	Project design document form (Version 12.0)
BASIC INFORMATION	
Title of the project activity	Lake Turkana 310 MW Wind Power Project
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	05
Completion date of the PDD	03/02/2022
Project participants	Lake Turkana Wind Power Limited Carbon Africa Limited
Host Party	Kenya
Applied methodologies and standardized baselines	Applied Methodology: ACM0002 – Consolidated baseline methodology for grid-connected electricity generation from renewable sources - Version 11.0 Standardized Baseline: ASB0050-2020: Grid Emission Factor for the Republic of Kenya, version 01.0
Sectoral scopes	Sectoral Scope 1. Energy Industries (renewable -/non-renewable sources)
Estimated amount of annual average GHG emission reductions	510,313 tCO_{2e}

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

The purpose of the Lake Turkana 310 MW Wind Power Project is the construction of a 310 MW wind power plant in Marsabit District, Kenya. The wind park will consist of 365 V52 Vestas turbines, each with a capacity of 850 kW. The project activity is estimated to supply almost 1,250 GWh of clean electricity to the Kenyan national grid per year. The project site is located at the southeastern end of Lake Turkana near Loiyangalani location in Marsabit District, Kenya. The project area has unique geographical conditions in which daily temperature fluctuations generate strong predictable wind streams. The average wind speed is 10.8 m/s. The wind power park will be connected to the Kenyan national grid at Suswa substation. Hereto, the project will rely on a to be constructed 400 kV transmission line of approximately 428 km in length.

The project will be a 'first-of-its-kind' in Kenya. Currently, nearly 55% of the power production in Kenya is based on hydropower. Fossil fuels constitute almost 32% of power production and geothermal 12%. Electricity generated from wind (5.1 MW, funded by the Belgian government) and biomass (26 MW) is limited, with wind being a marginal resource at less than half a percent of present installed capacity.[1] Due to the ever-increasing demand for electricity in Kenya there are various plans in the pipeline for further addition of new generation sources. The plans largely reflect the existing power generation mix with a focus both on fossil fuel based facilities and renewable energy projects, mostly geothermal.[2]

The baseline scenario for the project activity is *electricity 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".*

As can be read in section B.4 below as well as in Annex 3 – Baseline Information, the existing and planned grid-connected power plants in Kenya consist of a mix of fossil fuel and renewable energy-based power plants.

[1] Percentages installed capacity are based on the power generation situation in Kenya on 30 June 2009 (see p. 51 from the KPLC *Annual Report and Financial Statements for the Year Ended 30 June 2009*). The 5.1 MW wind project and the 26MW biomass project referred to in the text were commissioned after June 2009 and, therefore, not yet included in the KPLC annual report.

[2] Plans for future capacity additions are reflected in the *Update of the Least Cost Power Development Plan 2009- 2029*

The project activity will achieve CO_2 emission reductions through the replacement of electricity generated by fossil fuel fired power plants connected to the national grid. It is expected that the project will generate average annual emission reductions of 510,313 tCO_2 per year during the first crediting period.

The project Environmental Impact Assessment Licence was granted on 24 July 2009. The 20-year Power Purchase Agreement for the project was approved on 29 January 2010.

The implementation of the Lake Turkana 310 MW Wind Power Project is expected to contribute to the sustainable development of Kenya in various ways:

- The introduction of Lake Turkana 310 MW Wind Power Project will provide a reliable source of energy to Kenya's growing economy
- The project will open ways for the further expansion of wind power projects in Kenya and the region
- The project will generate local employment opportunities during the construction and operation phase
- The project will upgrade the road system in the project area and create access for economic development of previously marginalised areas
- The project will contribute to Kenya's fiscal revenues through the payment of taxes.
- The project will improve the hydrocarbon trade balance through reduction of oil imports used for electricity generation.
- The project will reduce the consumer price of electricity: In line with the 2008 Schedule of Tariffs for Supply of Electricity by the Kenya Power and Lighting Company Limited, all electricity tariffs in Kenya are liable to a Fuel Cost Charge, which is calculated monthly and published in the Kenya Gazette. The Fuel Cost Charge is transferred directly to the consumer and depends directly on the specific fuel consumption of the thermal power plants. The higher the fuel consumption (and fuel price) by the thermal power plants, the higher the Fuel Cost Charge and, therefore, the higher the electricity bill for the consumer. It is expected that the implementation of a large-scale wind project will reduce Kenya's reliance on expensive thermal power, especially thermal emergency power, and therefore the Fuel Cost Charge will be lower.

A.2. Location of project activity

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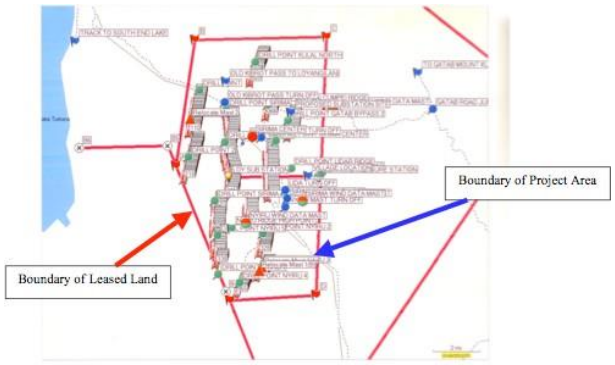
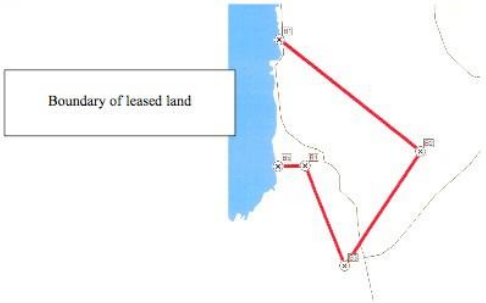
Host Party(ies): Republic of Kenya
Region/State/Province etc.: Eastern Province, Marsabit District
City/Town/Community etc.: Loiyangalani is the nearest town, 35 km northeast of the project site.

The project area is situated in Loiyangalani Location of Loiyangalani Division in Marsabit District of the Eastern Province of Kenya. It should be noted that Kenya is currently



Geographical Coordinates of the *Project Area*			Geographical Coordinates of the *Leased Land*		
	North (N)	East (E)		North (N)	East (E)
A	02° 29' 45.2"	36° 45' 35.0"	B1	02° 45' 31.8"	36° 42' 12.0"
B	02° 34' 25.5"	36° 46' 17.2"	B2	02° 32' 13.2"	36° 59' 13.2"
C	02° 34' 32.5"	36° 51' 10.3"	B3	02° 18' 36.1"	36° 50' 01.7"
D	02° 24' 58.7"	36° 50' 46.0"	B4	02° 30' 30.0"	36° 45' 17.4"
E	02° 24' 47.0"	36° 47' 34.6"	B5	02° 30' 25.8"	36° 42' 00.6"



undergoing a process of re- demarcation of administrative boundaries, including the creation of new zones. Hence the administrative zone hosting the project may be redefined from time to time. Geographically, the project area is located between the foot slopes of Mt Kulal and the southeastern end of Lake Turkana. The project site is situated on a piece of land, which has been leased, from the Marsabit County Council for a period of 33 years (twice renewable). The project area itself covers an area of 10,273 hectares whereas the leased land covers an area of 60,705 hectares. The coordinates and boundaries of the project area and leased land are given in the pictures and table below. The geographical coordinates of the wind turbines are given in Annex 5.[3]

A.3. Technologies/measures

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The purpose of the project activity is to build a 310 MW wind farm and supply 1,250 GWh of clean electricity per year to the Kenya national grid. A total of 365 Vestas V52 wind turbines will be

[3] Do note that the final positioning of a number of wind turbines might still change during construction.

installed, each with a capacity of 850 kW. NBo1 other or previous technology for power generation has been employed at the project site.

As per June 2009, the total electric system in Kenya had a capacity of 1,343 MW. The existing power plants connected to the Kenyan national grid consist of a mix of hydro, geothermal and thermal plants (mostly diesel generators and gas turbines). Hydropower 5makes up the largest part of the current existing capacity (55%). Thermal and geothermal make up 32% and 12% respectively.[4] More recently, the installed capacity of grid-connected biomass power plants and wind power has been upgraded to 26MW and 5.1MW respectively, but is still relatively small. An important part of the thermal power generating capacity has been installed as emergency power. However, because the continued increase in electricity demand and the frequent power shortages, these emergency units often continue to run at full capacity. In fact, the Kenya Electricity Generating Company (KenGen) is planning the installation of further thermal power units on a fast track basis to steer clear from future power outages.

The construction of a 310MW wind farm will make a very significant contribution to the renewable energy mix of the country. The project will also be the first large-scale wind farm in Kenya and the wider East African region. Based on a 45.94% net capacity factor, the wind farm is projected to deliver close to 1,248,624 MWh per year to the Kenyan national grid. The project activity will mostly replace electricity generated by thermal power plants, especially the ones that have been installed as emergency power and are ranking low in the merit order. As a result, the project activity is projected to achieve 736,615 tCO_2 emission reductions per year.

As explained in section B.4 “Description of how the baseline scenario is identified and description of the identified baseline scenario” the baseline scenario for the project activity is *electricity 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”.* As can be read in section B.4 below as well as in Annex 3 – Baseline Information, the existing and planned grid-connected power plants in Kenya consist of a mix of fossil fuel and renewable energy-based power plants.[5]

Based on the on-site wind measurements and analysis, the V52 – 850 kW 50/60 Hz Optispeed wind turbine from Vestas was selected as the most appropriate wind turbine (the turbine uses fluid-based cooling techniques that have the advantage of better protection against heat and dust in comparison to other similar models on the market, a feature very much needed in the area where the turbines will be built). Hub height will be at 44m above ground level.

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[4] KPLC *Annual Report and Financial Statements for the Year Ended 30 June 2009*

[5] *Update of the Least Cost Power Development Plan 2009-2029*

Key technology parameters for the V52 wind turbine are given in the table below:

Technology parameters for V52 – 850 kW 50/60 Hz Optispeed wind turbine from Vestas

Parameter	***Value***
Manufacturer	Vestas
Rotor Diameter	52 m
Area swept	2,124 square meter
Nominal revolutions	26 rpm
Operational interval	14.0-31.4 rpm
Number of blades	3
Hub height	44 m
Cut-in wind speed	4 m/s
Nominal wind speed	16 m/s
Cut-out wind speed	25 m/s
Nominal output	850 kW
Operational data	50 Hz/60 Hz 690 V
Lifetime	20 years

Other technological equipment to be located at the project site include: one 0.6/33 kV step-up transformer per turbine, a 33 kV collecting grid, a sectionalized 33 kV substation, three sets of single phase step-up transformers 33/220 (400) kV including capacitors, reactor banks, infrastructure, control, metering, fibre optic communication and other related equipment.

A main and back-up metering system will be installed by the project, the former to be owned and monitored by LTWP and the latter by the electricity off-taker (Kenya Power and Lighting Company - KPLC). Meter data will be recorded and stored by onsite devices as well as remotely via a fibre optic communication network linked to both the LTWP and KPLC control rooms. Photographic facilities will also record the metered data as part of monthly onsite verification procedures. The metering equipment will be located at the delivery point of the wind power plant to the grid, namely between the step-up transformers and the transmission line bus bars.

Given the remote location of the project site, the project will also construct a Project Village with all the necessary amenities and facilities, including housing for over 200 people, bank facilities, shopping facilities, clinic, recreation facilities, fuel station, incineration plant and waste water system. The Project Village will be used both during construction and operation. The lifetime of the Project Village is estimated at minimum of 20 years.

The implementation schedule is estimated as follows:

	Start Date	**End Date**

Financial close	-	30 June 2011
Signature of supply contract	-	30 June 2011
Construction of road	30 June 2011	30 May 2012
Construction of Transmission	30 June 2011	28 December 2012
Line		
Construction of 400 kV substation at Suswa	30 June 2011	18 August 2012
Construction of Project Village	8 September 2011	13 August 2013
Construction of 400 kV substation at Loiyangalani	31 October 2011	26 March 2013
Construction of road on-site	22 May 2012	10 June 2013
Installation of Turbines	3 July 2012	2 September 2013
First 60 turbines installed	-	10 September 2012
First 60 turbines tested and commissioned	-	21 May 2013
365 turbines installed	-	2 September 2013
365 turbines tested and commissioned	-	20 January 2014

Technology transfer will take place in part through the training of more than 50 local engineers by Vestas to provide support to the operations and maintenance of the project over its lifetime. Vestas will be responsible for maintenance efforts over an initial 10-year period, including monitoring and reporting of system performance, as per the Service and Availability Agreement between LTWP and Vestas Benelux B.V.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of Kenya (host)	• Lake Turkana Wind Power Limited • Carbon Africa Limited	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Host Country: The host country is Kenya and the Designated National Authority is the National Environment Management Authority (NEMA). The Government of Kenya ratified the Kyoto Protocol on 25 February 2005.

Project Participants: The project will be developed and operated by Lake Turkana Wind Power Limited, a consortium of foreign and local entrepreneurs including KP&P Africa, Aldwych International and the Industrial Development Corporation of South Africa (IDC). Carbon Africa Limited will be responsible for the carbon asset development and management.

A.5. Public funding of project activity

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There is no public funding involved in this project activity. The financing is being arranged through a purely project finance structure with commercial, market driven terms and conditions.

A.6. History of project activity

>>
1. The following points clarify whether the proposed CDM project activity is registered or deregistered under CDM.
(a) The proposed CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA);
(b) The proposed CDM project activity is not a project activity that has been deregistered.

2. The following points declare the proposed CDM project activity's involvement within any CDM PoA.

(a) The project participants declare that the proposed CDM project activity was not a CPA that has been excluded from a registered CDM PoA.
(b) It can also be declared that any registered CDM project activity or a CPA under a registered CDM PoA (within the same sectoral scope as the project activity, and while utilizing the same project technology as the ones utilized under the proposed project activity), whose crediting period has or has not expired (hereinafter referred to as former project) does not exist in the same geographical location as the proposed CDM project activity.

A.7. Debundling

>>
It is a large-scale project activity. Therefore, this section is not applicable.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

>>

The project uses the approved consolidated baseline and monitoring methodology ACM0002/Version 11: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources."

In addition, and in line with the provisions of ACM0002/Version 11, the project activity also draws upon the latest version of the following tools:

- Tool to calculate the emission factor for an electricity system (Version 02);
- Tool for the demonstration and assessment of additionality (Version 05.2);
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02);
- Combined tool to identify the baseline scenario and demonstrate additionality (Version 02.2).

B.2. Applicability of methodologies and standardized baselines

>>

The project meets all the conditions and criteria for the application of the approved and consolidated baseline and monitoring methodology ACM0002/Version 11:

- The project activity involves a grid-connected renewable power generation project activity that installs a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant);
- The project activity involves the installation of a wind power plant;
- The project activity does not involve switching from fossil fuels to renewable energy sources at the site of the project activity;
- The project activity is not a biomass fired power plant;
- The project activity does not involve the installation of hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant isless than 4 W/m2.

