/index.htm), Accessed on 09/05/2011.
[6] See http://www.renewable-energy-sources.com/2009/11/10/technical-lifetime-of-wind-turbines/ Accessed on 09/05/2011

The electricity generated from the project will be measured using two meters (one meter will be owned by Aeolus Kenya (Main Meter) while the other by Kenya Power and Lighting Company (back-up Meter)). The two meters will be located at a sub-station located within the wind project site. From the on site sub-station, the power will be transmitted to the Suswa sub-station of Kenya Power and Lighting Company (KPLC) via a 12 kilometer high voltage (132 kV) transmission line to be owned and operated by KPLC. The wind turbines will be monitored and controlled at the central control room at the project site.

Each wind turbine will have a step up transformer which will connect with the onsite substation. The net electricity supplied by the proposed project activity to the grid will be monitored through the two installed meters at the project substation site. Both exports to the grid (supply) and imports from the grid will be monitored and recorded.

Since there is a significant proportion of thermal power generation in the Kenya national grid system[7], the establishment of the proposed project activity will lead to greenhouse gas (GHG) emission reductions as estimated following the baseline methodology below.

Technology Transfer:

It is important for the staff to understand both the wind resource and the turbine technology. Technical training will be done as part of the installation programme. The manufacturer's turbine training manuals will be used on site. Opportunities for additional ad-hoc training will be created as and when needed.

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

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2012*	30,259
2013	121,036
2014	121,036
2015	121,036
2016	121,036
2017	121,036
2018	121,036
2019*	90,777
Total estimated reductions (tonnes of CO_2e)	847,252
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	121,036

* The crediting period starts on October 2012 and ends on September 2019.

A.4.5. Public funding of the project activity:

No public funds from Annex I countries is involved in the proposed project.

[7] See Annex 3 for Baseline Information.

SECTION B. Application of a baseline and monitoring methodology

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

Approved consolidated baseline and monitoring methodology ACM0002 version 12.1.0, EB 58 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applied to this project.

This methodology draws upon the following methodological tools:
• Tool to calculate the emission factor for an electricity system, version 02.2.1, EB 63,
• Tool for the demonstration and assessment of additionality, version 0.6.0.0, EB 65
• Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion version 02, EB 41,

However, no fossil fuels are required to operate the wind power plant and, as such, the related methodological tool is not required.

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

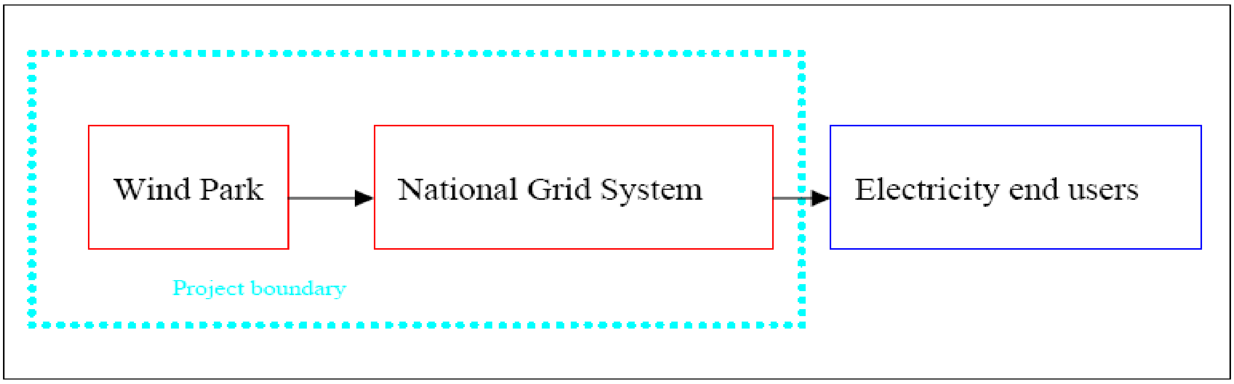
Applicability Requirement of ACM0002, Version 12.1.0	60 MW Kinangop Wind Park Project	Criteria Met?
Grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s)	The proposed project is a Greenfield grid-connected renewable power generation activity and the site where the project will be located has got no other wind power project	Yes
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	The proposed project is an installation of a new wind power plant	Yes
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity	The proposed project is a greenfield project (i.e. not capacity additions, retrofits or replacements).	Yes
In case of hydro power plants, one of 3 additional conditions must be met conditions must apply:	Project is not a hydro power plant and the conditions do not apply	Yes
The methodology is not applicable to the following: ▪ Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	Project does: ▪ not involve switching from fossil fuels to renewable energy sources ▪ is not a biomass fired plant	Yes

▪ Biomass fired power plants; ▪ Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.	▪ is not a hydro power plant	
The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.	The geographic and system boundary of Kenyan grid is clearly identifiable and information on the grid exits.	Yes

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

According to the methodology ACM0002 version 12.1.0 applied, and the proposed project being a grid connected wind power project, the spatial extent of the project boundary includes the project power plant (Kinangop Wind Park) and all power plants connected physically to the electricity system that the CDM project power plant is connected to (i.e. Kenyan grid).

Figure 2: A schematic diagram of the project boundary



The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table 2 below.

Table 2: Emission sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Major emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from noncondensable gases contained in geothermal steam.	CO_2	No	The proposed project activity is a greenfield wind power project. Hence, not relevant
		CH_4	No	
		N_2O	No	
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	The proposed project activity is a greenfield wind power project. Hence, not relevant
		CH_4	No	
		N_2O	No	
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	The proposed project activity is a greenfield wind power project. Hence, not relevant
		CH_4	No	
		N_2O	No	

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

The proposed project activity involves the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity. In accordance to the approved consolidated baseline and monitoring methodology ACM0002 version 12.1.0 the identification of the baseline scenario is defined as follows:

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

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

The table below demonstrates that real and actual actions took place in pursuit of the project, initially by EcoGen Wind Farms Ltd and Kengen, and later from January 2008 to date, by Aeolus Kenya Ltd. Financial close is expected in October 2011. A separate document "The Kinangop Wind Project History" has been attached for further clarification of the project history.

Key Dates: Kinangop Wind Project

2004	Project initiated by EcoGen Wind Farms Ltd (Ecogen) as a 30 MW project.
August 2005	EIA licence for 30 MW issued to Ecogen by National Environment Management Authority (NEMA; Website www.nema.go.ke/)
January 2008	Project ownership structure changed from a joint venture of EcoGen Wind Farms Ltd and Kenya Electricity Generating Company Ltd (Kengen) to Aeolus Kenya Ltd.
April 2008	Project up-scaled from 30 MW to 50 MW.
May 2008 – to date	Ongoing financial negotiations with financiers. The financial close is expected in October 2011. There have been some communication and records made on the financial negations (availed to the DOE on site).
June – Dec 2008	Lahmeyer International GmbH contracted and carried out a feasibility study for a 50 MW wind farm.
July 2008-Oct 2010	Aeolus Kenya started community sensitization activities within the community and negotiations with local Kinangop land owners for leasing land for the project. Last land lease agreement signed in October 2010.
July 2008 to March 2011	PPA negotiations started with KPLC in July 2008, negotiations continued through 2009 and stalled when the Kenya Government was unable to provide a Government Guarantee. In January 2010, the Kenya Government provided a support letter that is sufficient for financiers and so PPA negotiations resumed on 9th March 2010.
18th Dec 2008	Carbon credit purchase Term Sheet signed with J.P. Morgan Ventures Energy Corporation.
11th March 2009	Non-disclosure agreement (NDA) signed between Aeolus Kenya Limited