The project meets all the conditions and criteria for the application of the "*Tool to calculate the emissionfactor for an electricity system"* (Version 02):

- The project activity supplies electricity to a grid, i.e. the Kenya national grid

B.3. Project boundary, sources and greenhouse gases (GHGs)

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The spatial extent of the *project boundary* includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The Kenyan national grid was identified as the relevant electricity system and project boundary. The identification of the Kenyan national grid as the relevant electricity system is based on the following arguments:

- The Kenyan DNA has not published a delineation of the project electricity system and connected electricity system.
- The Kenya grid is connected to the Ugandan grid through a double circuit 132 kV transmission line. However, the Ugandan grid is not considered a connected electricity system because there are no spot markets in the Kenyan and Ugandan electricity system and the transmission line is not operated at 90% of its rated capacity during 90% or more of the hours of the year.
- Finally, Kenya doesn't have a layered dispatch system and the country has only one grid system that serves the entire country. Therefore, and in line with version 2 of the Tool to calculate the emission factor for an electricity system, the national grid definition is used by default.

A number of studies have been carried out in recent years to assess the feasibility of establishing interconnections between countries in the East African region which might affect the delineation of the electricity system in the future. Key interconnections that are currently explored, include:
Kenya-Ethiopia interconnector: The interconnector would enable transfer of electricity from identified large Ethiopian hydropower projects, which are more economical compared to potential sources identified in Kenya. It is expected that up to 1,000 MW can be imported from Ethiopia before the year 2020 with the initial 300 MW expected in 2014 and increasing gradually in the period.

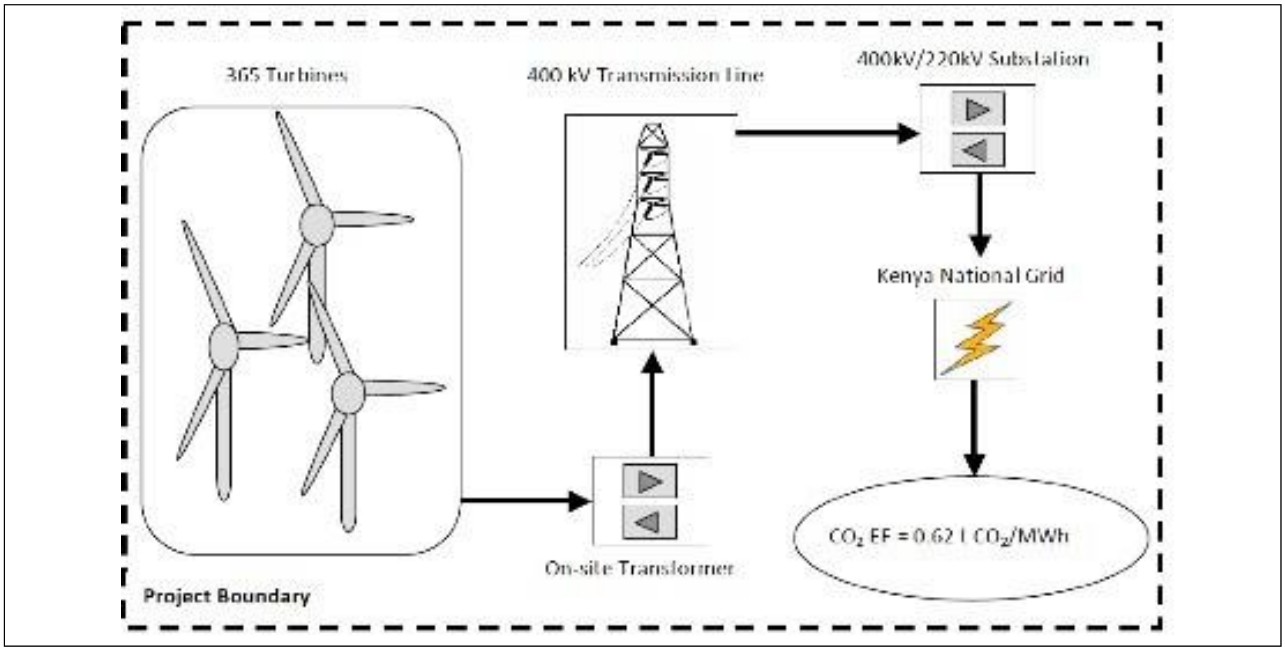
Other initiatives for integration of power grids of the countries in the Eastern African region include Kenya-Tanzania 400 kV interconnector project and a proposed second additional Kenya-Uganda 220 kV line to be constructed between Olkaria-Tororo. The Tanzania link is currently suspended as financiers await confirmation of availability of adequate power for trade between the two countries to justify the project.

The implementation of the proposed interconnections could affect the delineation of the relevant electricity system in the future and, therefore, potentially also the calculation of the grid emission factor in case substantial electricity imports will take place in the future, notably from Ethiopia. According to version 2 of the *Tool to calculate the emission factor for an electricity system*, the emission factor for electricity imports from connected electricity systems

located in another host country(ies) is 0 tons CO2 per MWh and, therefore, large electricity imports might result in a lower emission factor.

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

Source		GHG	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source as per ACM0002/Version11
		CH_4	No	Minor emission source as per ACM0002/Version11
		N_2O	No	Minor emission source asper ACM0002/Version11
Project activity	Project Activity	CO_2	No	Zero emission renewable energy project (wind energy)
		CH_4	No	
		N_2O	No	



B.4. Establishment and description of baseline scenario

>>

The project activity is the installation of a new, grid-connected renewable energy power plant. Hence, in accordance with the baseline methodology procedure described in ACM0002/Version11 the baseline scenario for the project activity is the following:

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

The existing installed capacity for grid-connect electricity generation in Kenya amounts to 1,343 MW. Hydropower accounts for roughly 55% of the capacity. Geothermal and

thermal account for 12% and 32%, respectively.[6] Electricity generated from wind (5.1 MW) and biomass (26 MW) is limited. The 5.1 MW of existing wind capacity is from a small wind farm in the Ngong Hills near Nairobi, constructed with a soft loan from the Belgian government and commissioned in August 2009. A subsequent 5 MW and an additional 10 MW of installed capacity are planned for the same site with, respectively, further financing from Belgium and a soft loan from the Spanish government. However, even with such, wind will still be a marginal resource at just over one percent of installed capacity.

The most important electricity producer is the state owned Kenya Electricity Generating Company (KENGEN). Besides KENGEN there are four Independent Power Producers (IPP) being Iberafrica, Tsavo Power, Orpower and Mumias. Aggreko is an Emergency Power Producer with two power plants. Together the non-KENGEN power producers have an installed capacity of 330MW.
In 2008, the Ministry of Energy adopted a Feed-in-Tariff (FiT) Policy for promoting the generation of electricity from renewable sources. The Policy covered electricity generation from wind, biomass and small hydro. The FiT for wind was set at 0.09 USD/kWh and was limited to individual wind power plants whose effective generation capacity does not exceed 50MW. The FiT only applies to the first 150MW capacity of wind power plants developed in the country.[7]

In January 2010, a first revision took place of the Feed-in-Tariff Policy to also include electricity generated from biogas, geothermal and solar. The FiT for wind was raised to 12 USD/kWh. The individual plant capacity, for which the wind FiT applies, was also increased to 100MW up to a cumulative capacity of 300MW.[8]

Expected capacity additions for the coming years are described in detail in the 2009-2029 Update of the Least Cost Power Development Plan prepared by the Ministry of Energy and the Kenya Power and Lighting Company.[9] Similar indications are given in the KPLC Annual Report & Financial Statements for the Year Ended 30 June 2009. Candidate generation resources considered include geothermal, coal, oil- fired plants, wind and imports from neighbouring Ethiopia.

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[6] KPLC *Annual Report and Financial Statements for the Year Ended 30 June 2009*

[7] Ministry of Energy (2008) *Feed-in-Tariffs Policy on Wind, Biomass and Small-Hydro Resource GeneratedElectricity*

[8] Ministry of Energy (2010) *Feed-in-Tariffs Policy on Wind, Biomass, Small-Hydro, Geothermal, Biogas and SolarResource Generated Electricity*

[9] Update of the Least Cost Power Development Plan 2009-2029

For more detailed information on existing and planned, grid-connected electricity generation plants, refer to Annex 3 – Baseline Information.

B.5. Demonstration of additionality

>>

In order to demonstrate additionality, and in line with ACM0002/Version 11, version 05.2 of the *"Tool for the demonstration and assessment of additionality"* was used.

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

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

The following are realistic and credible alternative(s) available to the project activity that provide outputs or services comparable with the proposed CDM project activity.

Alternative 1: The proposed project activity not undertaken as a CDM project activity.

Alternative 2: A fossil fuel based power plant producing electricity with comparable quality, properties and application areas (e.g. Medium Speed Diesel Plant). This alternative is considered credible because fossil fuel based power plants have already been implemented in Kenya by Independent Power Producers (e.g. Tsavo Power and Iberafrica). More recently, another IPP, Rabai Power, has commissioned a fossil fuel based power plant with a capacity of 90 MW. Plans are also underway to develop a 300/600MW coal fired power plant in Mombasa. It is not yet clear whether this will be implemented by KenGen or by an Independent Power Producer.

Alternative 3: 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 is considered credible because a geothermal power plant and a biomass power plant have already been implemented by Independent Power Producers in Kenya (Ormat Power and Mumias Sugar Company, respectively). It has to be noted that biomass based power production is heavily reliant on the availability of sufficient quantities of feedstock. Therefore, the development of a biomass based power project is probably a more credible scenario for agricultural companies (like sugar companies) that own a lot of agricultural waste and less so for a project developer without direct access to such biomass feedstocks. Currently, a number of small hydro projects are also under development, 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 sever droughts, has proven to adversely affect power production in the country.

Alternative 4: Electricity generated by the operation of grid-connected power plants and by the addition of new generating sources. This, in fact, is the continuation of the current situation and is the identified baseline for the installation of a new grid-connected renewable power plant according to ACM0002, version 11.

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

All the above alternatives are consistent with mandatory and regulatory requirements, especially the Energy Act (2006) that allows for Independent Power Producers to supply electricity to the national grid through a Power Purchase Agreement with the Kenyan Power and Lighting Company.[10] There are no restrictions on types of power plants, hence, both fossil fuel based power plants and renewable energy power plants are allowed to deliver electricity to the grid. Because the alternatives identified are in compliance with all applicable laws and regulations and are also realistic and credible alternatives available to the project participants, the project is additional under step 1.

Step 2. Investment Analysis

Without the projected revenue from the CERs, the project would not be financially feasible, especially given the many risks that are involved in the development of the project. The table below outlines how the CDM has played a crucial role in the negotiation of an appropriate tariff for the project and how the CDM was taken into consideration at an early stage. Tariff negotiations took place in USD currency. The final Power Purchase Agreement, however, is in Euro. All conversions were based on an exchange rate of 1 Euro = 1.454 USD.

27 April 2006	LTWP obtains exclusivity from Ministry of Energy to study wind resources near Lake Turkana.
23 November 2006	First wind measurement mast starts recording wind measurement data.
9 October 2007	Agreement is signed between LTWP and the Marsabit County
	Council to lease the land for 33 years (twice renewable).
March 2008	Three more wind measurement masts are erected and start

[10] The Energy Act, 2006

	recording wind measurement data The measurement masts started recording on 7 March 2008, 12 March 2008 and 15 March 2008, respectively.
March 2008	Ministry of Energy adopts Feed-in-Tariff Policy on Wind, Biomass and Small-Hydro Resource Generated Electricity. The Feed-in-Tariff for electricity generated from wind for wind power projects with an effective generation capacity of up to 50MW was set at 0.09 USD/kWh.[11] Because of the size of the LTWP project, the FiT was not applicable and a tariff needed to be negotiated with the local power distributor (KPLC).
May - July 2008	Initial discussions between KPLC and LTWP regarding the Power Purchase Agreement and tariff. Using the existing FiT as guidance, KPLC offered a tariff of 0.09 USD/kWh for the project. The tariff offer was insufficient to make the project economically viable and generate a rate of return that would be attractive enough to raise the necessary finance.
July 2008	LTWP contracted a consultant to assess whether it is possible to generate additional revenue from carbon credits.
September 2008	CDM Feasibility Study indicated that the project would meet the requirements of the CDM.[12]
November - December 2008	Negotiations continued between KPLC and LTWP and reached a deadlock where KPLC was now offering a maximum of 0.095 USD/kWh whereas LTWP was asking for 0.105 USD/kWh. In order to break the deadlock and bridge the gap of 0.01 USD/kWh, LTWP offered to pay KPLC up to 0.01 USD/kWh from the carbon credit revenue as long as KPLC would accept the tariff of 0.105 USD/kWh asked for by LTWP. The 0.01 USD/kWh was also based on the 2008 average CER price of € 11.46[13] (USD 16.66) and an estimated grid emission factor of 0.62 tCO2/MWh (A price of 16.66 USD/tCO2 in combination with an emission factor of 0.62 tCO2/MWh results in a little bit over 10 USD/MWh or

[11] Ministry of Energy (2008) Feed-in-Tariffs Policy on Wind, Biomass and Small-Hydro Resource Generated Electricity

[12] Adriaan Tas (2008) *Carbon Potential and Carbon Market Opportunities for the Lake Turkana Wind Power Farm Project in Marsabit, Kenya*.

[13] World Bank (2009) *State and Trends of the Carbon Market 2009*, p.31.

	0.01 USD kWh). On 10 December 2008, KPLC and LTWP agreed on the tariff of 0.105 USD/kWh. The tariff was converted to Euro (0.0722 Euro/kWh). As proposed by LTWP, KPLC will receive up to 0.01 USD/kWh from the carbon credits in return. Without the carbon credit revenue, KPLC would not have agreed on the tariff and, therefore, the carbon credits played a critical role in reaching a mutually acceptable tariff arrangement.
12 January 2009	PIN submitted to Kenya DNA
28-29 April 2009	Approval of Title Deed
21 May 2009	Letter of No Objection received from Kenya DNA
31 August 2009	Prior Consideration Form submitted to Kenya DNA and CDM Secretariat
31 August 2009	Prior Consideration posted on UNFCCC website.
18 December 2009	Approval of Power Purchase Agreement by the Energy Regulatory Commission of Kenya.
18 December 2009	Completion of financial model
18 December 2009	Aldwych International and LTWP sign a Joint Development Agreement
29 January 2010	Power Purchase Agreement was agreed.
17 March 2010	The Industrial Development Corporation (IDC) joins the Joint Development Agreement between LTWP and Aldwych International.
27 April 2010	Lenders' workshop.
30 June 2011	Financial Close, Signing of Supply Contract andStart of Construction
21 May 2013	Commissioning of the first 60 wind turbines
20 January 2014	Commission of complete wind project (i.e. 365 wind turbines)

As will be shown below, the guaranteed higher tariff that was negotiated with the utility in return for (part of) the carbon credit revenue has made the project financially viable and, therefore, the project activity is additional under step 2. In addition, and in line with version 05.2 of the *"Tool for the demonstration and assessment of additionality"*, barrier analysis has also been conducted under Step 3 in order to convey other ways in which the project is additional.

Sub-step 2a. Determine appropriate analysis method

The Tool for the demonstration and assessment of additionality provides three investment analysis methods:

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

The proposed project activity will generate financial and economic benefits other than CDM related income therefore the simple cost analysis (Option I) cannot be taken.

In line with ACM0002/Version 11, the baseline scenario for the project activity is the supply of electricity from a grid. Therefore, the baseline scenario does not necessarily require investment and is outside the control of the project developer. Option III, benchmark analysis is, therefore, selected as the appropriate analysis method for the project activity.

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

Because of the challenges involved in raising equity in Africa, the project activity has selected the Equity IRR (EIRR) as the most suitable indicator for carrying out the benchmark analysis. No publicly available and objectively verifiable information was found for EIRR benchmarks in the energy or infrastructure sectors in Kenya or East Africa. Therefore, the project has calculated the EIRR based on a risk-free rate plus a general equity risk premium, as follows:

Ke = GB + PEg

Where:
Ke = Average cost of equity financing
GB = Yield of a government bond issued by the host country
PEg = General equity risk premium

- GB is determined as the yield of a long-term government bond issued by the host country.
- For PEg, a value of 4.1% is used based on a worldwide average equity premium as calculated by Dimson et al. (2006).[14]

In order to determine GB, and considering the specific characteristics of the project activity (i.e. energy project), the average yield of a 12-year, tax exempt[15], government infrastructure bond (first infrastructure bond in Kenya) with the following characteristics was chosen[16]:

[14] Dimson E., P. Marsh and M. Staunton (2006), *The Worldwid Equity Premium: A Smaller Puzzle*

[15] Terms for Treasury Bond Issue No. IFB 1/2009/12 dated February 23, 2009: "Taxation: All payments ofdiscount/interest due will be free from withholding tax"

- Issue number: IFB1/2009/12YR
- Issue date: 23 February 2009
- Maturity date: 8 February 2021
- Tenor: 12 years
- Coupon: 12.50%

The observed, average yield of the above infrastructure bond is 13.51%.[17] The observed, average yield of the bond is only based on one year of data. Therefore, and in order to be conservative, the coupon rate of 12.50% was used for calculating the benchmark.

Given that the government bond used to determine the GB is tax-exempt, an adjustment factor for the applicable withholding tax rate (25%) is applied to the GB:[18]

GB = (12.5%)*(1.25)

Hence the GB for the benchmark is calculated at 15.625%.

In order to determine the general equity risk premium (PEg), a default value of 4.1% is used as per *"The worldwide equity premium: A smaller puzzle"* by Elroy Dimson, Paul Marsh and Mike Stauntun from London Business School.

Thus:

Ke = GB + PEg
Ke = 15.625 + 4.1
Average cost of equity financing = 19.725%

[16] Since the issuance of the first infrastructure bond, two other infrastructure bonds have been issued on 7 December 2009 (12 year, 12%) and on 1 March 2010 (8 years, 9.75%). Both government infrastructure bonds are also tax exempt. On 2 November 2009, the Kenya Electricity Generating Company (70% government owned) also issued tax-exempt infrastructure bond (10 years, 12.5%) to support the development and construction of a number of power generation projects. The specifics of the KenGen bond are similar to the specifics of the bond that was selected for calculating the benchmark.

[17] http://www.centralbank.go.ke/securities/bonds/TreasuryBondsList.aspx. Accessed on 12 March 2010.

[18] PKF Kenya Tax Guide 2009, p.3: "Other bearer bonds interest: 25%"

Hence the EIRR benchmark for the project activity is determined to be 19.725%. This is similar to the benchmark that came out of informal discussions with various investors and representatives from financial institutions in the region, i.e. 20%.

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

a. Basic parameters, costs and revenues used for the calculation of the Equity IRR

BASIC PARAMETERS			
Project Parameter	*Source*	*Value*	*Unit*
Wind Turbines	Financial Model	Vestas-V52	
Number of Turbines	Financial Model	365	
Turbine Capacity	Financial Model	0.85	MW
Gross Capacity	Financial Model	310.25	MW
Capacity Factor	Financial Model	45.94%	
Base Tariff	KPLC Letter	65.30	€/MWh
Fixed Portion of Base Tariff		55.16	€/MWh
Variable Portion of Base Tariff		10.14	€/MWh
Premium on Tariff based on projected CER revenue	KPLC Letter	6.88	€/MWh
Premium Tariff	PPA	72.20	€/MWh
Fixed Portion of Premium Tariff	PPA	62.06	€/MWh
Variable Portion of PremiumTariff	PPA	10.14	€/MWh
Tariff for Excess of 1,450 GWh	PPA	36.10	€/MWh
Euro/USD	Financial Model	1.454	
Corporate Tax	Financial Model	30.00%	
Equity% of CAPEX	Financial Model	30.00%	

Benchmark - Equity IRR	Calculated	19.725%	

CAPITAL EXPENDITURE		
Capex Item	*Depreciation Rate*	*Cost (Euro)*
Construction Costs		
EPC Contract	*4.00%*	*322,012,800*
Balance of Plant	*5.00%*	*77,100,000*
Land	*1.01%*	*1,455,822*
Aircraft	*5.00%*	*1,538,462*
IDC, Contingencies, Development Costs		
Contingencies	*4.00%*	*20,105,357*
Development Fees and Expenses	*4.00%*	*50,398,532*
IDC	*4.00%*	*21,889,966*
Net Revenues During Construction		
Net Revenues		*(39,259,297)*
Total Capital Expenditure		*455,241,702*

OPERATING EXPENDITURE	
Opex Item	*Cost/Year (Euros)*
Staff	2,781,644
Maintenance of Turbines	Year 1 and 2: 20,000 per Turbine Year 3,4,5: 25,000 per TurbineYear 6 and after: 33,000 per Turbine
Land Lease	17,123
Electricity	136,986
Insurance	2,629,985
Property Tax	58,200
Sundry Expenses	342,466

ERC Fee	15,000
Total Operating Expenditure	**13,281,405**

Revenue based on Base Tariff	
Sales of Electricity	1,248,624 MWh/year
Base Tariff	65.30 Euro/MWh
Total revenue based on Base Tariff	81,535,147 Euro/year

Revenue based on Premium Tariff	
Sales of Electricity	1,248,624 MWh/year
Premium Tariff	72.20 Euro/MWh
Total revenue based on Premium Tariff	90,150,653 Euro/year

b. Calculation of Equity IRR and Comparison with benchmark

The Equity IRR was calculated based on 20-year cash flow forecast. The table below gives an overview of the Equity IRR calculated for the Base Tariff and the Premium Tariff. As can be seen from the table, the Equity IRR based on the Base Tariff is below the required benchmark of 19.725%. The table also shows that the inclusion of CDM-based revenues increases the Equity IRR by more than 3% and almost takes it over the benchmark.

Equity IRR Base Tariff	16.35%
Equity IRR Premium Tariff	19.61%

Sub-step 2d. Sensitivity analysis

A sensitivity analysis was carried out for the following parameters:

- Electricity Tariff
- Electricity Generation
- Equity Investment
- Operating Expenditure

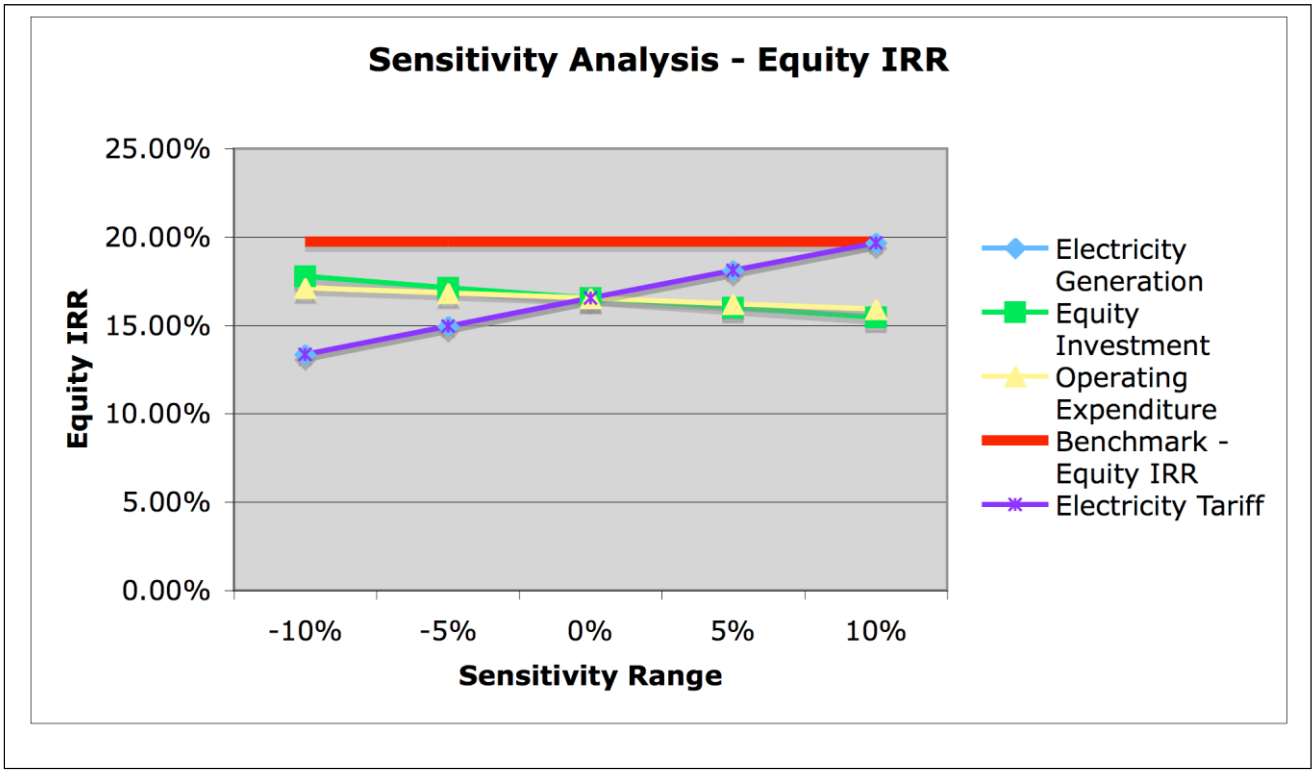
A sensitivity range of + and – 10% was used. The results of the sensitivity analysis are given in the table and figure below. From the table and figure below it can be seen that, keeping all other variables equal, the Equity IRR will only reach the required benchmark if the electricity generation is at least 10% higher than the estimated electricity generation or the price of electricity is at least 10% higher than agreed in the PPA.

	-10%	-5%	0%	5%	10%
Electricity Generation	13.19%	14.78%	16.35%	17.90%	19.43%
Electricity Tariff	13.19%	14.78%	16.35%	17.90%	19.43%
Equity Investment	17.57%	16.94%	16.35%	15.80%	15.29%
Operating Expenditure	16.95%	16.65%	16.35%	16.05%	15.75%

It is very unlikely the Equity IRR will cross the benchmark because of the following reasons:

In terms of the electricity tariff, there are no provisions in the PPA for a revision or increase in the electricity during the lifetime of the project apart from the escalable component of the Energy Charge Rate. The escalable component constitutes 14% of the aggregate tariff and is linked to the Consumer Price Index. Therefore, it is unlikely that the electricity tariff will increase by more than 10% at any point during the lifetime of the project.

In terms of electricity generation, it is not an unlikely scenario that the project will produce and deliver more electricity than the estimated 1,248,624 MWh per year. However, probabilities are low that the project will actually deliver more than 10% electricity because of uncertainties in how much electricity the relatively small Kenyan electricity system will actually be able to absorb. Furthermore, it is much more likely that the capital expenditure will increase compared to the estimates that were made at the time the investment decision was taken. This will cancel out any gains made by an increase in the electricity generation. The fact that the government of Kenya has recently withdrawn government guarantees puts further pressure on the cost of capital and raising the necessary finance. Finally, it should also be noted that the PPA provides for an Energy Thresholds of 1,445,400 MWh per year (p. 34 and 102 of LTWP Reference 114.). The tariff for electricity generation in excess of 1,445,400 MWh per year will be roughly half of the regular electricity tariff. Therefore, electricity generation in excess of 1,445,400 MWh per year will only make a marginal contribution to the revenue streams for the project. A scenario where the project would produce 1,445,400 MWh per year would result in an equity IRR of 21.18% which is only marginally above the benchmark and will most likely be cancelled out by increase in capital expenditure and financing costs. Therefore, it is concluded that it is very unlikely that the equity IRR will exceed the benchmark due to potential increases in electricity generation.



Outcome of Step 2: The Benchmark Analysis and Sensitivity Analysis show that the project activity is not financially viable without the CER revenue. Therefore, the project activity is additional under step 2.

Step 3. Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed CDM project activity:
Additionality has been shown in the investment analysis above. However, barrier analysis has also been conducted to reveal other ways in which the project is additional.

Access to capital

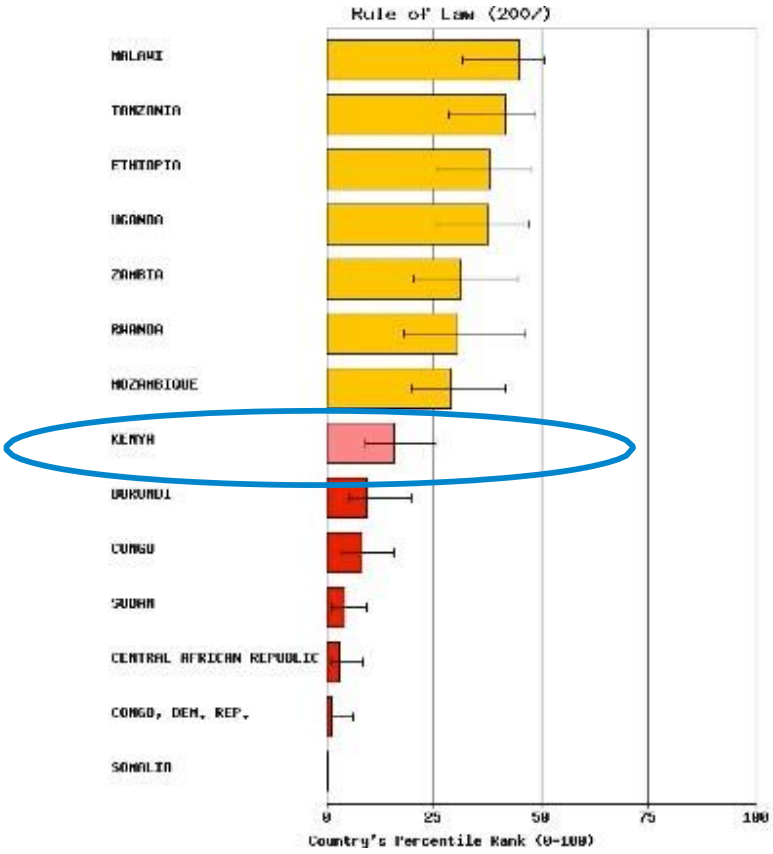
The project was initially developed by a group of nine entrepreneurs, based in Kenya and Europe, and not by a large utility or energy company. While the individuals making up the Lake Turkana wind farm consortium do have experience in wind farm realization in Europe and in doing business in Kenya, Lake Turkana Wind Power Limited (LTWP) was formed as a local limited liability company solely for the purpose of developing the project activity. As such it has no track record, no other investments and no project development resources other than some initial seed capital that the individual entrepreneurs are able to contribute. The company is not a subsidiary of a larger multinational group. The nominal share capital of LTWP is 15 million Kenya Shillings, or approximately 150,000 Euros. The remaining development has been carried out by selling small stakes to attract entrepreneurs to finance the costs incurred until recently, and the initial sponsors are now seeking the entry of an international partner to provide the equity required to achieve financial close.