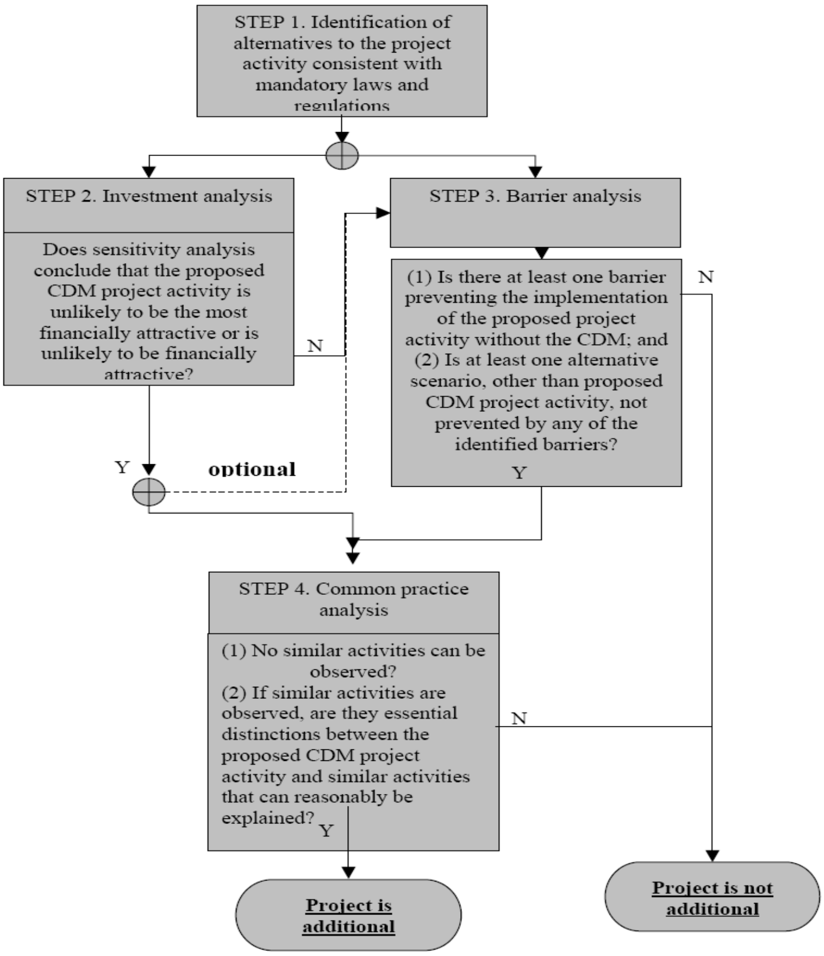
	and J.P. Morgan Ventures Energy Corporation for carbon credit purchase negotiation.
April 2009 – February 2011	Heads of Terms for land leasing agreements with local land owners prepared and signed.
June 2009	M.Torres Ólvega Industrial, S.L. contracted and carried out a feasibility for 59.4 (60) MW.
November 2009	New EIA completed and submitted to NEMA up-scaling the project from 30 MW to 50 MW. Approval given by NEMA.
04th December 2009	Prior Notification request sent to UNFCCC and project listed on UNFCCC website; http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html?s=20 The Prior Notification form was filled by J.P. Morgan Ventures Energy Corporation on behalf of the PP on 07/09/2009. However, the PP did not sign it until 04/12/2009 when it was sent to UNFCCC.
12th Feb 2010	Emission Reduction Purchase Agreement signed between Aeolus Kenya Limited and J.P. Morgan Ventures Energy Corporation.
May 2010	EIA variation from 50 MW to 60 MW requested and approval given by NEMA.
11th November 2010	The DNA was requested to issue a Letter of Approval
November 2010	Lahmeyer International GmbH contracted and carried out an updated feasibility study for a 60.8 MW wind farm.
20th December 2010	The Board of Aeolus Kenya Limited made the decision for project implementation and CDM application.
February 2011	Heads of terms for the Engineering Procurement & Construction contract agreed with Isolux Corsan. This will be the starting date of the project activity.
8th March 2011	Project issued with Letter of Approval by Kenya DNA.
9th March 2011	Project issued with Letter of Approval by Kenya DNA.
March 2011	PPA initialled by KPLC, Aeolus Kenya Ltd and the Kinangop Wind Park Ltd.
March 2011	Heads of Terms provided by financiers along with Mandate letter. This will be availed to DOE on site.
April 2011	Project Proponent met with EPC contractors in London for detailed negotiations on the EPC Contract. The EPC Contract Agreement will be signed after financial close.
May 2011	Negotiations commenced with GE for Full Service Agreement (FSA) for first 5 years of operation.
May 2011	The Bank contracted lenders local and international legal counsel. Legal documents on land leases and company submitted to them for review.

June 2011	Bank contracted independent Engineers CUBE Engineering to review the project. Representatives from CUBE come to Kenya for on site review.
June 2011	Meeting held in Nairobi between Project Proponents (owners), EPC Contractor Isolux Corsan, with turbine supplier GE, the bank and the banks independent engineer.
July 2011	Final draft of EPC contract circulated, all appendixes collated.
July 2011	Final Draft of the Full Service Agreement (FSA) contract being reviewed by all parties.
August 2011	Time for financial close

Since the project starting date (agreement on the Heads of Terms for the Engineering Procurement & Construction contract signed with Isolux Corsan in February 2011) is after 02 August 2008, the UNFCCC was notified of the commencement of the project activity and of the intention to seek CDM status as per the "Guidelines on the Demonstration and Assessment of Prior Consideration of the CDM"; (version 04), EB 62.

In order to demonstrate and asses additionality for this project, the "Tool for the demonstration and assessment of additionality"; version 06.0.0 (EB 65) is applied as per the requirements of the approved consolidated baseline and monitoring methodology, ACM0002 version 12.1.0.

The stepwise approach of the methodological tool for demonstration and assessment of additionality as shown in the flow chart below has been applied. The stepwise approached is discussed below.



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

Realistic and credible alternatives to the project activity have been defined through the following Sub-steps:

Sub-step 1a: Define alternatives to the project scenario

The following are the realistic and credible alternatives available to the project activity that provide outputs or services comparable with the proposed CDM project activity:

Alternative 1: The proposed project activity undertaken without being registered as a CDM project activity. This would entail the construction and operation of the project with the total installed capacity of 60.8 MW, without being registered as a CDM project activity.

Alternative 2**:** Electricity generated by the operation of grid-connected power plants and by the addition of new generating sources. This is the continuation of the current situation and, according to ACM0002, is the identified baseline for the installation of a new grid-connected renewable power plant,

Alternative 3**:** A fossil fuel based power plant producing electricity with comparable quality, properties and application areas. This alternative, involving the construction and operation of a new fossil fuel power plant, is considered credible because fossil fuel based power plants have already been implemented in Kenya by Independent Power Producers (e.g. Tsavo Power, Iberafrica and Rabai). More recently, another IPP, Rabai Power, has commissioned a fossil fuel based power plant with a capacity of 90 MW. Plans are also underway by Kengen to develop a 300/600MW coal fired power plant in Mombasa.

Furthermore, the Project Owner only has experience and right to invest and do business in wind power generation. The construction of fossil fuel power plants by the project proponent is not a plausible investment option as the project participant has no know-how and experience as well as a plan for investing in a fossil fuel power plant.

Alternative 4: A power plant using another source of renewable energy and producing electricity with comparable quality, properties and application areas (e.g. geothermal and biomass). This alternative, involving the construction and operation of another renewable power plant such solar, wind or biomass, is considered credible because a geothermal power plant and a biomass power plant have already been implemented by Kengen and Independent Power Producers in Kenya (Ormat Power and Mumias Sugar Company, respectively). Due to the deceasing availability of adequate biomass, and since the Project Developer has no access to adequate biomass, a biomass based plant is most unlikely in this case.

On the other hand, the establishment of a government owned geothermal exploration company (The Geothermal Development Company) has attracted a lot of interest from potential investors in geothermal based generation.

Currently, a number of small hydro projects are also being developed, however, none has been commissioned so far. Solar power plants are not considered a credible alternative given the high investment costs involved. Large hydro projects are also not considered an alternative because the country is aiming to diversify its power generation sources and reducing its over-dependence on hydro power plants, which, during severe droughts, has proven to adversely affect power production in the country. Also there are no potential large hydro sites.