Because of the small-scale nature of the company, the project faced considerable challenges in getting access to capital to finalize the development phase and implement the project. Raising the finance was also hampered by a number country related risks, including lack of political stability, corruption and the general investment climate in Kenya.

For instance, the Knaepen Package, a system for assessing political risk, classifies countries into eight country risk categories (0 - 7). The package is used by the OECD as well as some insurance companies and assesses the likelihood that a sovereign government will honour its contractual arrangements, in particular its payment obligations. The higher the category the higher the risk that the government will not honour its contractual arrangements and, hence, the higher the risk for investment. A recent assessment using the Knaepen Package methodology has put Kenya in risk category 6 (2 July 2010).

In a similar way, the Worldwide Governance Indicators developed by the World Bank, ranks Kenya below average when it comes to six different components of governance: i) Voice & Accountability, ii) Political Stability and Lack of Violence/Terrorism, iii) Government Effectiveness, iv) Regulatory Quality, v) Rule of Law, and vi) Control of Corruption.

Further indication regarding Kenya's country risks is given in the figure below, which ranks various countries in the region according to 'Rule of Law'. Percentile ranks indicate the percentage of countries worldwide that rate below the selected country. Higher values thus indicate better governance ratings. Kenya scores around 15% which means that only 15% of the countries in the world score worse in terms of 'Rule of Law'. The governance indicators aggregate the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, and international organizations.



Source: Kaufmann D., A. Kraay, and M. Mastruzzi 2008: Governance Matters VII: Governance Indicators for 1996-2007. http://info.worldbank.org/governance/wgi/mc_chart.asp#

Even though the investment climate in Kenya has been improving over the past couple of years (with a short downturn during and after the post-violence election in early 2008), the country credit rating of Kenya remains on the low side. A ranking published by the Institutional Investor (September 2007) ranked Kenya 109 out of 174 countries with a score of 30.6 out of 100 points. The post-election violence at the start of the 2008 has also proven how fragile the political system in Kenya is. In addition, Kenya also remains one of the most corrupt countries in the World. The

2009 Corruption Perceptions Index of Transparency International ranked Kenya 146 out of 180 with a score of 2.2 out of 10 (10=free of perceived corruption).

Due to these high risks associated with investment in Kenya, projects face considerable challenges in accessing finance and high returns on investment are needed in order to be able to raise the necessary finance. As was explained under Step 2 (Investment Analysis), the project has entered into an agreement with the local utility, KPLC, where KPLC will receive (part of) the carbon credit revenue in return for a higher guaranteed tariff. As was also demonstrated, this has enabled the project to offer an acceptable return to potential investors and make the project financially viable. Furthermore, through the arrangement with KPLC, the project kept its options open in terms of accessing capital from different potential sources and not only investors that understand carbon credit risks. This becomes clear if one consider the situation where the project, rather than building the carbon credits into the tariff arrangement with KPLC, the project would have accepted the lower tariff of 0.09 USD/kWh and, in addition, would have entered into an Emission Reduction Purchase Agreement to guarantee future project revenues from carbon credits. In principle, under this alternative scenario, the returns for the project would be the same as is the case now but arguably the risk profile of the project would be different because of the risks involved in developing and marketing the carbon credits. As a result, the pool of investors from which the project could have drawn, would have been narrowed down to those investors that understand the risks and opportunities in relation to carbon credits (e.g. only those banks who understand carbon credit risk would be inclined to provide a loan taking CDM registration into account). Therefore, it is argued that the CDM not only played a role in making the project financially viable, but the tariff arrangement with KPLC has also left the project with the opportunity to tap into a more diverse pool of potential investors.

Infrastructure barriers

The location of the project area has been selected because of its exceptional wind conditions. However, a significant disadvantage of the area is that it is located in a remote part of the country, at least 350km to the nearest load centre.

Loiyangalani is considered as one of the poorest divisions in Marsabit District, which itself is one of the poorest districts in Kenya. Acute poverty and the remoteness of the project area result in a situation where individuals or households cannot afford basic food and non-food items. Hence basic needs such as food, shelter, clothing, health and education cannot be met. The main causes of poverty in the project area include:

- Severe droughts;
- Inadequate water for domestic and non-domestic use;
- Undeveloped livestock/livestock products markets and unwillingness to sell livestock;

- Lack of employment opportunities;
- Over-dependency on relief food;
- Socio-political conflicts including ethnic clashes, banditry, cattle rustling, illiteracy and genderinequality.

In addition to the high levels of poverty in the project area, infrastructure and services are also extremely poor. There are no paved roads in the project area. Loiyangalani is connected to other areas through dry weather roads linking to North Horr, to Baragoi (to the south), to Gatab and to Marsabit via Kargi. In many areas, these roads are prone to seasonal floods, which make them impassable during heavy rains. Transmission and distribution infrastructure is completely absent in the project area and those who do have access to electricity are entirely dependant on off-grid (mostly diesel) generators. In fact, the absence of a grid connection point has been one of the key challenges in the development of the project. In addition, communication links are poor with intermittent cellular phone access only in some of the towns surrounding the project site. Access to water for construction and operations is another infrastructure barrier faced by the project activity.

It is also important to note the delicate security situation in and around the project area. This is a zone of ethnic tension, banditry and cattle rustling, driven in part by competition for scarce resources. Significant security incidences are reported weekly. United Nations, diplomatic mission and even national advisories suggest caution or armed escort and daylight only travel in the vicinity of the project area. Local stakeholder consultations have indicated the security situation may impact on existing and planned infrastructure in the area.

In order to overcome the above infrastructure barriers, the project will need to implement the following measures:

- The length of the route from the port of Mombasa, where the wind power equipment will arrive, and the project site south of Loiyangalani is approximately 1,200 km. Approximately 4,000 truckloads (to and from) will be required. A number of road adjustments, upgrades and constructions will be needed for the safe passage of the wind power units. Approximately 200 km of the road will undergo major reconstruction to a width of six metres.
- Establishment and running of a project “village” with housing, workshops, recreation centre, a bank, shops, offices, a laundry, a clinic and a fuel station will be required for project staff due to the absence of locally available facilities.
- Other measures such as installation of communication systems for project operations and water infrastructure (boreholes, sand dams, piping, etc).
- Increased presence of security staff and establishment and enhancement of local peace committees.

Most importantly, a 400 kV transmission line of approximately 428 km will need to be constructed to connect the project area to the national grid near Suswa, 70 km northwest of Nairobi. A power transmission substation will be built at the project site in Loiyangalani and a new terminal substation will be built at Suswa. Initially, the development and construction of the transmission line was part of the project activity. However, recently, responsibility for construction and operation of the transmission line has been transferred to the newly established, 100% government owned Kenya Transmission Company (KETRACO). The project proponent will continue with support for routing, engineering and technical studies.

Together, these infrastructure barriers constitute an important risk both for project planning and development, and for project implementation and might result in considerable delays. In contrast, these barriers only play a minor role in the implementation of fossil fuel-based power projects because the latter are less site-dependent and have more flexibility in identifying sites that are easy to access, close to load centres and that can be easily connected to the national grid.

Barriers due to prevailing practice, *inter alia*:

The project activity is a 'first-of-its-kind' in Kenya and the region. Until recently, there was only one grid-connected wind turbine operational in Kenya with a capacity of 0.35 MW. The wind turbine is operated by KENGEN and was a donated by Belgium in 1993. Using a soft loan from the Belgian government, KENGEN has recently added six more wind turbines, each with a capacity of 0.85 MW (total 5.1 MW). This 5.1 MW project is not registered as a CDM project activity.

Aside from the donor-financed 5.1 MW wind project, no other MW-scale wind farms exist in Kenya, or in East Africa. This is not due to a lack of potential wind sites or lack of project developers. On the contrary, 2005 and 2007 reports from the European Commission-funded *Mitigating Risk and Strengthening Capacity for Rural Electricity Investment in Africa* project identify at least four MW-scale wind farms in the pipeline in Kenya, none of which have been realized to date.[19][20] In some cases, development rights for a site have changed ownership more than once, still without successful implementation.

As opposed to the existing 5.1 MW wind project, the proposed project activity will be the first commercially financed wind power project in the Kenya and the region. In addition, the project will be constructed in a remote and marginalized area of Kenya where people have never had access to electricity before. This is entirely different from the 5.1 MW wind project, which was constructed in Ngong Hills, just outside the capital Nairobi and only a few kilometres away from the Kenya

[19] MIRREIA (2007a), Deliverable D6.1 *Finance Risk Mitigation*

[20] MIRREIA (2007b), Deliverable D4.2-4.4 *Potential Projects – Status Update. Kenya, Tanzania and Uganda*

national grid. Finally, the size of the project also makes it a 'first-of-its-kind'. In fact, the proposed project will be the first real proof that it is possible to commercially operate a large-scale wind farm in this part of Africa and that wind energy can be part of the solution to provide electricity to people in remote and marginalized areas. *Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):*

The first-of-its-kind barrier and infrastructure barrier do not prevent or have less impact on the implementation of alternative 4 "Electricity generated by the operation of grid-connected power plants and by the addition of new generating sources". More specifically, the implementation of a fossil fuel based power generation project, like a diesel plant, is not affected or less affected by the barriers that have been identified under step 3a. First, a number of fossil fuel based power generation projects, like diesel, have already been implemented in Kenya. In fact, since Lake Turkana Wind Power Limited started developing the proposed project activity in 2006, approximately 240 MW of fossil fuel based generating capacity has been installed in Kenya (the latest addition took place in October 2009 when Rabai Power commissioned a 90 MW diesel plant near Mombasa). This indicates that fossil fuel based power plants in general and diesel plants in particular are not a 'first-of-its-kind' in Kenya. Secondly, because of the experience with fossil fuel based power plants in Kenya, and because the investment cost for renewable energy projects (including wind power projects) are generally higher, it can be argued that fossil fuel based power projects are less affected by the access to capital barrier. In fact, as is well documented by various sources, renewable energy projects (including wind power projects) have high upfront investment costs but low operating costs. However, in Kenya, the advantage of having low operating costs is nullified because the cost of fuel is transferred directly to the consumer through the Fuel Cost Charge on the electricity bill in accordance with the 2008 Schedule of Tariffs for Supply of Electricity by the Kenya Power and Lighting Company Limited Set by the Energy Regulatory Commission under Powers Conferred under Section 45 of the Energy Act, 2006. Since the cost of fuel can be transferred to the consumer, a fossil fuel based power plant in Kenya does not only have the benefit of lower perceived risks and lower upfront investment, but can also benefit from the fact that the fuel cost charge is compensating for potentially high operating costs. Finally, fossil fuel based power plants, like diesel power plants, are less site dependent and, therefore, experience less impact from the infrastructure barrier. This as opposed to a wind power project, the siting of which highly depends on the availability of a good wind resource. In Kenya, the areas with the best wind potential are mostly situated in the Northern part of the country around Marsabit and, as was mentioned before, this area is highly underdeveloped and lacks any form of infrastructure, including a proper transmission and distribution system.

Since a diesel plant is not affected by the 'first-of-its-kind' barrier and infrastructure barrier, and less affected by the access to capital barrier, the project is additional under Step 3.

Step 4: Common practice analysis

In line with the "*Tool for the demonstration of and assessment of additionality*" (version 05.2), this step is omitted because in step 3 it has been demonstrated that the project is a 'first-of-its-kind'.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

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In line with ACM0002/Version 11, project emissions for the project activity are zero.

Project emissions

Project emissions are calculated using **equation (1)**:

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

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

- The project is not a geothermal or solar thermal project, which also uses fossil fuels for electricity generation. Therefore, $PE_{FF,y} = 0$
- The project is not a geothermal project. Therefore, $PE_{GP,y} = 0$
- The project is not a hydro project. Therefore, $PE_{HP,y} = 0$

Therefore, in line with ACM0002/Version 11, project emissions for the project activity are zero.

Baseline emissions

The baseline emissions (*BEy)* in year y are calculated using **equation (6)**:

$$BE_y = EG_{PJ,y} . EF_{grid,CM,y}$$

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)
EFgrid,CM,y = Combined margin CO2 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"

Because the project activity is a **Greenfield renewable energy power plant** and involves the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity $EG_{PJ,y} = EG_{Facility,y}$ (**equation (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)

The combined margin CO_2 emission factor

The combined margin CO_2 emission factor for the Kenyan grid, $EF_{grid,CM,y}$, is taken as a default value provided in the CDM approved standardized baseline, ASB0050-2020 “Grid Emission Factor for the Republic of Kenya”[21] version 01.0. In the previous version of the PDD, the parameter was registered as monitored one, and its value was 0.63 tCO_{2e}/MWh. However, the value of combined margin grid emission factor applied from ASB0050 is 0.4087 tCO_{2e}/MWh, which is conservative compared with the grid emission factor value applied ex-ante in the previous version of the PDD. This $EF_{grid,CM,y}$ value of 0.4087 tCO_{2e}/MWh will now remain fixed for the whole crediting period of the project activity. CDM approved standardized baseline “Grid Emission Factor for the Republic of Kenya” was calculated based on 2017-2019 data vintage.

Leakage

In line with ACM0002 version 11, no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected

[21] https://cdm.unfccc.int/methodologies/standard_base/2015/sb148.html

Emission reductions

The emission reductions of the project activity are calculated as follows:

ERy= BEy – PEy

Where:

ERy = Emission reductions in year *y* (t CO2e/yr)

BEy = Baseline emissions in year *y* (t CO2e/yr)

PEy = Project emissions in year *y* (t CO2/yr)

Because PE_y are zero, therefore:

ERy= BEy

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO2 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	The combined margin CO_2 emission factor for grid connected power generation in year y is using the ASB0050-2020[22], version 01.0, which is approved on 29/12/2020, hence valid for the monitoring period.
Value(s) applied	0.4087 tCO2/MWh
Choice of data or measurement methods and procedures	The value applied is taken from the ASB ASB0050-2020, version 01.0, which is approved on 29/12/2020. Therefore, this value is valid for the whole crediting period of the project activity.
Purpose of data	Calculation of baseline emissions
Additional comment	In the previous version of the PDD, the combined margin grid emission factor was established as a monitored parameter, and some secondary parameters were also added as parameters to be monitored, in order to arrive at its calculation. From this version of PDD, the combined margin grid emission factor is revised as fixed ex-ante parameter. This is done while applying all the CDM due procedures and through the procedure of PRC. Therefore, the additional parameters required to calculate combined margin grid emission factor (or any references to them) are also removed in this version. Also, since the parameter value is taken from a standardized baseline, addition of ex-ante fixed parameters (OM & BM values of grid emission factor) for supporting the calculations pertaining to combined margin grid emission factor is therefore not required.

B.6.3. Ex ante calculation of emission reductions

>>

In order to estimate the emission reductions of the project activity, one year of historic dispatch data (July 2008 – June 2009) were used. The data were obtained from KPLC. The estimated emission reductions are calculated as follows:

ERy= BEy

[22] https://cdm.unfccc.int/methodologies/standard_base/2015/sb148.html

Where:

ERy= Emission reductions in year *y* (t CO_2e/yr)
BEy= Baseline emissions in year *y* (t CO_2e/yr)

The baseline emission are calculated using the following formula:

$BE_y = EG_{facility,y} . EF_{grid,CM,y}$

Average future quantity of net electricity generation supplied by the project activity to the grid in year *y* (MWh/yr) is estimated to be in the order of 1,248,624 MWh.

The combined margin emission factor for the grid is taken from the standardized baseline ASB0050-2020: Grid Emission Factor for the Republic of Kenya (version 01.0).

Therefore:

$EF_{grid,CM,y}$ = 0.4087 tCO_2/MWh

And

BE_y = 1,248,624 * 0.4087 = 510,312

tCO_2/year

And

$ER_y = BE_y$ = 510,312 tCO2/year

More detailed and transparent calculations can be found in the Excel spreadsheet attached to this PDD.

B.6.4. Summary of ex ante estimates of emission reductions

Ex-ante estimations of emission reductions are based on the grid emission factor as calculated above and on the following construction and commissioning plan:

- 21 May 2013: Commissioning of first 60 wind turbines (51MW)
- From that date: installation and commissioning of one or two Vestas V52 wind turbine per day (i.e. capacity addition of 0.85MW or 1.7 MW per day)

- 20 January 2014: commissioning of final Vestas V52 wind turbine (i.e. plant running at full capacity of 310MW).

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2014-15	510,313	0	0	510,313
2015-16	510,313	0	0	510,313
2016-17	510,313	0	0	510,313
2017-18	510,313	0	0	510,313
2018-19	510,313	0	0	510,313
2019-20	510,313	0	0	510,313
2020-21	510,313	0	0	510,313
Total	**3,572,188**	0	0	**3,572,188**
Total number of crediting years	7			
Annual average over the crediting period	510,313	0	0	510,313

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Main and backup metering equipment installed at project activity site in linewith the provisions of the Power Purchase Agreement and the Kenya Electricity Grid Code

<table>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Year</th><th>Electricity Generation (MWh)</th></tr>
<tr><td>2013 (21 May 2013 – 31 December 2013)</td><td>275,380</td></tr>
<tr><td>2014</td><td>1,183,768</td></tr>
<tr><td>2015</td><td>1,248,624</td></tr>
<tr><td>2016</td><td>1,248,624</td></tr>
<tr><td>2017</td><td>1,248,624</td></tr>
<tr><td>2018</td><td>1,248,624</td></tr>
<tr><td>2019</td><td>1,248,624</td></tr>
<tr><td>2020 (1 January 2020 – 20 May 2020)</td><td>482,345</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Measurement methods and procedures</td><td>The net quantity of electricity generated is metered on site using the mainmetering system (SCADA controls and communication) and quantified ingeneration data and power export invoices to KPLC. The quantity of electricity supplied to the grid will be measured continuously and recorded monthly. LTWP shall install a data recorder and shall make a continuous recording of the Net Electrical Output. Such Net Electrical Output shall berecorded on appropriate magnetic media or equivalent. The data shall be stored in long-term data storage. The basic measurement period shall be 5 minutes. The metering shall register per measurement period the following data: per kWh and kVArh meter the delivered energy and reactive power and the metering period. The measurement period shallbe synchronized on the national standard time. The deviation of the start and stop time shall not be greater than 5 sec. When the synchronization system is out of service, the deviation of start and stop time shall be less as10 sec in max one week. All data shall be transferred to the meter data buffer, and to the SCADA systems of both KPLC and LTWP. In case the data measured and stored differ, the meter data buffer prevails.
The Metering System shall be read monthly on distance on the last day ofeach month (or such other day as may be agreed upon by the Parties) for
the purpose of determining the Net Electrical Output of the Plant since the preceding reading. LTWP shall read the Metering System by reading the login the SCADA system and taking the kWh meter position on the first dayof the calendar month at 0:00 midnight. KPLC shall verify the same
through their SCADA system.
All data collected as such will be archived electronically and be kept at leastfor two years after the end of the last crediting period.</td></tr>
<tr><td>Monitoring frequency</td><td>Recorded once every month</td></tr>
</table>

QA/QC procedures	Actual electricity supplied by the project activity to the grid as per main metering equipment measurements. Reconciliation of data with backup metering system as needed. Meters will have a fixed seal not to be brokenby the project proponent. Monthly on-site physical verification checks, including use of photographic facilities. To be double-checked with receipt of sales/invoices. The Main Metering Equipment and the Back-Up Metering Equipment shall be installed according to the requirement of the Kenya Electricity Grid Code and shall be to an international standard agreed between LTWP and KPLC providing a measured accuracy of class 0.2%. Any programmable settings available within a metering installation, data logger or any peripheral device, which may affect the resolution of displayed or stored data, shall meet the relevant requirements of IEC 1036 and shall comply with any applicable specifications or guidelines (including any transitional agreements) specified by the Kenya Bureau of Standards (KEBS). The methodof calibration and frequency of tests shall be agreed between LTWP and KPLCbased on knowledge of the performance and the design of the installed meters and the manufacturers' recommendations.
Purpose of data	Calculation of Baseline Emissions
Additional comment	The Power Purchase Agreement Schedules contain detailed procedures on howelectricity metering will take place.

B.7.2. Sampling plan

>>
Not Applicable.

B.7.3. Other elements of monitoring plan

>>
For a detailed description of the monitoring plan see Annex 4.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
The start date of the project will be 30/06/2011.

The starting date of the project has been determined in line with the definition of the *Starting Date of a CDM Project Activity* as given in version 05 of the Glossary of CDM terms and is based on the expected date that the contract with the wind turbine supplier will be executed.

C.2. Expected operational lifetime of project activity

>>
20 years (240 months)

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
Renewable

C.3.2. Start date of crediting period

>>
21/05/2013

C.3.3. Duration of crediting period

>>
7 years (84 months)

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
In line with the *Environmental Management and Coordination Act of 1999* and *the Environmental (Impact Assessment and Audit) Regulations 2003*, the project activity has carried out an Environmental and Social Impact Assessment (ESIA), which includes consideration of transboundary impacts.[23]

The ESIA Report was finalized in July 2009 and made available for public comments.

[23] Lake Turkana Wind Power Project. Environmental and Social Impact Assessment Study. July 2009.

Based on the ESIA, the National Environment Management Authority (NEMA) issued an Environmental Impact Assessment Licence for the project activity, dated 24 July 2009.

D.2. Environmental impact assessment

>>

The implementation of the Lake Turkana Wind Power (LTWP) project in northern Kenya will lead to a variety of socioeconomic benefits including stabilization of electricity in Kenya, increased economic growth, increased Government revenue, increased employment, enhanced infrastructure and other improvements, which also benefit the project area. Against the benefits brought about by development of the project, certain negative impacts may result from both the construction and operation phases of the wind farm.

The project activity is likely to cause minor negative impact on the environment of the project area including loss of habitat, destruction of floral and faunal communities, disturbance to livestock, soil erosion and potential siltation of aquatic habitats, pollution, ponding conditions and increased noise levels. Road construction activities will contribute to air pollution through gaseous emissions. This will emanate mainly from exhaust pipes for vehicles and machinery used in road construction. The construction and operation of the power plant is likely to release air emissions from construction machinery, turbines, vehicles transporting the turbines from Mombasa to the project site, airplanes travelling up and down from Nairobi to the project site, diesel generators, workshops and camps sites. The composition of gases released to the environment will include carbon dioxide, water vapour, organic acids, ammonia and traces of carbon monoxide, nitrogen oxides and sulphur oxides among other substances. The Environmental Management Plan for the project recognizes the increase in gaseous emissions and dust levels that will be caused during the construction phase through transport and construction activities. Therefore, a number of mitigation measures will be put in place to limit gaseous emission and dust levels, including use of appropriate machinery and regular servicing of vehicles.

Emissions from transport and construction, as well as dust levels will also be monitored during the construction phase.

Perhaps the most serious direct negative impact the project is likely to have on ecology of the area is the potential for bird mortality through collisions with the turbines. Population influx may also increase pressure on natural resources in and around the project area, for fuel wood and building materials. In terms of negative social impacts, population influx to the vicinity during the construction and operation phases of the project may result in cultural contamination, visual intrusion, increased incidences of diseases, increased insecurity and community conflicts, labour force management challenges and increased likelihood of accidents and occupational hazards.

A summary of the affected key environmental and social variables and the intensity of impact as extracted from the Environment and Social Impact Assessment Study is provided:

Parameter	Intensity of impact
Stabilization of electricity sector	+3
Promotion of economic growth	+3
Contribution to the Government revenue	+3
Potential for carbon market	+3
Increased employment	+2
Improved communication	+2
Visual intrusion	-1
Cultural contamination	-1
Increased incidence of diseases	-1
Labour force management challenges	-1
Increased risk of accidents	-1
Loss of habitat	-1
Destruction of flora and fauna	-1
Disturbance to livestock	-1
Soil erosion and siltation	-1
Pollution	-1
Ponding conditions (in quarries and pits)	-1
Increase in noise levels	-1
Birds' mortality through collisions with turbines	-2

Key
+3 – High positive impact (impact with national or international benefits)
+2 – Moderate positive impact (likely to impact on quality of life within the project area
-1 – Light negative impact (minor negative impact at the local level)
-2 – Moderate negative impact (impact likely to adversely affect the project area if not mitigated)

Avifauna mortality is seen as the most significant potential negative environmental impact of the project due to bird strikes especially given the relative proximity of the project area to Lake Turkana and associated migratory bird corridors. However, according to the ESIA, much of the detrimental effects of the wind farm on birds can be reduced to modest levels through careful siting, design and mitigation proposals as follows:

- Siting of the wind park should be done as early as possible in the planning stage. The project activity should be sited at least 3 km away from the Lake Turkana shoreline and also at least 1 km away from the forested areas of Mount Kulal and other hills in the project area;

- Cumulative effects of large wind farms may be considerable where the installations act as a barrier and bird movements are consequently displaced. This may lead to the disruption of ecological links between feeding, breeding and roosting areas. Suitable design can alleviate this impact on birds by providing for wide corridors between clusters of turbines;
- To avoid or reduce bird strikes, the project developer should minimise the attractiveness of the project area. This can be achieved through avoidance of introduction of open water or sewage ponds and the proper disposal of solid waste within a radius of 2 to 5 km around the wind park;
- Lighting of turbines has the potential to attract birds, especially at night and in bad weather, thereby potentially increasing the risk of collision. Any intensive lighting of the wind turbines should be avoided to reduce attractiveness to nocturnal and migrant birds.

The site of the wind farm is located at least 10 km from the lakeshore and, therefore, expected to be out of the path of migratory birds. The final version of the Environmental and Social Impact Assessment (July 2009) concluded that: “It should […] be noted that the turbines will be located at least 10km from the shore of Lake Turkana on the plateau behind the Ongipi massif. Since migrating and over wintering birds are normally associated with Lake Turkana shoreline and aquatic habitats, collision risk of birds is expected to be low”. In addition, the wind turbines will be clustered and located on the ridges with adequate spacing in between to allow for the passage of birds. As such, the project activity is already in line with two of the above recommendations. The project activity intends to also adhere to the other recommendations regarding bird impacts. Based on these actions,
In addition, the Environmental and Social Impact Assessment (ESIA) study recommends a number of measures to reduce other negative impacts including suggestions for noise abatement, waste management, water quality, protection and restoration of habitat and biodiversity, minimization of soil erosion and siltation and prevention of accidents and health hazards, among others.

Given that environmental management and monitoring have been identified as important for the protection of the ecology of the project area, the ESIA provides detailed suggestions for such. Based on this, and also as part of the project proponent’s own voluntary corporate social responsibility initiative, the project will establish, implement and monitor an Environmental and Social Management Plan. The plan, with an initial 250,000 Euros annual budget, will employ a full-time on-site Environmental and Social Development Manager, who will be assisted by a project team and representatives of local authorities, communities and civil society. Environmental and social impact monitoring will be conducted through (a) regular site visits, (b) systematic collection of data through measurements and observations and (c) periodic interviews with local stakeholders for their opinion on the implementation of the project. Modifications, if any, to the project activity can be made based on monitored findings.

The project activity will undergo an annual Environmental Audit, as required by Kenyan law.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>

A number of informal and formal stakeholder consultations have been conducted with reference to the project activity. Formal consultations include:

Date	Description
26 May 2007	Meeting with community Elders at Loiyangalani town
16 – 25 November 2007	Investigative and consultative mission to the wider project area for the Environmental and Social ImpactAssessment (ESIA)
21 & 22 April 2008	Stakeholder consultation at Loiyangalani to review the findings of the ESIA report
4 – 16 May 2009	Investigative and consultative mission to the wider project area to help design the project Corporate and Social Responsibility Programme
17 & 18 July 2009	CDM and Gold Standard local stakeholder consultationheld at Loiyangalani town

In addition, ongoing informal consultations with local stakeholders take place between consultants to the project proponent based on site or frequently visiting the project area and members of the LTWP team during almost monthly visits.

In terms of stakeholder feedback specific to the CDM component of project, a local stakeholder consultation was held on 17 & 18 July 2009 at the Palm Shade Camp in Loiyangalani town, Marsabit District, northern Kenya. The meeting doubled as a Gold Standard local stakeholder consultation. The CDM and Gold Standard meeting was the fifth formal local stakeholder consultation held to discuss theplanned wind farm.

Given the remoteness of the project area and in the absence of Internet services in most of the neighbouring villages, it was decided to physically distribute the invitations. A logistics company was hired to assist. One team member from Carbon Africa Limited, the carbon project developer, spent eight days (4-11 July 2009) travelling from one location to another to handover the invitations to local people, local policymakers and NGOs working in the project area. While distributing the invitations, various pre-consultation meetings were held to get an initial impression

of the key issues and concerns as well as to get advice and inputs on how best to organize the stakeholder consultation meeting.

Where possible, the physical distribution of invitations was followed and complemented by emails, telephone calls and text message. Stakeholders in Nairobi were invited through email and telephone calls. In addition, an advertisement was put in one of the national newspapers (The Daily Nation – 6 July 2009).