Alternative 4 cannot be the baseline scenario because the project location does not provide sufficient renewable resources except for the wind resource.

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

Both the above alternatives to the project activity are consistent with the *Energy Act (2006)*[8] and the related mandatory and regulatory requirements[9], taking into account the enforcement in the country and EB decisions on national and/or sectoral policies and regulations.

The *Energy Act (2006)* allows for Independent Power Producers to supply electricity to the national grid through a Power Purchase Agreement with the Kenyan Power and Lighting Company. There are no restrictions on types of power plants, and both fossil fuel based power plants and renewable energy power plants are allowed to deliver electricity to the grid.

Since the realistic and credible alternatives available to the project participants, as identified above, comply with all applicable laws and regulations, the project is additional under step 1.

Step 2: Investment analysis

Taking into account the *"Tool for the demonstration and assessment of additionality"; version 06.0.0* and *the "Guidelines on the Assessment of Investment Analysis"*, version 05 (Annex 5, EB62), this step has been used to determine that the proposed project activity is not economically or financially feasible, without the revenue from the sale of CERs.

The following Sub-steps have been used to conduct the investment analysis.

Sub-step 2a: Determine appropriate analysis method

The *"Tool for the demonstration and assessment of additionality";* version 06.0.0 (EB 65) provides for any of the following three investment analysis methods:

1. Simple cost analysis (Option I),
2. Investment comparison analysis (Option II)
3. Benchmark analysis (Option III).

As per the "*Tool for the demonstration and assessment of additionality*"; version 06.0.0 (EB 65), and since, the proposed project activity will generate financial and economic benefits (sale of electricity to the state utility) other than CDM related income, the simple cost analysis (Option I) cannot be applied.

The baseline scenario identified in accordance to the approved consolidated baseline and monitoring methodology, ACM0002 version 12.1.0, is the supply of electricity from the grid. This baseline does not necessarily require investment and is not within the control of the project developer (the project activity could be implemented by entities other than the project proponent). Benchmark analysis (Option III) is therefore selected as the most appropriate method of financial analysis for this project.

Given that the project has dual revenue streams, electricity for sale to the national grid and certified emission reductions, from the definition of alternatives in Sub-step 1a above, we are restricted to the proposed project activity not undertaken as a CDM project.

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

The Internal Rate of Return (IRR) is the most commonly used financial indicator by Bankers and Investors to assess the intrinsic viability of a project. The IRR thus computed, has to be compared with a benchmark indicator. The Project IRR has therefore been chosen as the relevant financial indicator for the

[8] http://www.erc.go.ke/energy.pdf accessed 09/10/2011
[9] http://www.erc.go.ke/erc/regulatory_instruments/?ContentID=16 accessed 09/10/2011

investment analysis of the proposed project and has been calculated on a pre-tax basis as per the "*Tool for the demonstration and assessment of additionality*", Version 06.0.0. The Project IRR has been chosen since this is a long term project with negative and positive cash flows and because Project IRR is not affected by subjective inputs (NPV for example is affected by the discount rate applied in the analysis).

As per page 3 of the "*Guideline on Assessment of Investment Analysis, vers 05*" (EB 62, Annex 5), in case where a benchmark approach is used, the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average cost of capital (WACC) are appropriate benchmarks for a project IRR". Based on this, the Project Proponent has applied the weighted average cost of capital (WACC).

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III)

The WACC has been calculated as follows, applying the guidelines and default values in Appendix A to the "*Guidelines on the Assessment of Investment Analysis",* ver 05 (Annex 5, EB 62)[10]:

$$WACC = (k_e*r_e)/(1-T) + (k_d*r_d*(1-T))$$

Where,

Symbol	Description	Value applied
WACC	Weighted Average Cost of Capital	11.59%
k_e	The proportion of equity	50% (default values applied)
k_d	The proportion of debt	50%
r_e	The cost of equity (after-tax)	13.25% (Annex 5, EB 62)
r_d	The cost of debt	9.92% (indicative value from financiers at decision time)
T	The applicable tax rate	0% (See files 'Updated SREP Draft Investment Plan-May2011.pdf' and 'USKCCKenyaEnergySectorBrief.pdf')

In the calculation of WACC, and following the "*Guidelines on the Assessment of Investment Analysis"*, version 05, the default equity to debt ratio of 1:1 has been applied. In annex 5, EB 62, the default cost of equity for Kenya is given on an after-tax basis. It is therefore corrected to the before-tax value by dividing the value with (1-the corporate tax rate).

The Project IRR has been calculated as detailed in the attached financials spread sheet. The Project IRR works out to 9.61% (without CDM) and 10.74% (with CDM). The key parameters and assumptions are explained below.

With reference to the *"Guidelines on the Assessment of Investment Analysis"*, version 05, a technical lifetime of 20 years has been applied. This is considered typical of most land-based wind turbines[11]. As per the guidelines, a fair value of the project assets at the end of the assessment period has been included in the cash inflow in the final year.

The electricity revenue has been calculated using the expected generation (178,520 MWh)[12] and the government approved feed-in-tariff for wind-generated electricity (0.12 US$/kWh)[13].

The main variables used for the investment analysis are shown in the table below.

---

[10] See spread sheet calculations for details

[11] Renewable Energy Sources; Latest trends in research and development of renewable energy sources, Technical Lifetime of Wind Turbines (http://www.renewable-energy-sources.com/2009/11/10/technical-lifetime-of-wind-turbines/); accessed on 20/04/2011

[12] Lahmeyer updated report; file "Kinangop_Kenya_addendum_101122.pdf" in folder "Feasibility Reports"

[13] http://www.erc.go.ke/erc/tarrifs/?ContentID=6 or http://www.erc.go.ke/erc/fitpolicy.pdf accessed on 20/04/2011

60.8 MW Kinangop Wind Power Park			
Item	**Value**	**Units**	**Source**
Installed Power	60.8	MW	Page 7 of Wind Resource and Energy Yield Assessment, Kinangop Wind Park Project; Addendum No. 1 of November 2010 (Ref file "Kinangop_Kenya_addendum.pdf"
Number of Turbines	38	Units	
Turbine Type	GE 1.6 XLE 80M		
Technical lifetime of turbines	20	Years	Page 14 of PDD
Net generation taken (10 year POE 90%)	178,520	MWh/year	Net electricity generation (Page 17 of Wind Resource and Energy Yield Assessment, Kinangop Wind Park Project; Addendum No. 1 of November 2010 (Ref file " Kinangop_Kenya_addendum.pd"))
Hours in a year	2,936	Hours	Based on Feasibility Study report at POE 90%. This is conservative.
Investment Cost	$148,007,960		
Amount of debt	50%		Based on Paragraph 18 of "Guidelines on the Assessment of Investment Analysis", vers 05; Annex 5; EB 62
Debt	$74,003,980		Calculated as 50% of capital
Own Capital	$74,003,980		Calculated as 50% of capital
Selling Price Electricity	$0.120	per kWh	As per the PPA and Feed-in-Tariff policy (http://www.erc.go.ke/erc/fitpolicy.pdf; already availed to DOE)
Monthly Electricity Revenue	$1,785,200		Calculated
CER Sales Price	$12.00	CER	As per the signed ERPA (already availed to DOE)

The cost data used for the investment analysis is as below:

TOTAL PROJECT COST			
	Total		
Procurement & Erection	$118,848,675		
Mandatory Spare Parts	$1,829,389		
Insurance during construction	$933,750		
Wind Resource Collection	$7,968,000		
EIA	$300,000		
Office & Workshop	$147,500		
Project Development	$12,038,212		
Contingency (5% of EPC)	$5,942,434		
TOTAL INVESTMENT COST	**$148,007,960**		
End value			
Scrap value per tonne	**$400**		
Number of turbines	38		
Weight per tower (tonnes)	80		
Scrap Value	$1,216,000		
Capital Cost Sensitivity	**Year 0**	**Year 1**	**Year 2**
	Down payment	Shipping	Commissioning
	60%	20%	20%
Investment Flow	$88,804,776	$29,601,592	$29,601,592

From the calculations above, the Project IRR at 9.61% (without CDM) is less than the benchmark rate (WACC) of 11.59% %. A comparison of the Project IRR with the benchmark (WACC) reveals that the project is not financially attractive.

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III):

The robustness of the conclusion drawn above has been tested, by subjecting the critical assumptions to reasonable variations as per the "*Guidelines on the Assessment of Investment Analysis*", version 05 which state that:

"Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spread sheets".

Rationale: The initial objective of a sensitivity analysis is to determine in which scenarios the project activity would pass the benchmark or become more favourable than the alternative.

Based on the guidelines, the Project Proponent has identified the critical factors as:

1. Investment cost
2. Operating cost
3. Power generation

Accordingly, the critical assumptions have been subjected to a goal seek sensitivity analysis. The outcome of the sensitivity analysis is given in the table below.

	Value to Benchmark	
Investment Cost	87%	Decrease of 13%
Operating Cost	42%	Decrease of 58%
Generation	112%	Increase by 12%

From the table above, it is evident that for the Project IRR to reach the benchmark value of 11.59%, one of the following is necessary:

1. The investment cost has to decrease by 13% while the other parameters remain constant
2. The operating cost has to decrease by 58% while the other parameters remain constant or
3. The generation has to increase by at least 12% while the other factors remain constant.

According to ***The Economics of Wind Energy, Page 35-*** (Global Wind Energy Council; http://www.gwec.net/index.php?id=102&L=0), about 75% of the investment cost is on the turbine (ex-works). It is further stated in the same document (Page 43) as follows:

"The recent increase in turbine prices is a global phenomenon, which stems mainly from a strong and increasing demand for wind power in many countries, as well as constraints on the supply side (not only related to turbine manufacturers but also resulting from a deficit in sub-supplier production capacity of wind turbine components, caused by the staggering increase in demand) and rising raw material cost"

Furthermore, once the Heads of Terms for the turbine (procurement and erection) is signed, it is unlikely to be changed to decrease the investment cost. The investment cost is therefore unlikely to decrease.

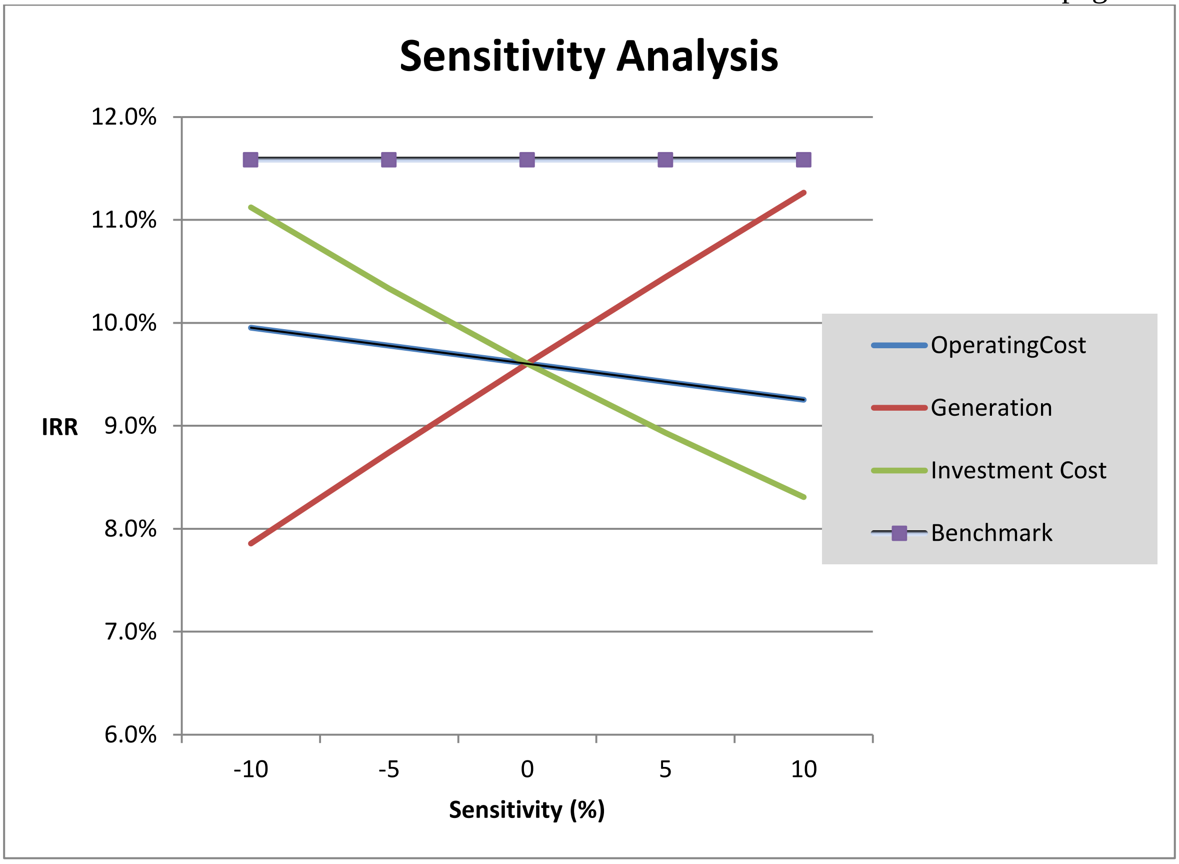
The operating cost is also not likely to decrease given the general trend in cost of living, strength of the local currency against other foreign currencies[14] and inflation. In addition, as the equipment ages, the cost of maintenance is expected to increase. Therefore, a reduction in operating costs is unlikely.

For the calculation of the Project IRR, a generation estimate of 178,520MWh per year has been applied (10 year POE 90%) based on the revised Lahmeyer Report[15]. According to the study report, this is the most optimistic generation, which is very realistic since the predictions are based on a 10-year POE 90%.

Considering the Project IRR value of 9.61% (without CDM) and 10.74% (with CDM) against a benchmark WACC of 11.59%, and considering that only a 5% increase in generation is required with CERs to reach the benchmark, the board decided to implement the project with CDM.

The benchmark and sensitivity analyses (under step 2) show that the project activity is not financially viable without the CER revenue (Project IRR of 9.61% against a benchmark of 11.59%) and the CER revenue helps to improve the Project IRR to 10.74%. With CERs, only a 5% generation increase is required to reach the bench. The sensitivity analysis is shown in the figure below:

[14] See http://www.standardmedia.co.ke/InsidePage.php?id=2000044601&cid=14&story=Kenya shilling hits record low 107 vs. dollar
[15] Lahmeyer updated report; file "Kinangop_Kenya_addendum_101122.pdf" in folder "Feasibility Reports"



The proposed project is therefore additional up to step 2.

Step 4: Common practice analysis.

This section provides the "Common practice analysis" as per Paragraph 47 of the "Tool for the demonstration and assessment of additionality", version 0.6.0.0, EB 65

Step 1. Output Range.

The proposed project has a capacity of 60.8MW consisting of 38 wind turbines of 1.6MW each. Going by the guideline of +/-50%, the applicable output range for the project is 30.4MW to 91.2MW.