The project arranged for travel and accommodation for stakeholders that needed to come from the widerproject area as well as from Nairobi to attend the workshop.

Approximately 70 people attended the meeting. This included individuals, official representatives and organizations from Loiyangalani, Gatab, South Horr, Mt. Kulal, Marsabit, Laisamis and Nairobi. Various levels of local and regional government, traditional leaders, local communities, pastoralists, ethnic minorities, civil society, faith-based organizations, international organizations, women and youth were present.

Comments from stakeholders were received during the CDM and Gold Standard consultation meeting as well as through email, telephone, text message and meetings in Nairobi. The comments were compiled in a Gold Standard stakeholder consultation report. The report complements the findings from previous stakeholder consultations.

After compilation of the Gold Standard stakeholder consultation report, the report was distributed to the different communities in the project area for further feedback (September 2009 – February 2010).

E.2. Summary of comments received

>>

Land issue

Communities living in and around the project area are mainly pastoralists and their livelihoods greatly depend on access to land. Various stakeholders raised concerns about the implication of the project on future access to land. Comments where also received on the lack of transparency about how the land hadbeen leased to the project developer.

Environmental impacts

Various comments were received in relation to potential environmental impacts of the project, both during the construction phase and during the operational lifetime of the project. Comments include:

- Dust: The combination of dry and windy conditions in the project area already creates high levels of dust in the project area. During the construction phase this situation might be temporarily aggravated.
- Water quantity and quality: Water availability in the project area is generally low and constitutes one of the major challenges for communities living in and around the project area. Concerns were raised about a potential reduction in water availability due to increase of water use during the construction phase of the project.
- Noise pollution: concerns were raised about the noise generated by the wind turbines
- Visual intrusion: some comments were received about the potential negative visual impact of the project.
- Biodiversity: The project will result in an influx of people which will likely increase pressure on local natural resources, especially for charcoal and fuel wood. Lake Turkana to the west also has significant aquatic life, including 48 fish species. Eighty-four species of water bird, 34 Palaeartic migrants and 10% (100,000) of East Africa and South East Asia's population of Little Stints (*Calidris minuta*) have been recorded on Lake Turkana near the project site. Three national parks and a biosphere reserve are located outside of but in the region of the project site, and the Kulal White-eye (*Zosterops kulalensis*) is endemic to one of them. Concerns were therefore expressed about the potential negative impacts of the project on biodiversity in general and avifauna in particular.

Benefit sharing

Because of high levels of corruption in Kenya, local stakeholders expressed reservations regarding distribution of the benefits of the project with local communities. One of the key questions was how the project will generate employment for local people and how the project will ensure transparency in the allocation of jobs and the avoidance of nepotism.

Communication and transparency

Various comments were received on the lack of communication between the project proponent and the local communities. Many stakeholders felt they were not properly informed about progress and plans.

Health and safety

In terms of health and safety impacts, the following comments were received:

- Increase in disease transmission due to influx of population may not be properly addressed
- Occupational health and safety measures for employees' protection may not be sufficient
- Compensation for victims (human and livestock) of accidents from project activities may beneeded

E.3. Consideration of comments received

>>

Land issue

The project proponent followed approved protocol at every stage and level of government to obtain lease of the land. Given that the process of land allocation to the project was of significant concern and that it was primarily an issue between the Marsabit County Council (custodian of the land in the project area) and local residents, the Marsabit County Council was given the opportunity to clarify the leasing process during the stakeholder consultation. The Council also agreed to discuss further any land-related concerns with community members after the meeting.

During the stakeholder consultation, it was also stressed again that the project will not fence off the project area and communities are free to enter the area where the wind turbines will be installed.

Environmental impacts

- Dust: the project will take necessary measures to reduce dust creation during the construction phase by, for example, sprinkling water.
- Water quantity and quality: in order to avoid competition with local water use, the project will drill its own boreholes for supplying the project with sufficient water. After the construction phase, excess boreholes will be made available to local communities.
- Noise pollution: It is estimated that significant noise (40-50 decibels) will not be heard further than 3 km from the wind turbines. The project site will also be 40 km from the nearest town, Loiyangalani, hence no major noise pollution is expected.
- Visual intrusion: visual intrusion will be hard to avoid (turbines will be painted to blend in), but aside from changes to "intrinsic" scenic value, it is difficult to predict if this will have a positive or negative impact on tourism.
- Biodiversity: the project area is planned outside the boundaries of national parks and reserves. In addition, the project area will be constructed at least 10 km from Lake Turkana leaving a corridor for migratory species. The project will also implement proper on-site waste management measures as to avoid attracting birds to the site.

The Environmental and Social Impact Assessment for the project activity, which was developed in consultation with stakeholders, have suggested a number of mitigation measures to improve the environmental performance of the Lake Turkana wind farm. As explained above, one of the proposed measures that will be implemented is the establishment of a dedicated environmental management and monitoring programme for the project, headed by a full-time Environmental and Social Development Manager. The environmental component of the programme will include an annual Environmental Audit, as required by Kenyan law.

Benefit sharing

The wind farm is expected to generate a total of 500 jobs during the construction phase and 200 jobs during the operational lifetime of the project. Selection of employees will be merit-based in and line withinternational standards.

In addition to job creation, the project will also implement a Corporate Social Responsibility Programme. The project developer is currently undertaking extensive consultations through a third party consultant for the design and operationalization of the programme. The programme will be dedicated to integrated development work in the Lake Turkana region, with a likely focus on livelihoods, health, infrastructure, water, security and education. The programme will be financed with a percentage of the revenues from the sale of electricity to the national grid. The proposed initiative will be implemented as a public-private partnership and has the potential to bring more development resources to the region than existing donor support. As the details of the Corporate Social Responsibility Programme are still being assessed in cooperation with local stakeholders, it is highly likely that the programme will directly address many of the comments raised.

Communication and transparency

A number of copies of previous stakeholder consultation and project reports were already distributed during the CDM and Gold Standard consultation in July 2009. In addition, 20 CDs containing digital copies of the reports as well as additional project documentation were distributed to key community members.

As a follow up to the CDM stakeholder consultation, further copies of all relevant and requested reportswere distributed as well as another 50 CDs.

During the stakeholder consultation, it was also agreed to appoint neutral community focal points forfuture communication with the project proponent.

Health and safety

Companies involved in the construction and operation of the project will respect international labourstandards to ensure the safety and health of their employees.

Lake Turkana Wind Power investors and lending institutions will adhere to the Equator Principles for environmental and social responsibility in project finance.

The increase of disease transmission due to influx of population will be mitigated through improvedhealth services in the area as a result of the Corporate Social Responsibility Programme.

SECTION F. Approval and authorization

>>

Project was approved by National Environmental Management Authority (Kenya DNA) on 24th June 2010.

Appendix 1. Contact information of project participants

Organization name	Lake Turkana Wind Power Limited
Country	Kenya
Address	Lake Turkana Wind Power Limited Ground Floor, Baobab Block Karen Office Park P.O. Box 2114-00502 Nairobi
Telephone	+254 (0)20 2726901
Fax	N/A
E-mail	info@laketurkanawindpower.com
Website	www.laketurkanawindpower.com
Contact person	Phylip Leferink

Organization name	Carbon Africa Limited
Country	Kenya
Address	P.O. Box 14938, Nairobi, Pin Code- 00800
Telephone	+254-204343526
Fax	N/A
E-mail	info@carbonafrica.co.ke
Website	www.carbonafrica.co.ke
Contact person	Adriaan Tas

Appendix 2. Affirmation regarding public funding

Not Applicable.

Appendix 3. Applicability of methodologies and standardized baselines

The Kenyan Power Sector

For Kenya to achieve its target of becoming an industrialized nation by 2030 in line with its *Vision 2030 Development Strategy* (2008), a reliable supply of commercial energy is crucial.
The power sector falls under the Ministry of Energy (MoE) and is regulated by the Electricity Regulatory Commission (ERC). The latter regulates the entire energy sector having replaced the Electricity Regulatory Board (ERB) after repeal of the *Electric Power Act 1997* and consequent enactment of the *Energy Act 2006*.[24] ERC is empowered to set, review and adjust tariffs, for all persons who transmit or distribute electrical energy for sale and to ensure competition in the power sub-sector, where this is feasible, such as in the generation function. ERC seeks to protect consumer interests, guarantee economic and financial viability of sub-sector utilities, and enhance the confidence of consumers, investors and lenders in the Kenyan power sub-sector.

The new *Energy Act 2006* (a consolidation of the *Electric Power Act 1997* and the *Petroleum Act 2000*) has set out the National Policies and Strategies for short to long-term energy development. The broad objective of the new Energy Policy is to ensure the provision of adequate, quality, cost-effective, affordable supply of energy while encouraging environmental conservation. The policy has identified anumber of key challenges, including:

- Upgrading and expanding the current energy infrastructure.
- Promoting energy efficiency and conservation.
- Protection of environment.
- Mobilizing requisite financial resources.
- Ensuring security of supply through diversification of sources and mixes in a cost effective manner.
- Increasing accessibility of energy services to all segments of the population including rural electrification.
- Enhancing legal regulatory and institutional frameworks to create consumer and investor confidence.
- Enhancing and achieving economic competitiveness.

Power Generation

The existing installed capacity for grid-connect electricity generation in Kenya amounts to 1343 MW. Hydropower accounts for roughly 55% of the capacity. Geothermal and thermal account for 12% and 32%, respectively. Electricity generated from wind (5.1 MW) and biomass (26 MW) is limited. The 5.1 MW of existing wind capacity is from a small wind farm in the Ngong Hills near Nairobi, constructed with a soft loan from the Belgian government and commissioned in August 2009. A subsequent 5 MW and an additional 10 MW of installed capacity are planned for the same

site with, respectively, further financing from Belgium and a soft loan from the Spanish government. However, even with such wind will still be a marginal resource at just over one percent of installed capacity.

Aside from these donor-supported activities, no other MW-scale wind farms exist in Kenya, or in East Africa. This is not due to a lack of potential wind sites or lack of project developers. On the contrary, 2005 and 2007 reports from the European Commission-funded *Mitigating Risk and Strengthening Capacity for Rural Electricity Investment in Africa* project identify at least four MW-scale wind farms in the pipeline in Kenya, none of which have been realized to date. In some cases, development rights for a site have changed ownership more than once, still without successful implementation.

The most important electricity producer is the state owned Kenya Electricity Generating Company (KENGEN). Besides KENGEN there are four Independent Power Producers (IPP) being Iberafrica, Tsavo Power, Orpower and Mumias. Aggreko is an Emergency Power Producer with two power plants. Together the non-KENGEN power producers have an installed capacity of 330 MW. The table below gives an overview of the grid-connected power plants in Kenya. The installed capacities are based on the KPLC Annual Report and Financial Statement for the Year Ended 30 June 2009. Electricity generation of the individual plants is calculated based on hourly dispatch data provided by KPLC.

Name	**Type**	**Owner**	**Year**	**Capacity (MW)**	**Electricity generation 2008-2009 (MWh)**	
Mumias	Biomass	Mumias	2005	2	4,782	
Total Biomass				***2***	***4,782***	
Olkaria II	Geothermal	KenGen	2003	70	529,948	
Orpower 4	Geothermal	IPP	2000/2009	48	279,540	
Olkaria I	Geothermal	KenGen	1985	45	366,807	
Total Geothermal				***163***	***1,176,295***	
Sondu Miriu	Hydro	KenGen	2008	60	330,649	
Gitaru	Hydro	KenGen	1999	225	651,335	
Turkwel	Hydro	KenGen	1991	106	519,388	
Kiambere	Hydro	KenGen	1988	156	615,493	
Masinga	Hydro	KenGen	1981	40	128,523	

Kamburu	Hydro	KenGen	1976	94.2	327,046	
Kindaruma	Hydro	KenGen	1968	40	157,011	
Gogo	Hydro	KenGen	1958	2	5,956	
Sagana	Hydro	KenGen	1955	1.5	6,259	
Sosiani	Hydro	KenGen	1955	0.4	1,644	
Tana	Hydro	KenGen	1955	14.4	44,461	
Wanji	Hydro	KenGen	1954	7.4	31,903	
Mesco	Hydro	KenGen	1933	0.38	2,581	
Ndula	Hydro	KenGen	1925	2	4,563	
Total Hydro				***748.78***	***2,826, 811***	
Aggreko (embakasi)	Thermal	Aggreko	2006	110	738,501	
Aggreko (eldoret)	Thermal	Aggreko	2006	40	174,040	
Tsavo Diesel	Thermal	Tsavo	2001	74	564,916	
Kipevu Diesel	Thermal	KenGen	1999	75	376,059	
Kipevu GT2	Thermal	KenGen	1999	30	87,927	
Iberafrica	Thermal	Iberafrica	1997	56	345,677	
Kipevu GT1	Thermal	KenGen	1987	30	99,348	
Nairobi South Fiat	Thermal	KenGen	1973	13.5	9,219	
Total Thermal				428.5	2,395, 686	
UETCL	Import				24,494.06	
Total Import				0	24,494	
Ngong wind	Wind	KenGen	1993	0.35		
Total Wind				0.35	0	
Grand Total				1,343	6,428,068	

Due to the ever-increasing demand for electricity in Kenya there are various plans in the pipeline for addition of new generation sources. The plans largely reflect the existing power generation mix with a focus both on fossil fuel-based facilities and renewable energy projects. In terms of renewable energy, the focus is mainly on the further exploitation of geothermal resources. There are also a number of coal-fired power plant facilities in the pipeline that will considerably add to the fossil fuel-based capacity in Kenya. Expected capacity additions for the coming years are described in detail in the *2009-2029 Update of the Least Cost Power Development Plan* prepared by the Ministry of Energy and the Kenya Power and Lighting Company. Similar indications are given in

the *KPLC Annual Report & Financial Statements for the Year Ended 30 June 2009*. Candidate generation resources considered by the Ministry of Energy include "geothermal, coal, oil-fired plants and imports from neighbouring Ethiopia".

The Kenyan Grid

The Kenyan electricity system has one grid system that serves the entire country. All generating facilities feed their power to this grid, which is owned by the Kenya Power and Lighting Company (KPLC). KPLC has the exclusive right to transport, distribute and sell electricity. Certain parts of the country are served by isolated fossil fuel generators.