Step 2. Applicable Geographical Area

The applicable geographical area for the proposed project covers the entire host country (Kenya) as the default area specified in the guideline. The projects within the host country and the output range that have started commercial operation and are connected to the national grid system are shown in the table below. Emergency supply projects that have been brought intermittently between 2006 to date due to poor hydrology have not been included in this table (See http://www.kplc.co.ke/fileadmin/user_upload/1Report_Pages.pdf):

Plant	Year of Commissioning	Capacity MW	Remarks
OLKARIA 1-Geothermal	1981	45	CDM registered
ORPOWER4 -Geothermal	1999-2009	48	CDM registered
MASINGA-Hydro	1981	40	

KAMBURU-Hydro	1974	90	
KINDARUMA-Hydro	1968	40	
Sondu	2008	60	
Kipevu Diesel-Petrothermal	1999	75	
Tsavo-Petrothermal	2001	74	
Iberafrica 1 -Petrothermal	1997	56	
Iberafrica 2-Petrothermal	2009	52	
AggrekoEmbakasi 1-Thermal	2006 to 2009	30	Emergency only and capacity has been varying
Kipevu GT1-Thermal	1997	30	
Kipevu GT2-Thermal	1999	30	

The total number N_{all}, which excludes the CDM-registered projects is 11.

Step 3. Applicable Technology

None of the plants listed in step 2 above apply wind energy technology. N_{diff} is therefore the same as N_{all} (11).

Step 3. Calculation of factor F

$F = 1-N_{diff}/N_{all}$

Factor F is therefore 0. There are therefore no plants using similar technology to the technology used in the proposed project activity.

Since factor F is 0, the proposed is not a common practice as per the guidelines. The proposed project activity is therefore additional under common practice analysis.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

Since the project is a wind energy project which is a renewable source, the project emissions are zero, $PE_y = 0$, as per the applicable methodology ACM0002 version 12.1.0.

Baseline Emissions Calculation

As per the applicable methodology ACM0002 version 12.1.0, baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \quad (6)$$

Where:

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

Calculation of $EG_{PJ,y}$

Since the project is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant), the net electricity generated is calculated as per ACM0002 version 12.1.0:

$$EG_{PJ,y} = EG_{facility,y} \qquad (7)$$

Where:

$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EG_{facility,y}$	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

Emission Factor of the grid ($EF_{grid,CM,y}$)

The baseline emission factor (EF_y) is calculated as a combined margin ($EF_{grid,CM,y}$), consisting of the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BM,y}$) factors in accordance with the latest "Tool to calculate the emission factor for an electricity system, version 02".

Calculations of the combined margin emission factor of the grid will be done ex-post based on dispatch data from an official source (Kenya Power and Lighting Company Limited (KPLC), www.kplc.co.ke and Energy Regulatory Commission, http://www.erc.go.ke/ctariff.pdf). KPLC does not post the dispatch data on its website, so the data has been obtained from KPLC on a disc.

Step 1: Identify the relevant electricity systems

As per the project boundary selected and in determining the electricity emission factors, the spatial extent of the project boundary includes the Kenyan grid system, which is physically connected to the project activity through transmission and distribution lines. All power plants considered in the baseline are connected to this grid system and the project activity will export power to this grid system and displace electricity within it.

The grid system is also connected to the Ugandan and Tanzanian grid systems. So far, imports to Kenya from the two systems and exports from Kenya to both systems are negligible (See page 104 of the KPLC Annual Report 2009-2010.pdf).

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Off-grid power plants are not included in grid emission factor determination (option I).

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

The tool to calculate the emission factor for an electricity system version 02 offers the following optional methods to calculate the Operating Margin emission factor(s), $EF_{grid,OM,y}$:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

The Dispatch Data Analysis method has been used to calculate $EF_{grid,OM,y}$.

The Operating Margin emission factor $EF_{grid,\mathit{OM},}$ will therefore be updated annually (*ex-post*) for the year in which actual project electricity generation and associated emissions reductions occur.

The baseline calculation for the PDD, however, is based on ex-ante data vintage using the most recent year (July 2009 to June 2010) which data was made available (See attached ER calculation spreadsheet).

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

(c) Dispatch data analysis

The dispatch data analysis OM emission factor ($EF_{grid,OM\text{-}DD,y}$) is determined based on the grid power units that are actually dispatched at the margin during each hour *h* where the project is displacing grid electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM\text{-}DD,y}$.

As per the methodological tool, the dispatch emission factor is calculated as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}} \qquad (10)$$

Where:

$EF_{grid,OM\text{-}DD,y}$	Dispatch data analysis operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{PJ,h}$	Electricity displaced by the project activity in hour h of year y (MWh)
$EF_{EL,DD,h}$	CO_2 emission factor for power units in the top of the dispatch order in hour h in year y (tCO_2/MWh)
$EG_{PJ,y}$	Total electricity displaced by the project activity in year y (MWh)
h	Hours in year y in which the project activity is displacing grid electricity
y	Year in which the project activity is displacing grid electricity

The hourly emission factor is calculated as follows:

$$EF_{EL,DD,h} = \frac{\sum_n EG_{n,h} \times EF_{EL,n,y}}{\sum_n EG_{n,h}} \qquad (12)$$

Where:

$EF_{EL,DD,h}$	CO_2 emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO_2/MWh)
$EG_{n,h}$	Net quantity of electricity generated and delivered to the grid by grid power unit n in hour h (MWh)
$EF_{EL,n,y}$	CO_2 emission factor of grid power unit n in year y (tCO_2/MWh)
N	Grid power units in the top of the dispatch (as defined below)

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

By using the dispatch data available from Kenya Power and Lighting Company (the power utility company), the dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) of the Kenyan grid system is calculated to be **0.738 tCO^2/MWh** (See ER calculation spreadsheet)

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, the Build Margin is calculated as per **Option 1**, where the first crediting period, the build margin emission factor is calculated *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation.

The sample group of power units *m* used to calculate the build margin was determined as per the following procedure, consistent with option 1 of data vintage selected above:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units},}$ in MWh);
b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities ($AEG_{total,}$ in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%,}$ in MWh);
c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

The set of power capacity additions in the electricity system that comprise 20% of the system generation ($AEG_{SET\text{-}\geq 20\%,}$ in MWh) and that have been built most recently constitute the larger annual generation and therefore has been used in calculating the BM.

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

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \textit{(13)}$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor (tCO_2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$FE_{EL,m,y}$	CO_2 emission factor of power unit *m* in year y (tCO_2/MWh)
m	power units included in the build margin
y	Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) has been determined as per the guidance in Step 4 (a) for the simple OM of the tool, using options A1, using for year *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

Using the available data, the Build Margin Emission Factor ($EF_{grid,BM,y}$) is calculated to be **0.496 tCO_2/MWh**.

Step 6: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM} \qquad (14)$$

Where:

$EF_{grid,CM,y}$	Combined margin CO2 emission factor (tCO_2/MWh)
$EF_{grid,OM,y}$	Operating margin CO_2 emission in year y (tCO_2/MWh)
w_{OM}	Weighting of operating margin emission factor (%)
$EF_{grid,BM,y}$	Build margin CO_2 emission factor (tCO_2/MWh)
W_{BM}	Weighting of built margin emission factor (%)

Since the project is a wind power project, the following default weight values have been used, w_{OM} = 0.75 and w_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.

Therefore, combined margin will be:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * 0.75 + EF_{grid,BM,y} * 0.25$$

=0.738*0.75 +0.496*0.25

= 0.678 tCO_2/MWh

Leakage

No leakage emissions are considered for the project.

Calculation of Emission Reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \qquad \textbf{(11)}$$

Where:

ER_y	Emission reductions in year y (tCO_2/yr)
BE_y	Baseline emission reductions in year y (tCO_2/yr)
PE_y	Project emissions in year y (tCO_2/yr)

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

For this project, all the parameters are monitored as shown in section B.7.1 below.

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

Based on the annual projected net generation of 178,520 MWh, the emission reduction ER_y by the project activity during a given year *y* is calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \quad (6)$$

$=178,520 * 0.678 = 121,036$ tCO_2e/yr

Therefore;

$$ER_y = BE_y - PE_y$$

= 121,036– *0*

= 121,036 t CO_2/yr

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of Baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2012*	0	30,259	0	30,259
2013	0	121,036	0	121,036
2014	0	121,036	0	121,036
2015	0	121,036	0	121,036
2016	0	121,036	0	121,036
2017	0	121,036	0	121,036
2018	0	121,036	0	121,036
2019*	0	90,777	0	90,777
Total (tonnes of CO2 e)	**0**	847,252	**0**	847,252

* The crediting period starts on October 2012 and ends on September 2019

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

All monitoring and training activities for the project will be headed by Wind Park Project Manager (WPPM) who will be reporting directly to the Managing Director. The WPPM will be in charge of both technical and administrative activities and he/she will be responsible for calculation of the emission reduction and data collection, completeness and storage.

Electricity generation parameter readings will be done daily and the records will be entered in the wind park log. Data in the log will be compiled at the end of each month and signed off by the WPPM.

These data will be reconciled and cross-checked with power export invoices and put in the right format and handed over to the GM for archiving.

The detailed monitoring plan is outlined in B.7.2

B.7.1 Data and parameters monitored:

Data / Parameter:	$FC_{i,n,h}$ and $FC_{i,m,y}$

Data unit:	Mass
Description:	Amount of fossil fuel type *i* consumed by power plant / unit *m*, or *n* in year *y* or hour *h*
Source of data to be used:	Utility or government records or official publications (Energy Regulatory Commission, http://www.erc.go.ke/ctariff.pdf) and the Kenya Power and Lighting Company Ltd; www.kplc.co.ke
Value of data applied for the purpose of calculating expected emission reductions in section B.6	The values are shown on the ER calculation spreadsheet; sheet "Emission Factor'.
Description of measurement methods and procedures to be applied:	The ERC has published the approved specific fuel consumption of the power plants in Kenya while the Kenya Power and Lighting Co Ltd (KPLC) provides the annual electricity generation from each plant. The fuel consumption of each plant is calculated as the product of the specific fuel consumption and the electricity generated by the plant. ▪ Dispatch data OM: Calculated annually for the year *y* in which the project activity is displacing grid electricity. ▪ BM: For the first crediting period calculated once ex-ante, following the guidance included in Step 5. For the second and third crediting period, only once *ex ante* at the start of the second crediting period
QA/QC procedures to be applied:	Only the official ERC specific fuels and KPLC issued electricity generation data are used. Each year the data is verified to ensure it the latest update.
Any comment:	-Equation 12 of the "Tool to calculate the emission factor for an electricity system", version 02 is applied.

Data / Parameter:	$EF_{CO2,i,y}$ and $EF_{CO2,m,i,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* used in power unit *m* in year *y*
Source of data to be used:	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
Value of data applied for the purpose of calculating expected emission reductions in section B.6	Industrial Diesel Oil (IDO)= 0.0726 Jet Kerosene (JK) = 0.0697 Heavy Fuel Oil (HFO) = 0.0755
Description of measurement methods and procedures to be applied:	▪ Dispatch data OM: Annually for the year y in which the project activity is displacing grid electricity or, if available, hourly ▪ BM: For the first crediting period, annually ex-post, following the guidance included in step 5. For the second and third crediting period, only once ex-ante at the start of the second crediting period
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EG_{pj,y} = EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*

Source of data used:	Project activity records
Value of data applied for the purpose of calculating expected emission reductions in section B.6	178,520
Description of measurement methods and procedures to be applied:	Electricity meters Continuous measurement and at least monthly recording
QA/QC procedures:	Cross check measurement results with records for sold electricity
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ / tonne
Description:	Net calorific value of fossil fuel type i in year y
Source of data to be used:	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 of data applied for the purpose of calculating expected emission reductions in section B.6	Industrial Diesel Oil (IDO)= 41.4 Jet Kerosene (JK) = 42.0 Heavy Fuel Oil (HFO) = 39.8
Description of measurement methods and procedures to be applied:	Dispatch data OM: Annually for the year y in which the project activity is displacing grid electricity or, if available, hourly BM: For the first crediting period calculated once ex-ante, following the guidance included in Step 5. For the second and third crediting period, only once *ex-ante* at the start of the second crediting period
QA/QC procedures to be applied:	-
Any comment:	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 CO_2 emission factor

Data / Parameter:	$EG_{m,y}$ and $EG_{n,h}$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant/unit m, and n in year y
Source of data to be used:	Utility records (KPLC)
Value of data applied for the purpose of calculating expected emission reductions in section B.6	The values are shown on the ER calculation spreadsheet; sheet “Emission Factor’.
Description of measurement methods and procedures to be applied:	Data provided directly by KPLC ▪ Dispatch data OM: Annually for the year y in which the project activity is displacing grid electricity or, if available, hourly ▪ BM: For the first crediting period, annually ex-post, following the guidance included in step 5. For the second and third crediting period, only once ex-ante at the start of the second crediting period
QA/QC procedures to be applied:	Only the official KPLC is used on annual basis
Any comment:	-

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.
Source of data to be used:	As per the “Tool to calculate the emission factor for an electricity system”
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0.678
Description of measurement methods and procedures to be applied:	As per the “Tool to calculate the emission factor for an electricity system”
QA/QC procedures to be applied:	As per the “Tool to calculate the emission factor for an electricity system”
Any comment:	As per the “Tool to calculate the emission factor for an electricity system” Whenever available, the official emission factor for the country as approved by the DNA shall be applied.

B.7.2. Description of the monitoring plan:

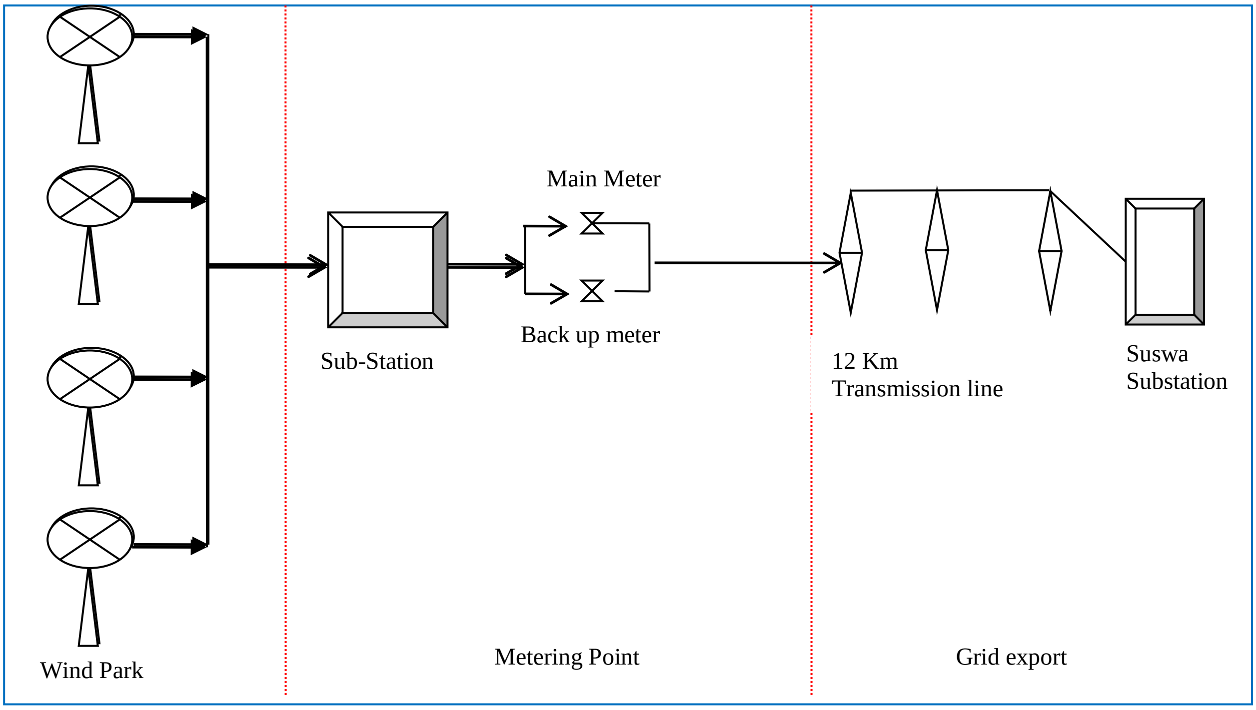
Electricity generated by the project is transmitted to the nearby sub-station and fed into the grid. The utility company, KPLC, will install their metering device at the substation to record the electricity exported by the project to the national grid (see figure 3 below).