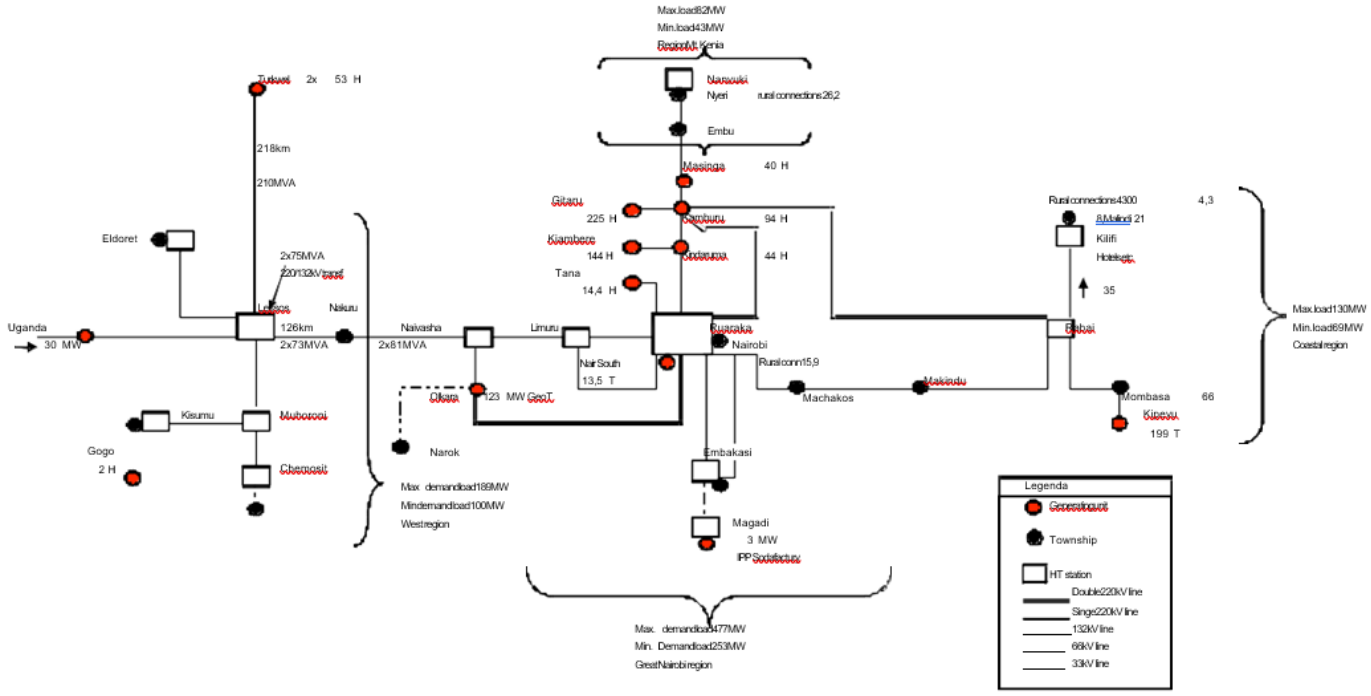

Figure 1: Schematic overview of existing power plants and transmission lines in Kenya

The transmission capacity as of June 2007 consisted of 1,323 km 220 kV and 2,122 km 132 kV lines, and the distribution system comprised 632 km 66 kV, 29 km 40 kV, 11,163 km 33 kV and 21,918 km 11 kV lines.

Also the national power grid will require considerable expansion to enable power transmission across the country in line with targeted growth, access scale up and an acceptable level of

reliability. Envisaged additional transmission lines for power evacuation other than project specific power evacuation lines include Mombasa-Nairobi and Olkaria-Nairobi and three regional interconnector projects linking Kenya with Ethiopia, Uganda and Tanzania.

Kenya Least Cost Power Development Plan 2009-2029

Year ending 30th June	Configuration				Capital Cost (Mln US$)	Type	Added Capacity MW	Total Effective Capacity MW	System Peak MW	Reserve Margin MW	Reserve Margin as %age of Peak
2008								1,135	1,086	49	5 %
2009	-1	×	8	OLK3	0	Geothermal	-8				
	-1	×	4	OLK3	0	Geothermal	-4				
	2	×	24	OLK3	135	Geothermal	48				
	3	×	8.7	COGN	33.74	Cogeneration	26				
	10	×	5.3	IBA1	68.25	MSD	53				
	-1	×	72	KIAM	0	Hydro	-72				
	1	×	82	KIAM	7.6	Hydro	82				
	6	×	0.9	WIN2	16	Wind –Ngong 2	5	1,265	1188	77	6 %
2010	3	×	10	IBA1	39	MSD	30				
	9	×	9.8	RBD1	115.19	Rabai MSD	89				
	-1	×	2.4	TAN1	0	Hydro	-2				
	-2	×	4	TAN2	0	Hydro	-8				
	2	×	4.3	TAN1	22.55	Hydro	9				
	2	×	5.5	TAN2	22.55	Hydro	11				
	-1	×	72	KIAM	0	Hydro	-72				
	1	×	82	KIAM	7.6	Hydro	82				
	9	×	10	MSD1	117	MSD	90				
	6	×	10	MD20	78	MSD	60				
	6	×	10	MD20	78	MSD	60				
	-1	×	10	FIAT	0	GT	-10				
	30	×	1.7	WIN1	0	Wind	50	1,652	1334	318	24 %
2011	6	×	20	MD20	156	MSD	120				

	0	×	0	MASI	0	Hydro	0				
	1	×	35	OK23	137	Geothermal	35				
	0	×	0	TRNS	280	TRANS(MSA-NRB)	0				
	0	×	0	TRNS	247	TRANS(LSM-SUS)	0				
	15	×	3.3	WIN3	150	Wind	50				
	2	×	9.8	C150	55.5	Coal(ARM1)	20	1,876	1481	395	27%
2012	15	×	3.3	WIN3	150	Wind	50				
	1	×	20	KIND	0	Hydro	20				
	2	×	10	SAHP	78	Hydro	21				
	2	×	150	C150	700	Coal	300				
								2,267	1672	595	36%
2013	0	×	0	TRNS	50	TRANS(LESS-OLK)	0				
	0	×	0	TRNS	34	TRANS(NRB-OLK)	0				
	0 0 2 1	× × × ×	0 0 70 150	TRNS TRNS GEOT C150	39 92 462 300	TRANS(LESS-TO) TRANS(RB-GAR-LAM) Geothermal Coal	0 0 140 150	2,557	1838	719	39%
2014	-1 2	× ×	15 70	OLK1 GEOT	0 462	Geothermal Geothermal	-15 140	2,682	2029	653	32%
2015	1 0 0 1	× × × ×	300 0 0 70	IMP1 TRNS SSTN GEOT	752 40 43.7 231	IMPORT TRANS(LONG-OLK) TRANS(Substation) Geothermal	300 0 0 70	3,052	2242	810	36%
2016	-2 3	× ×	15 70	OLK1 GEOT	0 693	Geothermal Geothermal	-30 210	3,232	2487	745	30%
2017	1 1	× ×	230 70	IMP1 GEOT	0 231	IMPORT Geothermal	230 70	3,532	2767	765	28%
2018	2 1 0 2	× × × ×	70 150 0 70	GEOT IMP1 TRNS GEOT	462 0 41 462	Geothermal IMPORT Line Geothermal	140 150 0 140	3,962	3066	896	29%

2019	-6 0 2 1	× × × ×	13 0 150 50	KIP1 TRNS C150 IMP1	0 21.8 600 0	MSD Line Coal IMPORT	-75 0 300 50	4,237	34 01	836	25%
2020	-10 1 0 3	× × × ×	5.7 370 0 150	IBA1 IMP1 TRNS C150	0 0 265. 4 900	MSD IMPORT Line Coal	-57 370 0 450	5,000	37 74	1,2 26	32%
2021	1 2	× ×	240 70	IMP1 GEOT	0 462	IMPORT Geothermal	240 140	5,380	41 88	1,1 92	28%
2022	-7 1 2 0	× × × ×	11 330 70 0	KIP2 IMP1 GEOT TRNS	0 0 462 41	MSD IMPORT Geothermal Line	-74 330 140 0	5,776	46 47	1,1 29	24%
2023	-1 -1 3 3	× × × ×	30 30 70 150	KGT1 KGT2 GEOT C150	0 0 693 900	GT GT Geothermal Coal	-30 -30 210 450	6,376	51 51	1,2 25	24%
2024	3 0 0 1 1 3	× × × × × ×	70 0 0 90 90 150	GEOT TRNS TRNS G90M G90K C150	693 41 262. 3 73.9 73.9 900	Geothermal Line Line GT GT Coal	210 0 0 90 90 450				
2025	1 1 3 3	× × × ×	90 90 70 150	G90K G90E GEOT C150	73.9 73.9 693 900	GT GT Geothermal Line	90 90 210 450	7,216	57 06	1,5 10	26%
	0	×	0	TRNS	41			8,056	63 18	1,738	28%
2026	3 3 1 3 1 4	× × × × × ×	70 150 90 70 90 20	GEOT C150 G90K GEOT G90M MD20	693 900 73.9 693 73.9 104. 3	Geothermal Coal GT Geothermal GT MSD	210 450 90 210 90 80	9,186	69 95	2,191	31%
2027	2	×	90	G90K	147.	GT	180				

	3 0 3 3	× × × ×	70 0 70 150	GEOT TRNS GEOT C150	8 693 41 693 900	Geothermal Line Geothermal Coal	210 0 210 450 0	10,236	77 42	2,494	32%
2028	2 -2 -3 3 3 0	× × × × × ×	150 24 8.3 70 150 0	C150 OLK3 COGN GEOT C150 TRNS	600 0 0 693 900 41	Coal Geothermal Cogeneration Geothermal IMPORT Line	300 -48 -25 210 450	11,123	85 68	2,555	30%
2029	3 2 1 1 3 0 4 4 2	× × × × × × × × ×	70 150 90 90 70 0 20 20 150	GEOT C150 G90K G90K GEOT TRNS MD20 MD20 C150	693 600 73.9 73.9 693 41 104. 3 104. 3 600	Geothermal Coal GT GT Geothermal Line MSD MSD Coal	210 300 90 90 210 0 80 80 300	12,483	94 80	3,003	32%

References:

- *Electric Power Act 1997*
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- *Retail Electricity Tariffs Review Policy 2005*
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- KenGen website: www.kengen.co.ke
- KPLC website: www.kplc.co.ke

- Ministry of Energy website: www.energy.go.ke
- Kenya Vision 2030
- Least Cost Power Development Plan 2009-2029

Appendix 4. Further background information on ex ante calculation of emission reductions

Appendix 5. Further background information on monitoring plan

Not Applicable.

Appendix 6. Summary report of comments received from local stakeholders

These are already discussed in Section E.2 of the PDD.

Appendix 7. Summary of post-registration changes

Following are the post registration changes to the PDD, for its version 5.0.
1. The combined margin grid emission factor, $EF_{grid,CM,y}$, which was a parameter to be monitored in the previous version (4.0) of the PDD, will now be an ex-ante fixed parameter. The fixed value for the parameter is applied from ASB0050-2020 “Grid Emission Factor for the Republic of Kenya” version 01.0, and is 0.4087 tCO2e/MWh.

2. A couple of default ex-ante fixed parameters were used for the calculation of combined margin grid emission factor, $EF_{grid,CM,y}$. They are $NCV_{i,y}$ & $EF_{CO2,i,y}$. Since the applied value does not require any further application of those fixed ex-ante values, these are now removed from Section B.6.1.

3. Using the default value provided under standardised baseline ASB0050-2020 does not require the monitoring of parameters $FC_{i,m,y}$,$FC_{i,n,y}$ & $EG_{m,y}$,$EG_{n,h}$, since these parameters are used to calculate the Combined Margin Grid Emission Factor. As the project activity is already applying a default value for grid emission factor (taken from a standardized baseline), monitoring these parameters is not required. Hence, these are removed from Section B.6.2.

4. The address of the project participant Lake Turkana Wind Power Limited is changed from what was provided in the previous version of the PDD (ver. 4.0). Therefore, the address of the PP is now changed in Appendix – 1.

5. Some editorial changes and corrections are made to the PDD, in order to make it consistent with the latest version of the applied PDD template. The transition of information required addition and deletion of information at certain places, which is made in-line with the form filling guidelines provided at the end of the PDD template.

Appendix 8. Geographical Coordinates of wind turbines

001	N2 33 52.2 E36 48 37.7	184	N2 29 44.0 E36 45 57.5
002	N2 33 49.9 E36 48 36.8	185	N2 29 44.1 E36 47 28.0
003	N2 33 47.7 E36 48 36.1	186	N2 29 42.9 E36 48 57.1
004	N2 33 45.4 E36 48 35.2	187	N2 29 41.7 E36 45 57.2
005	N2 33 43.2 E36 48 34.4	188	N2 29 40.1 E36 47 30.7
006	N2 33 40.9 E36 48 33.6	189	N2 29 40.1 E36 48 57.1
007	N2 33 38.7 E36 48 32.9	190	N2 29 39.5 E36 45 56.5
008	N2 33 36.5 E36 48 32.0	191	N2 29 37.3 E36 45 55.9
009	N2 33 34.2 E36 48 31.2	192	N2 29 37.4 E36 47 31.2
010	N2 33 31.9 E36 48 30.5	193	N2 29 37.3 E36 48 57.1
011	N2 33 29.6 E36 48 29.6	194	N2 29 35.0 E36 45 55.4
012	N2 33 27.4 E36 48 28.7	195	N2 29 34.6 E36 47 31.7
013	N2 33 25.2 E36 48 28.0	196	N2 29 34.4 E36 48 57.3
014	N2 33 22.9 E36 48 27.2	197	N2 29 32.7 E36 45 54.9
015	N2 33 20.7 E36 48 26.4	198	N2 29 31.9 E36 47 32.6
016	N2 33 18.5 E36 48 25.5	199	N2 29 31.6 E36 48 57.3
017	N2 33 16.2 E36 48 24.9	200	N2 31 06.0 E36 49 41.6
018	N2 33 14.0 E36 48 24.2	201	N2 29 29.1 E36 47 33.1
019	N2 33 07.7 E36 48 19.9	202	N2 29 28.7 E36 48 57.3
020	N2 33 04.6 E36 48 19.7	203	N2 29 28.2 E36 45 53.8
021	N2 33 01.6 E36 48 19.9	202	N2 29 26.5 E36 47 33.2
022	N2 32 58.6 E36 48 19.6	205	N2 29 26.0 E36 45 53.3
023	N2 32 55.6 E36 48 19.8	206	N2 29 25.9 E36 48 57.4