Meter readings will be carried out by utility company (KPLC) staff in the presence of the Wind Park Project Manager (WPPM) who will countersign the meter reading records. These readings will form the basis for billing and will also be taken as the net electricity generated and supplied to the grid ($EG_{pj,y}$).

The WPPM, in close consultation with a consultant, will be responsible for generation and management of all the data with regard to project site electricity generation parameters, and for liaising with KPLC and Electricity Regulatory Commission regarding the data on the Kenyan grid system power plants performance and their rated fuel consumption efficiencies and the dispatch order of power plants. The data collected will be used for the calculation of combined margin emission factor for the grid, as outlined on the data and parameters to be monitored.

All data collected as part of monitoring shall be archived electronically and be kept for not less than 2 years after the end of the last crediting period. Data shall be monitored as indicated in the tables in Section B.7.1.

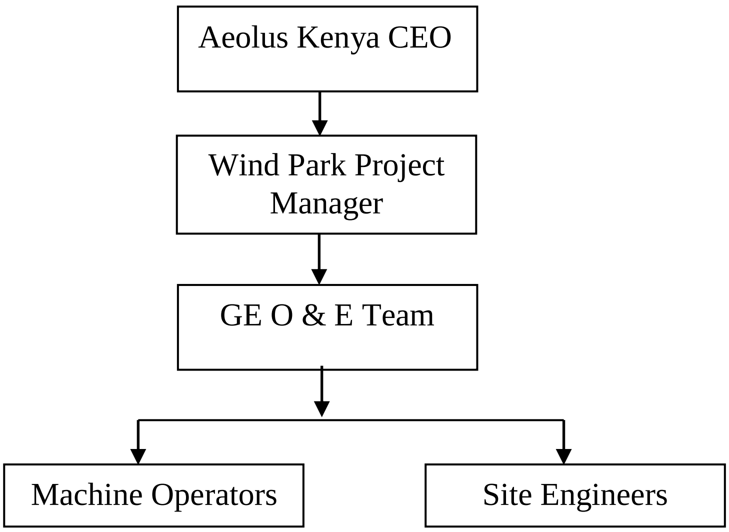
Figure 3: Schematic diagram on Metering point.



Organisational structure

Aeolus Kenya Limited is headed by a Chief Executive Officer assisted by a General Manager (GM) and an Operations Manager (OM). The wind Park is managed by Wind Park Project Manager (WPPM) who is overall in charge of daily operations at the Wind Park.

The operations and maintenance is outsourced from General Electric (GE) Company of US under the Full Service Agreement signed between the two companies. The GE staff will report to WPPM and provide daily power generation records for review and archiving. See illustration below:



All generation data is captured electronically using the central control system where a daily generation report is generated. The report contains data on grid availability, machine availability and generation of electricity. The WPPM reviews the machine availability from the generation report and initiates the forward corrective action request to GE in case the performance is not as per agreed O&M terms.

The daily generation reports contains all the data to be monitored, and once reviewed by WPPM, the data is entered into logbook (hard copy). This data together with the electronic data, will be used to counter check the Monthly Joint Meter reading to ensure accurate capture of exported electric energy. Each Month, a monthly report is generated and sent to Head office for review and archiving by the General Manager and the CEO.

All daily and monthly data will be maintained as hard copies for a minimum of 7+2 years (crediting period plus 2 years).

In order to ensure that the above activities are done as per the requirement, a CDM monitoring Manual will be developed and will be ready during wind park commissioning. The Manual will contained procedures and parameters to be monitored in order to ensure that all the employees who work in the wind park are conversant with the manual.

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):

09/05/2011

The baseline and monitoring methodology was developed and determined by ClimateCare Limited, who are consultants in the Project Design Document preparation. The monitoring of the project related parameters and record keeping will be done by Aeolus Kenya Limited (Kinangop Wind Park project) who are the project participant.

ClimateCare Limited,
Eden Square Business Centre,
P.O. Box 856-00606,
Nairobi, Kenya.
Tel: +254 20 367 3000
joash.obare@climatecare.org; tom.owino@climatecare.org
www.climatecare.org

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:

1/2/2011, when Heads of Terms for the Engineering Procurement & Construction contract was signed with Isolux Corsan.

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

20 years 0 months

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

C.2.1. Renewable crediting period:

This option has been chosen for the proposed project

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

01/10/2012 or on the date of registration, whichever occurs later

C.2.1.2. Length of the first crediting period:

7 years 0 months

C.2.2. Fixed crediting period:

Not applicable

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 was originally initiated by EcoGen Wind Farms Ltd as a 30 MW commercial wind park with a 33 kVA transmission line. Environmental Impact Assessment for the project was conducted and an EIA licence No. 0000216 was issued by National Environment Management Authority (NEMA) on 31st August 2005.

In January 2008, the project ownership structure changed from a joint venture of EcoGen Wind Farms Ltd and Kenya Electricity Generating Company Ltd to Aeolus Kenya Ltd, and in 2008 an Environmental Project Report was prepared for the project after the capacity of the project was increased from 30 MW to 50 MW. The report was submitted to NEMA, who, upon reviewing the report, issued the project with a Variation of EIA Licence on 16th March 2009.

However, after the preparation of the Wind Analysis Report by M. Torres and subsequent completion of the financial analysis, the project capacity was increased to 60 MW to improve its economic feasibility. The project developer therefore requested for another Variation of EIA Licence. The variation approval was granted in May 2010.

Analysis of the two reports did not bring out any major negative impacts on the environment.

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 implementation of the project is not expected to have any adverse impacts on the environment or the social aspects of the community. However, there are a few concerns which were identified during the EIA process which need to be addressed by the project in order to ensure that any impact from the project is minimised.

One environmental concern that was raised by the EIA is the threat to the Sharpe's Longclaw, an endangered bird species that used to inhabit the Kinangop plateau grasslands. Due to settlement and crop cultivation of the Kinangop grassland by the community, the bird's habitat is disappearing at a higher rate. Although the installation of the turbines will cause disturbance to grassland around the site, its impact will be minimal because the disturbed areas will be rehabilitated. In addition, the presence of Wind Park will ensure that there is no further cultivation of the area thereby helping in preserving the remaining grasslands within the project site. This might enable the bird to move back.

Another matter that was raised is disturbance of the soil during foundation preparation and erection of the turbines in the wind park and the transmission line to Suswa substation. However, the environmental management plan in place has recommended measures to be put in place to ensure that once the excavation work is complete, the affected sections are rehabilitated in order to avoid soil erosion by surface water runoffs.

The construction of transmission lines will lead to loss of land and property along the route. Based on the identified line routing, only one house will be affected, however KPLC, who are legal owners of the transmission line, are responsible for conducting the transmission line survey and for finalising the route. Before the start of construction line, KPLC will acquire land along the right of way corridor and compensate the owners and household affected in accordance to the Laws of Kenya and the prevailing compensation schedules.

The turbines will be located in a manner to ensure that appropriate distances between them and from the nearest houses/homesteads are maintained in order to reduce the impact of noise to the residents. During operation, noise generation from turbines will be monitored and the project proponent will take appropriate measures to ensure that the neighbouring community is not affected. Such measure will include regular maintenance of the turbines and/or relocation of affected neighbours and compensating them accordingly following laid down guidelines, although given the design of the selected turbines, this latter option is not anticipated.

The project proponent will put in place measures to ensure occupational health and safety procedures are maintained at all time during construction and operation of the wind farm.

SECTION E. Stakeholders' comments

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

The EIA meeting was carried out in 2004, whereby the local administration, the local community and concerned parties were invited. The invitation process was done through letters for local administration and relevant government offices, while the local community was invited through announcement made at local gatherings.

The meeting reviewed and discussed pertinent issues with regard to environmental and socioeconomic characteristics of South Kinangop division (project site and transmission line route). Also, the consultation involved a walk-through of the transmission line, where discussions were held with community members from Kinungi East and West sub-locations. Landowners were also consulted and their views were recorded.

The following additional stakeholder consultations, which were advertised through the local administration and in a daily newspaper, were held and minutes prepared in line with CDM requirements:

Location	Date	Time
Heni Social Hall	2nd Nov 2010	1100-1400hrs
Mendandu Shopping Centre	12th Nov 2010	1100-1400hrs
Magumu Shopping Centre	19th Nov 2010	1100-1400hrs

E.2. Summary of the comments received:

The consultation exercise identified lack of water and transportation as key issues which they wanted to be incorporated into the Corporate Social Responsibility plan of the Kinangop Wind Park.

Roads are impassable especially during the rains and they wanted them repaired. Also, the community has dug shallow wells for water but these wells usually go dry during the dry season forcing the community members to walk long distances (about 25 km) to fetch water.

With regard to compensation for land, the community was willing to lease land for erection of turbines as long as they will be compensated as already agreed in the Land Lease Agreements. The compensation for transmission line corridor will be done by KPLC who will follow laid down guidelines.

The details of the meetings were recorded on the minutes for the three meetings.

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

All views presented during the consultation process were documented and those that required clarifications were addressed during the forum.

On the project design side, there were no comments which required project design change since electricity generation from wind is standard. Issues that might affect the social, economic and environment and which were considered significant were identified and mitigation measures were formulated to address them during project implementation.

Of key issues was access to electricity, clean water and roads. The management of the project activity considered them and during project implementation,

- the community members will be provided with solar panels for lighting since it will not be possible to supply them with power directly from the project plant. KPLC is the only authorised retailer of electricity by law
- A borehole will be sunk to supply the local community with water,
- Roads leading to the project site will be improved during project construction and thereafter in order to ensure that there is easy access to the site. This will also enable the community to have a passable road.

In addition, the project proponent undertook to set up a Community Development Fund which will be used to fund community development projects as prioritised by the community.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	J.P. Morgan Ventures Energy Corporation
Street/P.O.Box:	20-28 Moorgate
Building:	EC2R 6DA, Floor: 02
City:	London
State/Region:	-
Postcode/ZIP:	EC2R 6DA
Country:	United Kingdom
Telephone:	+44 20 77427913
FAX:	
E-Mail:	environmental.markets@jpmorgan.com
URL:	www.jpmorganclimatecare.com
Represented by:	Philip Hardwick
Title:	Executive Director
Salutation:	Mr.
Last name:	Hardwick
Middle name:	-
First name:	Philip
Department:	-
Mobile:	+ 44 7919110156
Direct FAX:	
Direct tel:	+44 20 77427913
Personal e-mail:	philip.x.hardwick@jpmorgan.com

Organization:	Aeolus Kenya Limited
Street/P.O.Box:	235
Building:	Nairobi Business Park, Unit B, 2nd Floor, Karen
City:	Nairobi
State/Region:	Kenya
Postcode/ZIP:	00502
Country:	Kenya
Telephone:	+254 733631653
FAX:	
E-Mail:	jenny@aeoluskenya.com
URL:	
Represented by:	Jenny Fletcher
Title:	Executive Director
Salutation:	
Last name:	Fletcher
Middle name:	
First name:	Jenny
Department:	
Mobile:	+254 733631653
Direct FAX:	
Direct tel:	
Personal e-mail:	jenny@aeoluskenya.com

Organization:	EcoSecurities International Limited
Street/P.O.Box:	40 Dawson Street
Building:	-
City:	Dublin
State/Region:	
Postcode/ZIP:	02
Country:	Ireland
Telephone:	+353 1613 9814
FAX:	+353 1672 4716
E-Mail:	info@ecosecurities.com
URL:	www.ecosecurities.com
Represented by:	
Title:	Company Secretary
Salutation:	Mr.
Last name:	Browne
Middle name:	-
First name:	Patrick
Department:	-
Mobile:	-
Direct FAX:	-
Direct tel:	cdm@ecosecurities.com
Personal e-mail:	-

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding will be used in the proposed project

Annex 3

BASELINE INFORMATION

The Kenyan electricity system consists of one national grid system which serves the entire country. All the generating companies feed their power into the national grid. The grid is owned and operated by the Kenya Power and Lighting Company (KPLC), the sole power distribution and retailing company. However, not all parts of the country are served by this grid, some parts of the country are served by isolated fossil fuel generators owned by KPLC.

The Kenyan electricity system comprises of around 1,455MW of installed capacity, with an effective capacity of 1,401MW.

As per the KPLC annual Report, KPLC in 2009/2010 purchased 6,692 GWh of electricity, out of which, 6,654 GWh went into the national grid, while 38 GWh was used in the isolated off-grid locations. The grid mix contained more renewable source than non-renewable generated electricity, but with falling rainfall patterns in the country, the share of fossil fuel generated electricity is rising gradually.

During this period, the share of various generating sources was as shown in the table below:

Type	Installed	Proportion (%)	Effective	Proportion (%)	GWh	Proportion (%)
Geo	198	13.61	189	13.49	1,339	20.12
Hydro	759	52.13	729	52.00	2,170	32.62
Thermal	468	32.13	453	32.29	2,991	44.95
Wind	5.1	0.35	5.1	0.36	16.3	0.24
Cogen	26	1.79	26	1.86	99	1.49
Import	0	0.00	0	0.00	38	0.57
Total	**1,455**	**100**	**1,401**	**100**	**6,654**	**100**
Off-grid	17.1	1.18	15.4		38	0.57

Source: Kenya Power and Lighting Company website www.kplc.co.ke

The table below shows power plants, which are connected to the Kenyan grid in the year 2009.

COMPANY	Capacity (MW) as at 30/06/2010		Energy Purchased Units in GWh
	Installed	Effective	2009/10
KenGen			
Hydro			
Tana	14.4	0	29
Kamburu	94.2	90	244
Gitaru	225	216	457
Kindaruma	40	40	111
Masinga	40	40	61
Kiambere	164	164	546
Turkwel	106	105	335
Sondu Miriu	60	60	340
Small Hydros	14.7	12.8	46
Hydro Total	**758**	**728**	**2,170**
Thermal			
Kipevu Steam	0	0	0
Kipevu I Diesel	75	60	316
Fiat - Nairobi South	0	0	0
Kipevu Gas Turbines	60	60	145
Garissa & Lamu	5.4	5.2	19
Thermal Total	**140**	**125**	**481**
Geothermal			
Olkaria I	45	44	366
Olkaria II	105	97	573
Geothermal Total	**150**	**141**	**939**
Wind			
Ngong	5.1	5.1	16.3
KenGen Total	**1,054**	**999**	**3,606**
Government of Kenya (Rural Electrification Programme)			
Off-grid Thermal Stations	11.7	10.2	19
Independent Power Producers (IPP) - Thermal, Geothermal & Hydro			
Iberafrica	108.5	108.5	621
Westmont	0	0	0
Tsavo	74	74	495
Mumias - Cogeneration	26	26	99
OrPower 4 -Geothermal	48	48	400
Rabai Power	90	90	318
Imenti Tea Factory (Hydro)	0.6	0.6	0.3
IPP Total	**347**	**347**	**1,933**
Emergency Power Producers (EPP)			
Aggreko energy to Kenyan Market	60	60	1,096
Aggreko energy to Uganda	0	0	0
EPP Total	**60**	**60**	**1,096**
Imports			
UETCL			37
TANESCO			1.1
Total Imports			**38**
SYSTEM TOTAL	**1,473**	**1,416**	**6,692**

Annex 4

MONITORING INFORMATION

See section B.7.2. above