024	N2 32 52.6 E36 48 19.7	207	N2 29 24.0 E36 47 32.4
025	N2 32 49.7 E36 48 19.4	208	N2 29 23.8 E36 45 52.7
026	N2 32 26.5 E36 46 18.2	209	N2 29 23.1 E36 48 57.5
027	N2 32 24.2 E36 46 17.8	210	N2 29 21.6 E36 45 52.2
028	N2 32 21.7 E36 46 17.3	211	N2 29 21.4 E36 47 32.3
029	N2 32 19.4 E36 46 16.8	212	N2 29 20.2 E36 48 57.6
030	N2 32 17.0 E36 46 16.3	213	N2 29 19.4 E36 45 51.5
031	N2 32 14.5 E36 46 16.2	214	N2 29 18.7 E36 47 32.3
032	N2 32 12.1 E36 46 15.7	215	N2 29 17.2 E36 45 51.0
033	N2 32 09.6 E36 46 15.4	216	N2 29 17.4 E36 48 57.6
034	N2 32 07.2 E36 46 15.0	217	N2 29 16.1 E36 47 32.5
035	N2 32 05.0 E36 46 14.6	218	N2 29 14.8 E36 45 50.7
036	N2 32 02.7 E36 46 14.1	219	N2 29 14.5 E36 48 57.7
037	N2 32 00.3 E36 46 13.7	220	N2 29 13.5 E36 47 32.4
038	N2 32 00.1 E36 48 59.2	221	N2 29 11.7 E36 48 57.8
039	N2 31 57.8 E36 46 13.4	222	N2 29 10.9 E36 47 32.1
040	N2 31 57.6 E36 48 58.8	223	N2 29 08.9 E36 48 57.8
041	N2 31 55.5 E36 46 12.7	224	N2 29 08.3 E36 47 31.8
042	N2 31 55.1 E36 48 58.0	225	N2 29 06.0 E36 48 58.0
043	N2 31 53.1 E36 46 12.3	226	N2 29 05.6 E36 47 31.8
044	N2 31 52.5 E36 48 57.5	227	N2 29 03.2 E36 48 58.0
045	N2 31 50.7 E36 46 11.9	228	N2 29 03.0 E36 47 31.6
046	N2 31 49.9 E36 48 56.9	229	N2 29 00.4 E36 47 31.4
047	N2 31 48.2 E36 46 11.6	230	N2 29 00.4 E36 48 58.0
048	N2 31 47.8 E36 47 25.9	231	N2 28 57.8 E36 47 31.1

049	N2 31 47.5 E36 48 56.4	232	N2 28 57.3 E36 48 58.2
050	N2 31 46.0 E36 46 11.0	233	N2 28 55.3 E36 47 30.5
051	N2 31 45.2 E36 47 25.9	234	N2 28 54.7 E36 48 58.2
052	N2 31 45.0 E36 48 55.7	235	N2 28 52.7 E36 47 30.1
053	N2 31 43.6 E36 46 10.8	236	N2 28 51.9 E36 48 58.4
054	N2 31 42.5 E36 47 26.4	237	N2 28 50.3 E36 47 29.4
055	N2 31 42.5 E36 48 55.2	238	N2 28 49.1 E36 48 58.4
056	N2 31 41.4 E36 46 10.2	239	N2 28 47.7 E36 47 28.7
057	N2 31 41.0 E36 49 47.9	240	N2 28 46.3 E36 48 58.4
058	N2 31 40.0 E36 48 54.6	241	N2 28 45.3 E36 47 27.5
059	N2 31 39.7 E36 47 27.3	242	N2 28 43.4 E36 48 58.5
060	N2 31 39.2 E36 46 09.7	243	N2 28 42.3 E36 47 25.7
061	N2 31 38.3 E36 49 47.7	244	N2 28 40.6 E36 48 58.5
062	N2 31 37.5 E36 48 53.9	245	N2 28 39.4 E36 47 23.6
063	N2 31 37.0 E36 47 27.8	246	N2 28 37.7 E36 48 58.6
064	N2 31 36.8 E36 46 09.4	247	N2 28 34.9 E36 48 58.7
065	N2 31 35.5 E36 49 47.4	248	N2 28 29.9 E36 47 00.9
066	N2 31 35.0 E36 48 53.3	249	N2 28 28.4 E36 48 11.8
067	N2 31 34.7 E36 46 09.1	250	N2 28 27.2 E36 47 00.9
068	N2 31 34.4 E36 47 28.0	251	N2 28 25.6 E36 48 11.7
069	N2 31 32.6 E36 46 08.7	252	N2 28 24.6 E36 47 01.0
070	N2 31 32.8 E36 49 47.1	253	N2 28 22.8 E36 48 11.5
071	N2 31 31.7 E36 47 28.3	254	N2 28 22.0 E36 47 01.0
072	N2 31 30.4 E36 46 08.4	255	N2 28 20.0 E36 48 11.4
073	N2 31 30.0 E36 49 46.8	256	N2 28 19.4 E36 47 01.0

074	N2 31 29.0 E36 47 28.6	257	N2 28 17.1 E36 48 11.4
075	N2 31 28.0 E36 46 08.0	258	N2 28 16.7 E36 47 01.0
076	N2 31 27.2 E36 49 46.7	259	N2 28 14.3 E36 48 11.2
077	N2 31 26.3 E36 47 28.7	260	N2 28 14.1 E36 47 00.9
078	N2 31 25.7 E36 46 07.8	261	N2 28 11.6 E36 47 00.9
079	N2 31 24.5 E36 49 46.3	262	N2 28 11.5 E36 48 11.0
080	N2 31 23.6 E36 47 29.0	263	N2 28 08.9 E36 47 01.1
081	N2 31 23.3 E36 46 07.2	264	N2 28 08.7 E36 48 10.9
082	N2 31 21.8 E36 49 45.9	265	N2 28 06.2 E36 47 00.3
083	N2 31 20.9 E36 46 06.9	266	N2 28 05.9 E36 48 10.7
084	N2 31 20.9 E36 47 29.3	267	N2 28 03.6 E36 47 01.7
085	N2 31 19.1 E36 49 45.6	268	N2 28 03.2 E36 48 10.7
086	N2 31 18.5 E36 46 06.4	269	N2 28 00.4 E36 48 10.7
087	N2 31 18.2 E36 47 29.7	270	N2 27 57.5 E36 48 10.7
088	N2 31 16.2 E36 46 06.0	271	N2 27 56.7 E36 46 59.1
089	N2 31 16.4 E36 49 45.3	272	N2 27 54.8 E36 48 10.7
090	N2 31 15.5 E36 47 30.1	273	N2 27 54.1 E36 46 59.0
091	N2 31 13.7 E36 46 05.6	274	N2 27 51.9 E36 48 10.6
092	N2 31 13.8 E36 49 44.9	275	N2 27 51.5 E36 46 58.3
093	N2 31 12.9 E36 47 30.3	276	N2 27 49.2 E36 48 10.5
094	N2 31 11.3 E36 46 05.1	277	N2 27 49.0 E36 46 57.9
095	N2 31 11.0 E36 49 44.7	278	N2 27 46.3 E36 46 57.9
096	N2 31 10.3 E36 47 30.4	279	N2 27 43.8 E36 46 57.8
097	N2 31 09.0 E36 46 04.5	280	N2 27 41.2 E36 46 57.8
098	N2 31 08.3 E36 49 44.3	281	N2 27 39.3 E36 46 57.7

099	N2 31 07.6 E36 47 30.4	282	N2 27 36.8 E36 46 57.6
100	N2 31 06.7 E36 46 04.3	283	N2 27 34.4 E36 46 57.6
101	N2 31 05.5 E36 49 44.1	284	N2 27 31.7 E36 46 57.6
102	N2 31 05.0 E36 47 30.3	285	N2 27 29.1 E36 46 57.6
103	N2 31 04.5 E36 46 03.9	286	N2 27 26.4 E36 46 57.6
104	N2 31 02.8 E36 49 43.9	287	N2 27 23.7 E36 46 57.6
105	N2 31 02.3 E36 46 03.4	288	N2 27 23.7 E36 48 47.2
106	N2 31 02.4 E36 47 30.1	289	N2 27 21.4 E36 48 46.9
107	N2 31 00.0 E36 46 03.1	290	N2 27 21.1 E36 46 57.6
108	N2 31 00.1 E36 49 43.5	291	N2 27 19.0 E36 48 46.5
109	N2 30 59.8 E36 47 29.9	192	N2 27 18.5 E36 46 57.7
110	N2 30 57.8 E36 46 02.8	193	N2 27 16.7 E36 48 45.9
111	N2 30 57.4 E36 49 43.2	294	N2 27 15.9 E36 46 56.8
112	N2 30 57.2 E36 47 29.8	295	N2 27 14.1 E36 48 45.5
113	N2 30 54.6 E36 47 29.8	296	N2 27 08.6 E36 48 45.5
114	N2 30 54.8 E36 49 42.9	297	N2 27 08.5 E36 46 59.7
115	N2 30 52.0 E36 47 29.5	298	N2 27 06.3 E36 48 45.2
116	N2 30 52.1 E36 49 42.5	299	N2 27 05.9 E36 46 59.5
117	N2 30 49.5 E36 47 29.0	300	N2 27 03.9 E36 48 44.8
118	N2 30 49.4 E36 49 42.2	301	N2 27 03.3 E36 46 59.6
119	N2 30 46.9 E36 47 28.6	302	N2 27 01.7 E36 48 44.5
120	N2 30 44.5 E36 47 27.5	303	N2 27 00.6 E36 46 59.8
121	N2 30 42.0 E36 47 26.3	304	N2 26 59.4 E36 48 44.3
122	N2 30 41.3 E36 46 11.6	305	N2 26 58.0 E36 46 59.6
123	N2 30 39.6 E36 47 25.5	306	N2 26 57.1 E36 48 43.8

124	N2 30 39.0 E36 46 10.9	307	N2 26 55.3 E36 46 59.7
125	N2 30 37.1 E36 47 24.6	308	N2 26 54.9 E36 48 43.3
126	N2 30 36.6 E36 46 10.4	309	N2 26 52.7 E36 46 59.8
127	N2 30 34.5 E36 47 24.1	310	N2 26 52.5 E36 48 43.0
128	N2 30 34.3 E36 46 10.0	311	N2 26 50.3 E36 48 42.8
129	N2 30 32.1 E36 46 09.3	312	N2 26 50.0 E36 46 59.8
130	N2 30 32.0 E36 47 23.4	313	N2 26 48.2 E36 48 42.2
131	N2 30 29.9 E36 46 08.9	314	N2 26 47.5 E36 46 59.6
132	N2 30 29.5 E36 47 22.8	315	N2 26 46.0 E36 48 41.8
133	N2 30 27.7 E36 46 08.3	316	N2 26 44.8 E36 46 59.8
134	N2 30 27.6 E36 48 55.8	310	N2 26 43.8 E36 48 41.2
135	N2 30 27.0 E36 47 21.9	318	N2 26 42.1 E36 47 00.1
136	N2 30 25.6 E36 46 07.7	319	N2 26 41.6 E36 48 40.4
137	N2 30 24.8 E36 48 55.8	320	N2 26 39.5 E36 47 00.0
138	N2 30 24.4 E36 47 21.7	321	N2 26 39.3 E36 48 39.9
139	N2 30 23.3 E36 46 07.1	322	N2 26 36.9 E36 46 59.6
140	N2 30 22.0 E36 48 56.0	323	N2 26 37.0 E36 48 39.7
141	N2 30 21.8 E36 47 21.7	324	N2 26 34.7 E36 48 39.6
142	N2 30 21.0 E36 46 06.4	325	N2 26 34.3 E36 46 59.4
143	N2 30 19.2 E36 47 21.8	326	N2 26 32.6 E36 48 38.9
144	N2 30 19.1 E36 48 56.1	327	N2 26 31.8 E36 46 58.7
145	N2 30 18.7 E36 46 06.0	328	N2 26 30.3 E36 48 38.2
146	N2 30 16.4 E36 46 05.5	329	N2 26 29.2 E36 46 57.7
147	N2 30 16.5 E36 47 22.1	330	N2 26 21.8 E36 47 05.8
148	N2 30 16.3 E36 48 56.2	331	N2 26 19.3 E36 47 05.3

149	N2 30 14.3 E36 46 04.9	332	N2 26 16.8 E36 47 04.6
150	N2 30 13.8 E36 47 22.4	333	N2 26 14.4 E36 47 03.6
151	N2 30 13.5 E36 48 56.2	334	N2 26 11.8 E36 47 03.1
152	N2 30 11.9 E36 46 04.3	335	N2 26 09.3 E36 47 02.5
153	N2 30 11.1 E36 47 22.8	336	N2 26 09.2 E36 48 49.1
154	N2 30 10.7 E36 48 56.3	337	N2 26 07.1 E36 48 48.3
155	N2 30 09.6 E36 46 03.7	338	N2 26 06.7 E36 47 02.2
156	N2 30 08.3 E36 47 23.3	339	N2 26 04.9 E36 48 47.5
157	N2 30 07.9 E36 48 56.3	340	N2 26 02.8 E36 48 46.5
158	N2 30 07.2 E36 46 03.1	341	N2 26 00.6 E36 48 45.6
159	N2 30 05.7 E36 47 23.6	342	N2 25 58.5 E36 48 44.4
160	N2 30 05.1 E36 48 56.5	343	N2 27 23.8 E36 48 46.5
161	N2 30 04.8 E36 46 02.6	344	N2 25 54.3 E36 48 41.7
162	N2 30 03.0 E36 47 24.1	345	N2 25 52.2 E36 48 39.9
163	N2 30 02.6 E36 46 02.0	346	N2 25 50.1 E36 48 38.6
164	N2 30 02.3 E36 48 56.6	347	N2 25 48.0 E36 48 37.6
165	N2 30 00.3 E36 46 01.4	348	N2 25 45.9 E36 48 36.5
166	N2 30 00.2 E36 47 25.3	349	N2 25 43.9 E36 48 35.2
167	N2 29 59.6 E36 48 56.6	350	N2 25 41.8 E36 48 34.2
168	N2 29 58.0 E36 46 00.9	351	N2 25 39.6 E36 48 32.9
169	N2 29 57.4 E36 47 26.1	352	N2 25 37.4 E36 48 32.2
170	N2 29 56.8 E36 48 56.7	353	N2 25 28.3 E36 47 57.5
171	N2 29 55.6 E36 46 00.4	354	N2 25 26.1 E36 47 56.4
172	N2 29 54.8 E36 47 26.5	355	N2 25 23.8 E36 47 55.4
173	N2 29 54.0 E36 48 56.7	356	N2 25 21.6 E36 47 54.5

174	N2 29 53.2 E36 45 59.7	357	N2 25 19.4 E36 47 53.7
175	N2 29 52.1 E36 47 26.8	358	N2 25 17.1 E36 47 52.7
176	N2 29 51.2 E36 48 56.9	359	N2 25 14.8 E36 47 51.8
177	N2 29 50.8 E36 45 59.2	360	N2 25 12.5 E36 47 51.0
178	N2 29 49.4 E36 47 27.2	361	N2 25 10.3 E36 47 50.1
179	N2 29 48.6 E36 45 58.7	362	N2 25 08.0 E36 47 49.3
180	N2 29 48.4 E36 48 56.9	363	N2 25 05.7 E36 47 48.3
181	N2 29 46.7 E36 47 27.7	364	N2 25 03.5 E36 47 47.4
182	N2 29 46.3 E36 45 58.1	365	N2 25 01.2 E36 47 46.6
183	N2 29 45.7 E36 48 57.0	-	-

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Document information

Version	*Date*	*Description*
12.0	8 October 2021	Revision to: Improve consistency with version 03.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN).
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the “CDM project standard for project activities” and with the PoA-DD and CPA-DD forms; • Make editorial improvement.

Version	*Date*	*Description*
09.0	24 May 2017	Revision to: • Ensure consistency with the “CDM project standard for project activities” (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the “Project design document form for small-scale CDM project activities” (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.

Version	*Date*	*Description*
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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